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Research Article

Impact of Oil Massage Therapy on Weight Gain in Low-Birth-Weight Infants in the Neonatal Intensive Care Unit

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ABSTRACT

Background: Oil massage therapy on low birth weight (LBW) babies has been proposed to have several potential benefits, including promoting growth & weight gain, improving neurodevelopmental outcomes, reducing stress & promoting sleep, and enhancing parent-infant bonding. Despite the potential benefits of oil massage therapy for LBW babies, there is a lack of high-quality evidence to support its use. Therefore, this study was designed to evaluate the effectiveness of oil massage therapy on weight gain in LBW babies admitted to the neonatal intensive care unit (NICU).

Methods: In this study, purposive sampling was used to choose a quasi-experimental pre-test post-test control group design with a sample of 30 LBW babies weighing between 1.5-2.5kgs & aged between 10 days to 3 months. Digital newborn weighing equipment was used to determine the weight of LBW newborns, and a self-structured questionnaire was employed to collect socio-demographic data. The study compared an experimental group that received oil massage therapy with a control group that did not receive the intervention.

Results: The experimental group, which received oil massage therapy, showed significant weight increases compared to the control group. The pre-test & post-test scores of the experimental group showed a significant increase in weight, indicating the effectiveness of oil massage therapy.

Conclusion: The study supports the use of oil massage therapy as a safe & non-medical care strategy to promote weight gain in LBW babies.

Key-words: Chest circumference, Coconut oil, Head circumference, Low birth weight babies, Oil massage

INTRODUCTION

Low birth weight (LBW) is a significant public health issue, with approximately 15 million infants born with LBW annually worldwide [1]. LBW babies are at a higher risk of developing various health complications, including infections, respiratory distress syndrome, and feeding difficulties, among others [2]. These complications can lead to a prolonged hospital stay in the NICU, which can have a significant impact on the baby's growth & development.

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Weight gain is a crucial indicator of the health & development of LBW babies. Rapid weight gain is associated with better neurodevelopmental outcomes & reduced morbidity in this vulnerable population [3]. LBW infants often struggle with feeding difficulties, inadequate caloric intake, & challenges in maintaining body temperature, all of which can impede weight gain progress [4]. Therefore, interventions supporting healthy weight gain in LBW babies are essential for improving

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their short- & long-term outcomes.

One intervention that has been proposed to improve the growth of LBW babies in the NICU is oil massage therapy. Oil massage therapy has been traditionally used in many cultures as a therapeutic intervention for promoting growth & well-being in infants. The gentle application of oils on the skin is believed to enhance circulation, improve digestion, and stimulate weight gain by increasing nutrient absorption [5]. In the context of LBW babies in the NICU, oil massage therapy may offer a non-invasive & cost-effective approach to supporting weight gain while providing additional benefits such as improved sleep patterns & reduced stress levels [6]. Despite the potential benefits of oil massage therapy for LBW infants, there is a lack of comprehensive research examining its effectiveness, specifically on weight gain outcomes in NICU settings. Therefore, the present study was designed to evaluate the effectiveness of oil massage therapy on weight gain in LBW babies admitted to the NICU.

MATERIALS AND METHODS

Study design and setting- The research was carried out in the NICU of HSK Hospital & Research Centre Navanagar, Bagalkot, utilizing a Quasi-experimental pre-test post-test control group design. The experimental group underwent oil massage therapy, while the control group did not. 30 LBW babies meeting the inclusion criteria were included, with 15 allocated to each group using the purposive Sampling Technique.

Description of data collection instruments

Section 1: Socio-demographic variables- Self-structured interview was scheduled for collecting the socio-demographic variables such as gestational age, gender, age of LBW babies, family monthly income, occupation of mother & father & birth order.

Section 2: Neonatal parameters- It consists of vital parameters, temperature, heart rate, respiration, oxygen saturation & Apgar score at birth.

Section 3: Anthropometric measurements- It consists of length, weight, head circumference, chest circumference & birth weight of low-birth-weight baby.

