

## Comparison of the Effect of Massage with Coconut Oil and Sunflower Oil on the Growth of Premature Infants

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J Babol Univ Med Sci; 22; 2020; PP: 119-125

Received: Jul 15<sup>th</sup> 2019, Revised: Sep 21<sup>st</sup> 2019, Accepted: Nov 13<sup>rd</sup> 2019.

### ABSTRACT

**BACKGROUND AND OBJECTIVE:** Prematurity and low birth weight are one of the major health problems and the most common causes of infant mortality. Infant massage is potentially beneficial for physiological and psychological health. The present study was conducted to compare the effect of massage with coconut oil and sunflower oil on the growth of premature infants.

**METHODS:** This clinical trial was performed on 100 premature infants admitted to the neonatal intensive care unit of Amirkola Children's Hospital in 2018 in four groups of 25 infants. Infants of the intervention groups with one cc of sunflower oil and coconut oil and the oil-free massage group were massaged for 15 minutes three times a day for seven days with the help of a research assistant, and the control group received only routine care. The weight, height, and head circumference of infants were collected using a personal profile questionnaire and compared in four groups at the beginning and end of the intervention.

**FINDINGS:** Comparison of mean weight and head circumference changes at the end of the first week between coconut oil massage group (0.134±0.334 cm, 6.81±3.04 g), sunflower oil massage group (0.239±1.172 cm, 6.35±2.69 g), oil-free massage group (1.061±1.534 cm, 2.95±2.65), and control group (0.663±1.174 cm, 3.52±4.38 g) showed significant difference (p<0.05). Comparison of mean height changes in different groups (0.413±0.739, 0.448±0.747, 0.458±0.693, 0.429±0.611 cm, respectively) did not show any significant difference.

**CONCLUSION:** The results of the study showed that oil massage is recommended as it increases the rate of changes in weight gain and head circumference in premature infants.

**KEY WORDS:** *Infant, Premature, Massage, Sunflower Oil, Coconut Oil, Growth.*

### Please cite this article as follows:

Aziznejadroshan P, Zahed Pasha Y, Hajiahmadi M. Comparison of the Effect of Massage with Coconut Oil and Sunflower Oil on the Growth of Premature Infants. J Babol Univ Med Sci. 2020; 22: 119-25.

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## Introduction

Pretermaturity and low birth weight are among the major health problems and the most common causes of infant mortality (1). The birth rate of premature babies in the world is 9.6% (2), and its rate is 12.7% in the United States (3). Low growth rate is one of the most important problems for premature and low birth weight infants (4). Gaining the desired weight is one of the indicators that is considered in the early discharge of premature infants from the hospital (5). Massage is one of the oldest healing techniques in the world and is used as a routine care for the baby in many cultures, especially in South Asian countries (6,7).

Massage improves the mother's attachment and sensitivity to the symptoms of the disease in the baby and helps the mother-infant positive interactions. Another important effect of massage is to promote optimal growth and development in infants (8). Massage with medium pressure stimulates parasympathetic activity through traction and mechanical receptors (9). The mechanisms of massage therapy that affect weight gain in premature infants have not yet been fully specified. Massage may increase gastric stimulation and secretion of hormones such as gastrin, cholecystokinin, insulin, insulin growth factor, improvement in blood circulation and lymphatic fluid (10,11).

Topical oils (mustard, sunflower, sesame and coconut oil) are used to massage the infant due to availability, cost and safety, especially in South Asia and sub-Saharan Africa (12). Topical massage with sunflower oil has positive effects on weight gain, increased skin function and temperature regulation, reduces water excretion through the epidermis, reduces infant infection and also promotes skin integrity, nerve growth and mother-infant transplantation (13). Some studies have reported that body massage with vegetable oils such as coconut oil (14) and sunflower oil (15) increases the rate of weight gain in infants. Alizadeh Taheri et al. studied the effect of sunflower oil massage on the rate of weight gain in infants and concluded that the average daily weight gain on the fifth day in the intervention group was significant compared to the control group and the length of stay in the intervention group was shorter (15).

