



**USE OF COCONUT OIL MASSAGE VERSUS OLIVE OIL MASSAGE ON
SELECTED PHYSICAL AND PHYSIOLOGICAL PARAMETERS AMONG
LOW BIRTH WEIGHT NEWBORNS IN SELECTED HOSPITALS, IN WEST
BENGAL**

Dipa Ghosh^{1*}, Smritikana Mani², Parul Datta²

¹Government School of Nursing, Ghatal, Department of Health and Family Welfare, GN-29, Swasthya Bhawan Sector-V, Salt Lake, Kolkata, West Bengal, India 700091

² College of Nursing, Medical College and Hospital, Kolkata-73, The West Bengal University of Health Sciences, DD 36, 2nd Avenue, DD Block, Sector 1, Bidhannagar, Kolkata, West Bengal, India 700064

*gdipa01@gmail.com

ABSTRACT

The most significant contributing factor of neonatal mortality and morbidity is low birth weight (LBW). Oil massage helps in growth and development in LBW infants. The purpose of the study is to evaluate the effectiveness of coconut oil versus olive oil massage on selected physical and physiological parameters among LBW newborns. Ethical permission was taken. The study design is quasi experimental time series design. 30 LBW newborns (10 in coconut, 10 in olive & 10 in control group) were selected by non-probability purposive sampling. Data were collected from NICU by using valid and reliable Record Analysis, Physical Assessment, Modified Brazelton's Scale and Maturity Assessment Scale. 10 ml /kg/day oil applied once only for 15 minutes upto 28th day. Weight, length, head and chest circumference, sleep, cry and maturity were assessed on 8th, 15th, 22nd and 29th day for each newborn. The result showed that there were no significant difference in physical parameters on 29th day of observation among three groups except weight gain ($F=8.70$, $p=0.001207$). There were significant difference in all post assessments of sleep. There were significant difference in cry score on 15th day ($p=0.007701$) and 22nd day ($p=0.000758$) of observation. Statistically significant differences were not found in all assessment of maturity. It can be concluded that oil massage has positive effect, compared to control. The study has a great implication in nursing service by practicing oil massage helps to gain weight and improve behaviour among LBW newborns. A similar study could be conducted using large sample for generalization.

Keywords: low birth weight; coconut; olive oil; massage

First Received

28 July 2020

Revised

20 August 2020

Accepted

24 September 2020

Final Proof Received

13 November 2020

Published

28 November 2020

How to cite (in APA style)

Ghosh, D., Mani, S., & Datta, P. (2020). Use of Coconut Oil Massage versus Olive Oil Massage on Selected Physical and Physiological Parameters among Low Birth Weight Newborns in Selected Hospitals, in West Bengal. *Indonesian Journal of Global Health Research*, 2(4), 401-410. <https://doi.org/10.37287/ijghr.v2i4.303>

INTRODUCTION

The most significant contributing factor of neonatal mortality and morbidity is low birth weight. WHO estimated that every year more than 20 million are born < 2500 g among them 96% in developing countries. Globally the prevalence of LBW newborns was 14.6% (UNICEF & WHO, 2019). In India, 48.1% infants died from LBW and premature birth according to the 'Causes of Death Statistics', 2010-13 report by the census office. The prevalence of LBW in different parts of West Bengal ranges between 28-31.3% (Kumar et al., 2018). Hypothermia is one of the major risk factors of co-morbidities and mortality among low birth weight newborns. A study result showed that, Hypothermia developed at least once within 24 hours in 70.4% Very Low weight

babies and in 58.5% Low weight babies (Tanigasalam et al., 2019). A review article was published in Indian Pediatrics journal, which has shown that massaging of premature babies with coconut oil is beneficial to gain weight, build bone mass and leave the hospital earlier (Kulkarni et al., 2010).