Section 4: Nutritional information- It includes details on direct breastfeeding, spoon feeding with expressed breast milk, artificial feeding amounts, number of feedings, IV fluids type & amount, total parenteral nutrition amount, & the use of a digital weighing machine as a medical diagnosis research tool.

Section 5: Intervention phase- The procedure consists of 3 phases:

Phase 1: Preparation of unit & baby- The unit's preparation includes closing the window, turning off the fan, and putting items near the bedside. The baby's preparation comprises gaining informed agreement from parents, determining the feeding time, providing a comfortable position, removing the baby's garments, and monitoring vital parameters to assure the baby's safety during the intervention.

Phase 2: Prone position massage technique- Begin by completing 12 firm strokes with the palms for 5 seconds each in specified regions. Using alternate hands, begin with the head, moving from the forehead hairline down the scalp to the neck. Massage the neck from the midline outwards with both hands. Then, with both hands, apply pressure to the shoulders from the midline outwards. Transition to the back, beginning at the nape of the neck and continuing down to the buttocks with long, strong strokes with alternate hands.

Phase 3: Supine position massage technique- The technique involves 12 firm strokes in each area as follows: on the forehead, strokes are made from the midline outward with both hands simultaneously; on the cheeks, strokes are made from the side to the nose with both hands simultaneously in a rotating & clockwise direction; on the chest, butterfly stroking is done from the midline upward, outward, downwards, & inwards, back to the starting point; on the abdomen, strokes are made in a clockwise direction around the abdomen, avoiding the epigastrium & using gentle strokes; on the upper limbs, strokes are made from the shoulder to the wrist using alternate hands; on the palms, strokes are made from the wrist to the fingertips using alternate hands; on the soles, strokes are made from the heel to the tiptoe using alternate hands. In addition, five events lasting two seconds each are conducted for the passive flexion and extension motions of each significant joint (shoulder, elbow, hip, knee, and ankle).

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Description of oil massage therapy- Oil massage therapy for babies aged 10 days to 3 months, weighing 1.5 to 2.5 kgs, was conducted over ten days. Each day, the babies received two massages, one in the morning & one in the evening, each lasting for 15 minutes. The chosen oil for the massages was coconut oil, known for its nourishing & gentle properties on delicate skin. The massages were administered one hour after the babies had been fed, ensuring their comfort & relaxation during the sessions.

Statistical analysis- Analysis of the data was done with SPSS version 28. The acquired data was input into an MS Excel spreadsheet. For completeness and accuracy, the data was edited. Numerical codes were used to categorize the responses. Mean±standard deviation was used to calculate descriptive statistics, while the chi-square test was used to calculate inferential statistics. The p-values less than 0.05 were regarded as statistically significant.

Ethical approval- The institutional ethical clearance committee of the B.V.V.S. Sajjalashree Institute of Nursing Sciences in Navanagar, Bagalkot, provided the certificate of ethical clearance (Ref. No: BVVS/SIONS/IEC/2022-23/946 DATE: 12/08/2022). Before data collection, all subjects provided written informed consent.

RESULTS

In the study comparing an experimental group & a control group regarding low-birth-weight babies, several socio-demographic variables were analyzed (Table 1). Regarding gestational age, the experimental group had 20% in the 29-32 weeks range, 53.3% in the 33-36 weeks range, & 26.6% in the 37-40 weeks range. For gender distribution, 60% of LBW babies in the experimental group were male, while 40% were female. Regarding the age of LBW babies, 86.6% were from birth to 1 month old, 6.6% were between 1 to 2 months old, & another 6.6% were between 2 to 3 months old. Family income distribution showed that in the experimental group, 46.6% had a family income between 1,00000-2,00000 & 3,00000-4,00000, & 16.6% had an income above 5,00000. The fathers' occupations in the experimental group were as follows: 26.7% were government employees, 46.7% were private employees, & 26.7% had other occupations. For mothers' occupations in the experimental group, 13.3% were government employees, 20% were private employees, & 66.7% had other occupations. Lastly, birth order distribution indicated that in the experimental group, 66.7% were first-borns, while second-borns & third-borns each accounted for 13.3%.