In the study of Mirmohammadali et al., the results showed that the mean weight and height were significantly different between the massage groups with sunflower oil, massage with sesame oil, massage without oil and the control group and the mean weight of infants in the massage group with sunflower oil

increased significantly in comparison with the other three groups (10). In their study, Amini et al. found that massage did not show a significant difference in daily weight gain between the two groups (massage and control) (16). Lee also found that, after 4 weeks of infant massage, there was no significant difference in weight gain and height gain between the two groups (12).

In their study, Diego et al. found that infants who were massaged for ten minutes a day for five days showed no difference in weight gain compared to the control group (5). Several factors, such as the method of massage, the characteristics of the baby, the use of different oils and the duration of the massage are varied in different studies (13,17). However, more clinical trials are required to evaluate the effectiveness of different oils and determine the most effective ones.

Massage has several benefits for infants, especially high-risk infants, and is one of the most important and widely used types of complementary medicine. Given the role that nurses play in the health and development of premature infants, and the conflicting results of studies on the effect of massage with oils and considering that lack of proper weight gain of the infant is one of the signs of danger and proper development is one of the criteria for the discharge of low birth weight infants from the hospital and one of the goals of neonatal health, the present study was conducted to compare the effect of massage with coconut oil and sunflower oil on the growth of premature infants.

## Methods

This clinical trial was conducted in the neonatal and intensive care unit of Amirkola Shafizadeh pediatric hospital in 2018 after obtaining permission from the ethics committee of Babol University of Medical Sciences with the ethics code Mubabol.REC.1385.1. Based on the study of Golchin et al. (18), the number of samples for each group was 21, and considering a 20% drop chance for each group, 25 infants were assigned in each group (based on Altman nomogram). 100 hospitalized low birth weight infants were selected by convenience sampling method and after justifying and attracting the cooperation of mothers, the samples were randomly assigned in groups of sunflower oil, coconut oil, massage without oil and control in blocks of five (25 infants in each group). Infants weighing less than 2,500 grams at birth, gestational age 33 to 36 weeks, direct breastfeeding, no abnormalities and dysfunction of the

central nervous system, no respiratory distress and receiving supportive oxygen, no congenital infections and no drugs or alcohol abuse by the mother during pregnancy, infants in need of surgery, light therapy or blood transfusions, and lack of intravenous nutrition were included in the study. Infants with gastrointestinal problems such as vomiting or milk intolerance were excluded. The milk intake was the same in the four groups at a daily dose of 120 cc per kg at the beginning of the study. For all infants, a questionnaire including personal information (gestational age, birth weight, weight and age at enrollment, gender and fifth minute Apgar score) and growth information (weight, height, head circumference) were completed before the beginning of the study. The infants in the intervention group were each given massage therapy three times a day for a week with an interval of at least 4 hours and each session lasted 15 minutes (18). The infants in the control group received routine intensive care for premature infants. Before starting the massage, to determine the sensitivity of infants to sunflower or coconut oil, some of it was rubbed on the infant's wrist and if no skin allergy was observed, they were included in the study. Massage was performed each time one hour after breastfeeding to avoid vomiting. During the massage, the infants were placed in a quiet environment with mild light, completely naked, and in an incubator at a temperature of 32 to 34° C.

Before performing the massage, the masseuse/masseur washed her/his hands according to the hand washing instructions and applied the palms of hands with 1 cc of sunflower or coconut oil to reduce the friction between the massaging fingers and infant skin and then warmed the hands under a warmer. The massage technique in this study was performed in two phases, lying on the abdomen and lying on the back. The direction of massaging the limbs was from distal to proximal. The pressure was to the extent that the infant skin color changed from pink to slightly white, and the muscles were felt under the fingers. During the massage, if the infant cried or urinated or defecated, the massage would be stopped for a few seconds and resumed.