LBW infants are suffer 2 or 3 times more than normal children with disabilities and health problems. The topical oil or emollient massage therapy is effective for reducing the neonatal infections 41%, reducing mortality 26% and improving newborn care. (Duffy et al., 2012) Topical oil application has been proved to improve the skin barrier function, thermoregulation and also is suggested to have a positive effect on growth. Moderate pressure massage therapy and passive movement of the limbs have been shown to result in weight gain in preterm low birth weight infants and subsequent increase in bone density (Dhar et al., 2013). Touch plays a crucial role in development of emotional and physical health. Lack of touch may result in abnormal behaviours among newborns. When the newborns are massaged constantly, they develop less behavioural distress, more quiet sleep, improvement in body weight, reduction in stress and improvement in maternal newborn relationship (Anitha Mary Oyasisa, 2011).

A study was conducted on effectiveness of oil massage on physical parameters among low birth weight babies at selected hospitals in Vellore (Indumathi & Pandiammal, 2019). The study result revealed that, post-test mean value was higher in the experimental group than in the control group. The post-test mean value of weight was 1.9875. The mean difference of weight was 0.52. The post-test means values for all parameters such as length, head circumference and chest circumference were higher than the control group.

A study was conducted on effect of oil massage on growth and neurobehavioral in very low birth weight preterm neonates (Arora et al., 2005). The study result revealed that, weight gain in the oil massage group ($365.8 \pm 165.2\text{g}$) was higher compared to the only massage group ($290.0 \pm 150.2\text{g}$) and no massage group ($285.0 \pm 170.4\text{g}$). But the differences in other anthropometric parameters were not statistically significant. Neonatal neurobehaviours were comparable among three groups. From the above literature support, investigator wants to know the benefits of oil massage for caring the LBW newborns. The purpose of the study is to evaluate the effectiveness of coconut oil massage versus olive oil massage on selected physical and physiological parameters among LBW newborns.

METHOD

This type of quantitative research with a Quasi experimental Time-Series design. The study was conducted in MCH, Kolkata. The population of this study is hospitalized low birth weight newborns, with purposive non-probability sampling technique. The sample of this research is LBW newborn whose birth weight 1000g to 1400g with a sample size of 30 (10 for coconut, 10 for olive oil and 10 for control). Data Collection Tools with: Tool I: Record analysis; Tool II: Part A: Physical Assessment, Part B: Modified Standard Brazelstone's Behavioral Assessment scale, and Part C: Maturity assessment scale. Data collection with Coconut oil and olive oil massage for 15 minutes, 10 ml/kg of body weight 28th days. Post assessments were done on 8th, 15th, 22nd and 29th day.

RESULTS

Gestational age (n=30 (n₁=10, n₂=10, n₃=10))

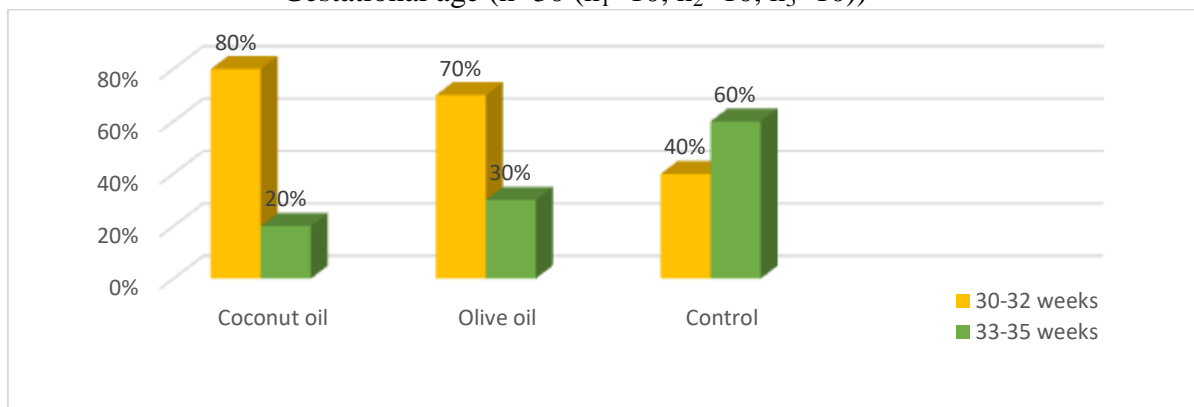


Figure 1. Bar diagram showing percentage distribution of LBW newborns of three groups according to gestational age.