Table 1: Distribution of demographic variables of low-birth-weight babies

Socio-demographic variables	Experimental group		Control group	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Gestational age (weeks)				
29-32	3	20	4	26.6
33-36	8	53.6	4	26.6
37-40	4	26	7	46.6
Gender				
Male	6	40	12	60
Female	9	60	3	30
Age of LBW babies				
Birth-1 month	13	86.6	12	80
1 month-2 months	1	6.6	2	13.3
2 month-3 months	1	6.6	1	6.66
Family income (Rs)				
1,00000-2,00000	9	60	7	46.6
3,00000-400000	5	33.3	7	46.6

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Above 5,00000	1	6.6	1	6.6
Occupation of father				
Govt. employee	6	40	4	26.7
Private employee	4	26.7	1	6.7
Others	5	33.3	10	66.7
Occupation of mother				
Govt. employee	2	13.3	2	13.3
Private employee	3	20	2	13.3
Others	10	66.7	11	73.3
Birth order				
1	12	80	10	66.7
2	3	20	3	20
3	0	0	2	13.3

In Table 2, the distribution of neonatal parameters between the experimental group & the control group is presented. In terms of temperature, in the experimental group, 60% of neonates had temperatures ranging from 96.1 to 98.6^{0}F; in the control group, this percentage was higher at 80%. For heart rate, 80% of neonates in the experimental group had rates between 121 & 140 beats per minute, compared to 20% in the control group with rates between 141 & 150 beats per minute. Regarding respiration, a higher percentage (66.6%) of neonates in the experimental group had rates between 31 & 40 breaths per minute. In contrast, in the control group, more neonates (53.3%) had rates between 41 & 50 breaths per minute. Oxygen saturation levels varied, with the experimental group showing a distribution of 16.6%, 80%, & 3.3% for saturation levels below 95%, between 96-97%, & between 98-99%, respectively. In comparison, the control group had percentages of 13.3%, 46.6%, & 40% for these respective categories. Apgar scores were also different between the groups, with a higher percentage (66.6%) of neonates in the experimental group scoring between 4-7, while in the control group, more neonates (53.3%) scored between 8-10.

Table 2: Distribution of neonatal parameters

Neonatal parameters	**Experimental group**		**Control group**	
	Frequency	**Percentage (%)**	**Frequency**	**Percentage (%)**
Temperature (^{O}F)				
96.1-98	6	40	9	60
98.1-100	9	60	6	40
Heart rate (beats per minute)				
121-140	12	80	12	80
141-150	3	20	3	20
Respiration (breaths per minute)				
31-40	5	33.3	10	66.6
41-50	10	66.6	5	33.3
Oxygen saturation				
Below 95	1	6.6	2	13.3
96-97	12	80	6	40
98-99	2	13.3	7	46.6
Apgar score				
4-7	10	66.6	10	66.6
8-10	5	33.3	5	33.3

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Results of anthropometric measurements showed that the majority of the experimental group (60%) falls in the 51-60 cm range, while the control group is more evenly distributed between the 41-50 cm (53.3%) & 51-60 cm (46.7%) ranges. Both groups have a similar distribution for head circumference, with most individuals in the 26-27.9 cm range (53.3% in the control group & 40% in the experimental group). Regarding chest circumference, the experimental group shows a more even distribution across the 21-28.9 cm ranges, while the control group is more concentrated in the 23-24.9 cm range (53.3%). Regarding weight at the time of admission, the experimental group has a higher percentage of individuals in the lower weight categories (1-1.5 kg & 1.6-2.5 kg) than the control group, which is more distributed across all weight categories (Table 3).

Table 3: Distribution of anthropometric measurement.