In the first phase, the infant was placed on the stomach and the masseuse/masseur moved the palm of her/his hand on the infant's hips to its neck in 25 five-second movements. In the second phase, the baby was lying on its back. The change of status from the first to the second phase was very slow. In the second phase of the massage, the infant's palm was massaged in a

circular motion by the masseuse/masseur's index finger toward the shoulders (25 five-second movements). Massage of the legs was done in the same way, except that the touch of the foot was from the toes to the heels. Chest massage was done in a butterfly mode with two index fingers and the middle fingers of both hands from the sternum to the sides (20 three-second movements). Finally, the abdominal massage was done with the same two fingers of one hand in a clockwise direction (25 five-second movements).

The weight of infants without diapers and clothes was measured every day at noon using a fixed digital scale (Seca; made in Germany) with an accuracy of  $\pm 10$  g. Head circumference and height of the infant were measured before the beginning of the first massage and at the end of the seventh day by research assistant who was unaware of the purpose of the study to minimize bias. Standard tools were used to measure weight, height and head circumference for all infants. Data were collected using SPSS software and paired t-test and the groups were analyzed by independent t-test, analysis of variance (ANOVA) and non-parametric Kruskal-Wallis test, while  $p < 0.05$  was considered significant.

## Results

In this study, infants were not significantly different in terms of neonatal demographic variables and the status of study groups at the beginning of the study (Table 1). Comparison of mean changes in weight and head circumference at the end of the first week in coconut oil massage group ( $0.134 \pm 0.334$  cm,  $6.81 \pm 3.04$  g), sunflower oil massage group ( $0.239 \pm 1.172$  cm,  $6.35 \pm 2.69$  g), oil-free massage group ( $1.061 \pm 1.534$  cm,  $2.95 \pm 2.65$ ), and control group ( $0.663 \pm 1.174$  cm,  $3.52 \pm 4.38$  g) showed significant difference ( $p < 0.05$ ). However, comparison of mean height changes in different groups ( $0.413 \pm 0.739$ ,  $0.448 \pm 0.747$ ,  $0.458 \pm 0.693$ ,  $0.429 \pm 0.611$  cm, respectively) did not show any significant difference ( $p > 0.05$ ) (Table 2). Moreover, in the four groups of massage with sunflower oil, massage with coconut oil, massage without oil, and control group, the mean weight ( $2805.8 \pm 877.43$ ,  $2449.8 \pm 909.52$ ,  $2875.16 \pm 855.23$ , and  $2620 \pm 848.66$  g, respectively), height ( $40.54 \pm 2.69$ ,  $41.82 \pm 2.36$ ,  $40.154 \pm 5.02$ , and  $39.46 \pm 3.84$  cm, respectively) and head circumference ( $31.32 \pm 1.74$ ,  $31.58 \pm 2.12$ ,  $31.84 \pm 2.94$ , and  $32.49 \pm 2.71$  cm, respectively) at the end of the first week after the intervention, did not show significant statistical difference between the groups.

**Table 1. Comparison of demographic characteristics of premature infants in coconut oil massage group, massage with coconut oil, oil-free massage and control group**

Groups	Control	Oil-free massage	Massage with sunflower oil	Massage with coconut oil	P-value
Variables	Mean±SD Or number(%)	Mean±SD Or number(%)	Mean±SD Or number(%)	Mean±SD Or number(%)	
Fetal age (weeks)	35.40±1.979	35.36±2.564	34.04±3.234	33.36±3.012	0.047 (ANOVA Test)
Neonatal age (days)	6.20±4.583	5.76±4.567	6.20±4.183	13.08±11.317	0.212 (Kruskal-Wallis Test)
Fifth minute Apgar	8.08±0.909	8.20±1	8.12±1.301	7.68±1.145	0.401 (ANOVA Test)
Birth weight (g)	2571.6±856.27	2846±859.4	2703±863.4	2227.4±1035.5	0.101 (ANOVA Test)
Birth height (cm)	39.16±3.99	39.42±5.27	40.3±2.89	41.38±2.65	0.172 (ANOVA Test)
Head circumference at birth (cm)	32.42±2.95	31.64±3.28	31.52±1.82	31.42±2.46	0.544 (ANOVA Test)
<b>Gender</b>					0.231 (Pearson Chi-Square Test)
Male	10(40)	17(68)	14(56)	12(48)	
Female	15(60)	8(32)	11(44)	13(52)	