Birth Weigh (n=30 (n₁=10, n₂=10, n₃=10))

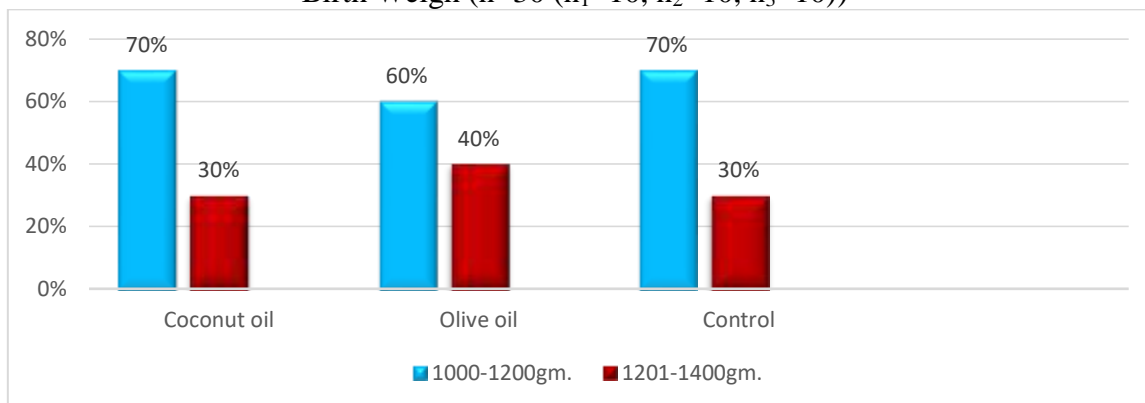


Figure 2. Bar diagram showing percentage distribution of LBW newborns of three groups according to birth weight.

Table 1.

Showing ANOVA of three groups in terms of weight (n=30(n₁=10, n₂=10, n₃=10))

| Observation | Mean score | | | F | P |
|----------------------|-------------|-----------|---------|------|-----------|
| | Coconut oil | Olive oil | Control | | |
| 8 th day | 1096.5 | 1113.8 | 1092.5 | 0.16 | 0.852773 |
| 15 th day | 1199.8 | 1165.4 | 1151 | 0.53 | 0.591995 |
| 22 nd day | 1325.3 | 1274.2 | 1207.4 | 3.11 | 0.060431 |
| 29 th day | 1469 | 1399.1 | 1294.4 | 8.70 | 0.001207* |

df=28, p<0.05 level of significance, * significant.

Table 1 revealed that, the P and F value of weight gain on 29th day of observation are 0.001207 and 8.70 which was significant difference among three groups at df 28 at 0.05 level of significance.

Table 2.
 Showing ANOVA of three groups in terms of length (n= 30 (n₁=10, n₂=10, n₃=10))

| Observation | Mean score | | | F | P |
|----------------------|-------------|-----------|---------|---------|----------|
| | Coconut oil | Olive oil | Control | | |
| 8 th day | 38.05 | 38.24 | 38.36 | 0.18 | 0.831951 |
| 15 th day | 38.72 | 38.81 | 38.86 | 0.03 | 0.963134 |
| 22 nd day | 39.48 | 39.49 | 39.49 | 0.00026 | 0.999741 |
| 29 th day | 40.37 | 40.3 | 40.2 | 0.06 | 0.940863 |

df=28, p<0.05 level of significance.

Table 2 revealed that, there were no significant difference of length at different observations among three group at df 28 at 0.05 level of significance.

Table 3.
 Showing ANOVA of three groups in terms of head circumference
 (n=30 (n₁=10, n₂=10, n₃=10))

| Observation | Mean score | | | F | P |
|-------------|-------------|-----------|---------|------|----------|
| | Coconut oil | Olive oil | Control | | |
| 8th day | 27.22 | 26.96 | 27.46 | 0.50 | 0.611458 |
| 15th day | 27.82 | 27.49 | 27.95 | 0.51 | 0.605556 |
| 22nd day | 28.59 | 28.2 | 28.52 | 0.41 | 0.667018 |
| 29th day | 29.44 | 28.94 | 29.19 | 0.59 | 0.563966 |

df=28, p<0.05 level of significance.