Anthropometric measurement	Experimental group		Control group	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Length (cm)				
31-40	5	33.3	6	40
41-50	9	60	8	53.3
51-60	1	6.6	1	6.7
Head circumference (cm)				
24-25.9	0	0	2	13.3
26-27.9	8	53.3	2	13.3
28-29.9	7	46.6	11	73.3
Chest circumference (cm)				
21-22.9	3	20	0	0
23-24.9	3	20	5	33.3
25-26.9	3	20	2	13.3
27-28.9	0	0	2	13.3
29-30.9	6	40	6	40
Weight at the time of admission (kg)				
1-1.5	10	66.6	7	46.6
1.6-2.5	5	33.3	8	53.3

Table 4 shows that in terms of direct breastfeeding, both groups had similar percentages, with 33.3% in the experimental group & 33.3% in the control group. However, when it came to spoon feeding, a higher percentage (74.6%) in the experimental group reported 'Yes' compared to only 26.7% in the control group. Artificial feeding was more prevalent in the control group, with 64% reporting 'Yes' compared to 20% in the experimental group. The feeding ranges were also different, with the control group (73.3%) receiving 210–260 ml more frequently than the experimental group (13.3%). Additionally, there was a difference in the frequency of feedings; the experimental group received 12 feedings (74.6%), whereas the control group received 8 (53.3%). 46.6% of the control group and none of the experimental group received intravenous fluids. There was variation in both the kind and quantity of fluids among the groups. Medical diagnoses varied, with mild RDS being more common in the experimental group (20%) than in the control group (53.3%). On the tenth day, the control group (46.6%) had a higher prevalence of weights exceeding 2-2.5 kg than the experimental group (6.7%).

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Table 4: Description of nutritional information.

Nutritional information	Experimental group		Control group	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Direct breast feeding				
Yes	5	33.3	5	33.3
No	10	66.7	10	66.7
Spoon feeding				
Yes	7	46.7	4	26.7
No	8	53.3	11	73.3
Artificial feeding				
Yes	3	20	6	40
No	12	80	9	60
Amount of feeding (ml)				
210-260	11	73.3	2	13.3
261-310	4	26.6	11	73.3
311-360	0	0	2	13.3
Number of feeding				
8 times	8	53.3	10	66.7
12 times	7	46.7	5	33.3
IV fluids				
Yes	07	46.6	07	46.6
No	08	53.3	08	53.3
Type of fluids				
9% 1/2 DNS	5	33.3	5	33.3
10% Dextrose	3	20	2	13.3
Others	7	46.7	8	53.3
Amount of fluid (ml)				
0-100	7	46.6	8	53.3
101-200	6	40	5	33.3
201-300	1	6.6	2	13.3
301-400	1	6.6	0	0

Medical diagnosis				
Mild RDS	3	20	5	33.3
LBW	11	73.3	5	33.3
Severe RDS	1	6.7	1	6.6
Others	0	0	4	26.6
10th day of weight (kg)				
1.5-2	9	60	8	53.3
Above 2-2.5	6	40	7	46.6

Table 5 provides a breakdown of the levels of weight for low-birth-weight babies in both the experimental & control groups. In the experimental group comprising 15 babies, 73.3% weighed between 1.5-2kgs, while 26.6% weighed between 2.1-2.5kgs. On the other hand, in the control group composed of 15 babies, 46.6% considered between 1.5-2kgs, & 53.3% weighed between 2.1-2.5kgs. These data suggest that a higher percentage of babies in the experimental group fell into the lower weight category (1.5-2kgs) compared to the control group, where a higher percentage fell into the slightly higher weight category (2.1-2.5kgs).

Table 5: Description of levels of weight of low-birth-weight babies

Levels of weight (kg)	Experimental group		Control group	
	Frequency	Percentage (%)	Frequency	Percentage (%)
1.5-2	11	73.3	7	46.6
2.1-2.5	4	26.6	8	53.3

The experimental group's pre-test scores were 1.78 on average with a 0.302 standard deviation, whereas the control group's pre-test scores were 1.99 on average with a 0.314 standard deviation. This suggests that, relative to the control group, the experimental group performed worse on average on the pre-test (Table 6).

Table 6: Description of mean & SD of pre-test score.

Groups	Mean	Standard deviation
Experimental group	1.78	0.302
Control group	1.99	0.314

The present study also compared the effectiveness of oil massage therapy on weight by analyzing the pre-test & post-test scores of both the experimental group & the control group (Table 7). In the experimental group, the mean weight in the pre-test was 1.78±0.302, which increased to 1.97±0.300 in the post-test. The paired t-value for this group was 3.743 with a p-value of 1.761, indicating a significant difference in weight before & after the oil massage therapy. On the other hand, in the control group, the mean weight in the pre-test was 1.99±0.314, which slightly decreased to 1.97±0.405 in the post-test. The paired t-value for this group was -0.455 with a p-value of 1.761, suggesting no significant difference in weight before & after the oil massage therapy.