**Table 2. Comparison of the effect of massage with coconut oil and sunflower oil on the growth variables of premature infants**

Groups	Growth variables	Control	Oil-free massage	Massage with sunflower oil	Massage with coconut oil	P-value (ANOVA Test)
Time of test		Mean±SD	Mean±SD	Mean±SD	Mean±SD	
Baseline	Weight (g)	2538.6±842.58	2804.12±852.82	2650.24±853.77	2305.6±886.6	0.222
	Height (Cm)	39.3±3.86	39.97±4.99	40.36±2.80	41.8±2.28	0.104
	Head circumference (Cm)	32.28±2.65	31.52±3.04	31.30±1.61	31.53±2.09	0.527
End of the first week of study	Weight (g)	2620±848.66	2875.16±855.23	2805.8±877.43	2449.8±909.52	0.312
	Height (Cm)	39.46±3.84	40.15±5.02	40.54±2.69	41.82±2.36	0.143
	Head circumference (Cm)	32.49±2.71	31.84±2.94	31.32±1.74	31.58±2.12	0.344
Mean changes	Weight (g)	3.52±4.38	2.95±2.65	6.35±2.69	6.81±3.04	0.000
	Height (Cm)	0.429±0.611	0.458±0.693	0.448±0.747	0.413±0.739	0.107
	Head circumference (Cm)	0.663±1.174	1.061±1.534	0.239±1.172	0.134±0.334	0.04

## Discussion

Based on the results of this study, the comparison of the mean changes in weight and head circumference at the end of the first week after the intervention showed an increase in coconut oil and sunflower oil massage groups compared to other groups and this difference was significant. However, the comparison of the mean changes in infant height did not show significant difference. In addition, the mean weight, height and

head circumference of infants at the end of the first week after the intervention did not show a statistically significant difference between the groups. Consistent with the results of the present study, other studies have shown that body massage, especially with oil, has a positive effect on the rate of weight gain in infants (4,19,20). The results of the study of Akhavan Karbasi et al. showed that two weeks after the intervention, there

was no significant difference in weight gain, height and head circumference. In the group that received the massage, infant weight was significantly higher than the control group only at the age of two months, but no difference in height and head circumference was observed between the two groups (21). In our study, weight, height, and head circumference were measured at the end of the first week, and perhaps if the measurement was followed at one to two months of age, the results would probably be different. After four weeks of massage, Lee et al. did not find any significant statistical differences in the weight gain of the two groups of infants. He also suggests that massage is beneficial for infants because it improves the mother-infant relationship (12), which is similar to the results of the present study. Kianmehr et al. showed that there was no statistically significant difference in daily weight gain between the two groups of intervention and control and concluded that massage for five days can make a significant difference in weight gain of infants (20). The results are consistent with the present study. Only one study investigated the effects of a five-day body massage with sunflower oil on the weight of premature infants. During the study period, differences in mean weight gain on the first and fifth days in the intervention group was significant (15), which is not consistent with the above study. In most studies, the duration of

sunflower oil massage varies from fourteen to twenty-eight days (22), while in this study, the duration of sunflower oil massage was seven days. Yilmaz et al. reported that weight gain and height increased in the massage group compared to the control group after two to fourteen weeks (23). The reason for this difference may be due to the duration of the massage. Overall, the findings of the present study show that massage with coconut oil and sunflower oil improves weight gain in premature infants. Given that massage has many benefits for infants, especially high-risk infants, and is a method that is cost-free and mothers can do it at any time and place, and since nurses are mostly busy and to improve the interaction between mother and infant, it is necessary for mothers to be aware of the use of oil massage, its benefits and effects on premature infants, and consider the use of massage methods with sunflower oil and coconut oil in the care of infants.

### **Acknowledgment**

Hereby, we would like to thank the deputy of research and technology of Babol University of Medical Sciences for supporting the research and all the nurses of Babol University of Medical Sciences, especially Ms. Shokoofeh Gholami, who aided us with sample collection.

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