Table 3 revealed that, there were no significant difference of head circumference at different observations among three group at df 28 at 0.05 level of significance.

Table 4.
 Showing ANOVA of three groups in terms of chest circumference
 (n=30 (n₁=10, n₂=10, n₃=10))

| Observation | Mean score | | | F | P |
|----------------------|-------------|-----------|---------|------|----------|
| | Coconut oil | Olive oil | Control | | |
| 8th day | 23.47 | 23.03 | 23.53 | 0.48 | 0.624901 |
| 15 th day | 24.1 | 23.6 | 25.07 | 0.98 | 0.393856 |
| 22 nd day | 24.97 | 24.41 | 24.73 | 0.60 | 0.557574 |
| 29 th day | 25.96 | 25.24 | 25.51 | 1.01 | 0.382901 |

df=28, p<0.05 level of significance.

Table 4 revealed that, there were no significant difference of chest circumference at different observations among three group at df 28 at 0.05 level of significance.

Table 5.

Showing ANOVA of three groups in terms of sleep (n =30(n₁=10, n₂=10, n₃=10))

| Observation | Mean score | | | F | P |
|----------------------|-------------|-----------|---------|-------|-----------|
| | Coconut oil | Olive oil | Control | | |
| 8 th day | 5.5 | 5.4 | 4.4 | 5.77 | 0.00817* |
| 15 th day | 5.7 | 5.8 | 4.5 | 13.85 | 0.000072* |
| 22 nd day | 5.7 | 5.6 | 4.4 | 12.96 | 0.000113* |
| 29 th day | 5.9 | 5.8 | 4.9 | 11.06 | 0.000309* |

df=28, p<0.05 level of significance, * significant.

The data presented in the table 5 reveal that, there were significant difference of sleep score at different observations among three groups at df 28 at 0.05 level of significance.

Table 6.

Showing ANOVA of three groups in terms of cry (n=30 (n₁=10, n₂=10, n₃=10))

| Observation | Mean score | | | F | P |
|----------------------|-------------|-----------|---------|------|-----------|
| | Coconut oil | Olive oil | Control | | |
| 8 th day | 3.9 | 4.1 | 3.3 | 2.13 | 0.137543 |
| 15 th day | 4.4 | 4.7 | 3.6 | 5.85 | 0.007701* |
| 22 nd day | 4.8 | 5.2 | 3.8 | 9.48 | 0.000758* |
| 29 th day | 4.7 | 5.1 | 4.3 | 3.29 | 0.052315 |

df=28, p<0.05 level of significance, * significant.

The data presented in the table 6 reveal that, the p value of cry score of 15th and 22nd day observations are .007701 and .000758, which are significant difference among three group at df 28 at 0.05 level of significance.

Table 8.

Comparison of weight, length, head and chest circumference between coconut and olive groups on 29th day (n=30 (n₁=10, n₂=10, n₃=10))

| Items | Mean Score | | M _D | 't' |
|---------------------|-------------|-----------|----------------|------|
| | Coconut oil | Olive oil | | |
| Weight | 1469 | 1399 | 69.90 | 2.07 |
| Length | 40.37 | 40.30 | 0.07 | 0.15 |
| Head Circumference | 29.44 | 28.94 | 0.50 | 0.92 |
| Chest Circumference | 25.96 | 25.24 | 0.72 | 1.29 |

df=18, table value - 2.10, p<0.05 level of significance.

Data presented in table 8 depict that there were no significant difference of weight, length, head and chest circumference between coconut and olive oil group at the end of observation. The obtained values are lower than the table value (t 18 = 2.10) at 0.05 level of significance.