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Table 7: Description of the effectiveness of oil massage therapy on weight by comparing the pre-test & post-test scores of the experimental group & control group.

Groups	Mean±SD		Paired t-value	p-value
Experimental group	Pre-test	1.78±0.302	3.743	1.761
	Post-test	1.97±0.300		
Control group	Pre-test	1.99±0.314	-0.455	1.761
	Post-test	1.97±0.405		

The association between pre-test weight & various socio-demographic variables was analyzed using a chi-square test (Table 8). The results indicate significant associations ($p<0.05$) between pre-test weight & gestational age, APGAR score, head circumference, chest circumference, & weight at the time of admission. Specifically, higher pre-test weights were significantly associated with older gestational age, higher APGAR scores, larger head & chest circumferences, & increased weight at the time of admission. On the other hand, no significant associations were found between pre-test weight & gender, age of the low birth weight (LBW) baby, family monthly income, occupation of the father or mother, temperature, heart rate, respiration rate, oxygen saturation, direct breastfeeding, spoon feeding, artificial feeding, amount of feeding, number of feedings, IV fluids administration, type of IV fluids used, amount of fluids administered, or medical diagnosis.

Table 8: Description of association between the pre-test weight & selected variable.

Socio-demographic variables	Calculated x^2 value	Tabular x^2 value	p-value
Gestational age	3.901	3.84	<0.05
Gender	0.0226	3.84	>0.05
Age of LBW baby	0.1086	3.84	>0.05
Family monthly income	0.137	3.84	>0.05
Occupation father	1.22	3.84	>0.05
Occupation mother	0.25	3.84	>0.05
Birth order	1.508	3.84	>0.05
Temperature	2.4609	3.84	>0.05
Heart rate	0.0087	3.84	>0.05
Respiration	0.0006	3.84	>0.05
Oxygen saturation	0.625	3.84	>0.05
APGAR score	7.656	3.84	<0.05
Length	0.1758	3.84	>0.05
Head circumference	4.1233	3.84	<0.05
Chest circumference	4.0006	3.84	<0.05
Weight at the time of admission	13.398	3.84	<0.05
Direct breast feeding	2.1711	3.84	>0.05
Spoon feeding	0.574	3.84	NA
Artificial feeding	0.4242	3.84	NA
Amount of feeding	1.6346	3.84	NA

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No. of feeding	1.0772	3.84	NA
IV fluids	3.348	3.84	NA
Type of IV fluids	1.25	3.84	NA
Amount of fluids	0.4593	3.84	NA
Medical diagnosis	0.2153	3.84	NA

DISCUSSION

The study comparing a control group with an experimental group on LBW babies found many noteworthy changes in socio-demographic characteristics between the two groups. The experimental group displayed a higher gestational age than the control group. This statement aligns with prior research demonstrating a favorable relationship between an extended gestational age and improved delivery outcomes, such as a decreased likelihood of LBW [7]. The experimental group had a higher family income, with a substantial percentage of participants reporting higher income levels. Socioeconomic status has long been recognized as a crucial determinant of health outcomes, including birth weight [8]. Higher family income can provide access to better healthcare services, nutrition, & living conditions, all of which can contribute to reducing the risk of low birth weight.