Table 7.
Showing ANOVA of three groups in terms maturity (n=30 (n1=10, n2=10, n3=10))

| Items | Observation | Mean score | | | F | P |
|-------------|-------------|-------------|-----------|---------|------|----------|
| | | Coconut oil | Olive oil | Control | | |
| Posture | 8th day | 3.7 | 3.5 | 3.5 | 0.27 | 0.761817 |
| | 15th day | 3.9 | 3.6 | 3.9 | 1.30 | 0.287354 |
| | 22nd day | 4 | 3.9 | 4 | 1 | 0.381099 |
| | 29th day | - | - | - | - | - |
| Square | 8th day | 1.7 | 1.9 | 1.8 | 0.40 | 0.668302 |
| Window | 15th day | 1.7 | 2 | 2 | 1.32 | 0.281801 |
| | 22nd day | 2.1 | 2 | 2.1 | 0.11 | 0.89146 |
| | 29th day | 2.6 | 2.8 | 2.5 | 0.74 | 0.486 |
| Arm | 8th day | 3.5 | 3.2 | 3.2 | 0.41 | 0.666957 |
| Recoil | 15th day | 3.9 | 3.7 | 3.6 | 0.67 | 0.519906 |
| | 22nd day | 4 | 3.7 | 4 | 1.97 | 0.15822 |
| | 29th day | 4 | 3.8 | 4 | 2.25 | 0.124801 |
| Popliteal | 8th day | 2.4 | 2.6 | 2.3 | 0.91 | 0.413337 |
| Angel | 15th day | 2.7 | 2.9 | 2.7 | 0.70 | 0.502557 |
| | 22nd day | 2.9 | 3 | 3 | 0.31 | 0.735775 |
| | 29th day | 3.5 | 3.3 | 3.3 | 0.64 | 0.537441 |
| Scarf | 8th day | 1.7 | 1.7 | 1.4 | 1 | 0.38742 |
| Sign | 15th day | 2 | 2 | 1.9 | 0.31 | 0.737039 |
| | 22nd day | 2.4 | 2.4 | 2 | 1.94 | 0.171752 |
| | 29th day | 2.9 | 2.7 | 2.7 | 0.47 | 0.630249 |
| Heel to Toe | 8th day | 2.5 | 2.6 | 2.3 | 1 | 0.38742 |
| | 15th day | 2.8 | 2.8 | 2.7 | 0.09 | 0.913517 |
| | 22nd day | 3.4 | 3.2 | 3.1 | 0.75 | 0.482525 |
| | 29th day | 3.9 | 3.6 | 3.7 | 1 | 0.38742 |

df=28, p<0.05 level of significance.

The data presented in the table 7 reveal that, there were no significant difference of maturity level in terms of posture, square window, arm recoil, popliteal angel, scarf sign and heel to toe score at different observations among three group at df 28 at 0.05 level of significance.

Table 9.
Comparison of sleep and cry between coconut and olive oil groups (n=30 (n1=10, n2=10, n3=10))

| Items | Observations | Mean score | | M _D | ‘t’ |
|-------|----------------------|-------------|-----------|----------------|------|
| | | Coconut oil | Olive oil | | |
| Sleep | 8 th day | 5.50 | 5.40 | 0.10 | 0.31 |
| | 15 th day | 5.70 | 5.80 | -0.10 | 0.49 |
| | 22 nd day | 5.70 | 5.60 | 0.10 | 0.44 |
| | 29 th day | 5.90 | 5.80 | 0.10 | 0.60 |
| Cry | 15 th day | 4.40 | 4.70 | -0.30 | 0.87 |
| | 22 nd day | 4.80 | 5.20 | -0.40 | 1.25 |

df=18, table value - 2.10, p<0.05 level of significance.

Data presented in table 9 depict that there were no significant difference of sleep and cry between coconut and olive oil group at different observations. The obtained values are lower than the table value ($t_{18} = 2.10$) at 0.05 level of significance.

DISCUSSION

Major findings of the study

Gestational age:

In coconut oil group, 80% LBW newborns belong to 30-32 weeks of gestational age whereas, 20% LBW newborns belong to 33-35 weeks of gestational age. In olive oil group, 70% LBW newborns belongs to 30-32 weeks of gestational age whereas, 30% LBW newborns belong to 33-35 weeks of gestational age. In control group, 40% LBW newborns belong to 30-32 weeks of gestational age whereas, 60% LBW newborns belong to 33-35 weeks of gestational age.