Furthermore, the study highlighted differences in parental occupations between the two groups. Parental occupation can reflect socioeconomic status & access to resources that are essential for maternal health during pregnancy. Research has shown that certain occupations may expose individuals to environmental hazards or stressors that can impact pregnancy outcomes [9]. Understanding these occupational differences is vital for developing targeted interventions for at-risk populations. The experimental group showed a higher percentage of neonates with temperatures between 98.1-100.9°F compared to the control group. This is consistent with a study by Escrig *et al.* [10], which found that higher ambient temperatures were associated with higher neonatal temperature in the first 24 hours of life. However, it is essential to note that both groups fall within the normal newborn temperature range, typically between 97-99°F [11]. Regarding heart rate, most neonates in both groups fell within the 121-140 beats per minute range. However, a higher percentage of neonates in the experimental group had heart rates between 141-150 beats per minute. This is slightly higher than the normal range for newborns, typically between 100-160 beats per minute [12]. It may be worth investigating whether this more elevated heart rate in the experimental group is associated with adverse outcomes. Apgar scores were similar between the two groups, with most neonates scoring between 8-10. The Apgar score is a measure of newborn health & is assessed at 1 & 5 minutes after birth. Scores range from 0-10, with scores below 7 indicating need for medical attention [13]. Both groups in this study had Apgar scores within the normal range, indicating healthy newborns.

The experimental group exhibited a higher concentration of individuals in the 51-60 cm range for anthropometric measurements compared to the control group, which showed a more even distribution between the 41-50 cm & 51-60 cm ranges. This finding suggests that the experimental group may have a higher average height than the control group, which could be attributed to genetic, environmental, or lifestyle factors. Previous research has shown that variations in height can be associated with differences in health outcomes such as cardiovascular disease, diabetes, & mortality rates [14]. Therefore, it is essential to investigate further the potential impact of these height differences on the health of the individuals in the experimental & control groups. Additionally, the experimental group had more individuals in lower weight categories at admission than the control group. This finding suggests that there may be differences in weight or nutritional status between the two groups. Previous research has shown that variations in weight can be associated with differences in health outcomes such as obesity, diabetes, & cardiovascular disease [15]. Therefore, it is essential to investigate further the potential impact of these weight differences on the health of the individuals in the experimental & control groups.

The findings from our study suggest that a higher percentage of babies in the experimental group fell into the lower weight category (1.5-2kgs) compared to the

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control group, where a higher percentage fell into the slightly higher weight category (2.1-2.5kgs). This finding is consistent with previous research indicating that low birth weight is associated with an increased risk of neonatal mortality & morbidity [16]. Moreover, our finding that a higher percentage of babies in the experimental group fell into the lower weight category (1.5-2kgs) is also consistent with previous research indicating that low birth weight is associated with an increased risk of adverse health outcomes in later life [17].
The present study provides evidence that oil massage therapy can effectively reduce weight compared to a control group without the intervention. The results indicate a significant increase in weight among the experimental group who received oil massage therapy, while the control group experienced minimal change in weight. This finding aligns with previous research on the effects of massage therapy on weight loss. One study conducted by Kunin *et al.* investigated the impact of Swedish massage on cortisol levels & perceived stress in overweight women. The researchers found that participants who received Swedish massage had significantly reduced cortisol levels & perceived stress, suggesting that massage therapy may contribute to weight loss by reducing stress hormones associated with weight gain [18]. Another study by Field *et al.* examined the effects of massage therapy on obese women with depression. The study found that massage therapy significantly reduced depression symptoms & improved mood, which could potentially contribute to weight loss efforts by enhancing mental well-being [19].
The results of this analysis indicate a significant association between pre-test weight & several socio-demographic variables, such as gestational age, APGAR score, head circumference, chest circumference, & weight at the time of admission. These findings suggest that pre-test weight may be necessary when evaluating neonatal health outcomes. This is consistent with previous studies that found associations between pre-test weight & various neonatal health indicators. For instance, a study by Chen *et al.* [20] found that infants with higher pre-test weights had better neurodevelopmental outcomes at 2 years of age. Another study by Kim *et al.* [21] reported that pre-test weight was positively associated with birth weight & length.

LIMITATIONS

The small sample size of 30 LBW babies limits the generalizability of the findings. The study does not provide long-term follow-up data on the effects of oil massage therapy on weight gain & other outcomes in LBW babies.

CONCLUSIONS

The study's main finding is that LBW newborns' weight improved after they received massage therapy with coconut oil. According to the survey, giving LBW newborns oil massage helped them gain weight. The research findings provide compelling evidence that oil massage therapy is a safe and effective non-medical approach to helping LBW babies gain weight.

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