Birth weight:

In coconut oil group, maximum birth weight of LBW newborns (70%) belong to 1000-1200 gm whereas, 30% LBW newborns belong to 1201-1400gm. In olive oil group, maximum birth weight of LBW newborns (60%) belong to 1000-1200 gm whereas, 40% LBW newborns belong to 1201-1400gm. In control group, maximum birth weight of LBW newborns (70%) belong to 1000-1200 gm whereas, 30% LBW newborns belong to 1201-1400gm.

Homogeneity of three groups

The calculated 't' values of weight, length, head and chest circumference are less than table value ($t_{18}=2.10$) at 0.05 level of significance. So, three groups are homogenous. The calculated 't' values of sleep, cry, posture, square window, arm recoil, popliteal angel, scarf sign and heel to toe are less than the table value ($t_{18}=2.10$) at 0.05 level of significance. So, three groups are homogenous.

Physical parameters

The present study result showed that, on 22nd day of observation, the mean weight of three groups are 1325.30, 1274.20 and 1207.40. On 29th day, the mean weight gain was higher in coconut oil group (1469 gram) and olive oil group (1399.1 gram) compared to control group (1294.4 gram). The calculated p value was 0.001207 and F value was 8.70 at df 28 at 0.05 level of significance. It was statistically significant that, weight gain was higher in experimental groups compared to control group. So, it was recognized that, oil massage (coconut oil and olive oil) was effective for weight gain among LBW newborns.

The study findings are consistent with another study among 60 low birth weight newborns (Sally & Singh, 2017). The study result revealed that, the mean value of weight gain was 4.5 with a standard deviation of 3.65 in experimental group and 2.03 mean weight gain with the standard deviation of 0.7 in the control group and the obtained 't' value was 3.21 which showed that, there was a significant difference between experimental and control group at $p < 0.01$ level. Another study was conducted among 60 preterm newborns (M., 2015). The study result showed that, in experimental group the mean weight gain was 1.92 ± 0.29 compared to control group 1.82 ± 0.21 . The

calculated 't' value was 1.94 and table value was 1.69 at $p=0.05$. So, it is statistically significant that, weight gain is higher in experimental group compared to control group.

The present study result showed that, the p values of length, head and chest circumference of 29th day of observation were 0.940863, 0.563966 and 0.382901 at df 28 at 0.05 level of significance. There was no statistically significant difference of physical parameters in terms of length, head and chest circumference among LBW newborns of three groups. The study findings are consistent with another study among 224 babies (112 preterm and 112 term babies) in Mumbai (Sankaranarayanan et al., 2005). The study result revealed that, weight gain velocity over first 31 days was higher in the coconut oil group as compared to the mineral oil and placebo groups but, there were no statistically significant difference in the length and head circumference at 14 and 31 days among three groups.

Newborn behaviors

The present study result showed that, the p values of sleep score of 8th, 15th, and 22nd and 29th day of observations of three groups were 0.00817, 0.000072, 0.000113 and 0.000309 at df 28 at 0.05 level of significance. It was statistically significant that, oil massage is significantly effective for improving sleep state in experimental groups compared to control group. The p value of cry score on 8th and 29th day are .137543 and .052315, which are not significant difference. But, the p values of cry score of 15th and 22nd day of observations of three groups were 0.007701 and 0.000758 at df 28 at 0.05 level of significance. It was statistically significant that, oil massage is significantly effective for reducing cry in experimental groups compared to control group on 15th and 22nd day of observations.

The study findings are consistent with another study, which was conducted in Tamil Nadu among normal 60 newborns (Anitha Mary Oyasisa, 2011). The study result revealed that, the pre and post-test assessment the mean difference of selected behavioral responses was obtained as 28.57, 3.34, 32.43, and 23.3. The oil massage is highly significant at $p<0.05\%$ level. The independent 't' test ('t' = 20.35) between experimental and control group. Hence, the stated hypothesis concluded that, oil massage was significantly effective on selected behavioral responses of normal newborns. Another study was conducted among 60 LBW neonates (Shawky Mahmud et al., 2016). The study result revealed that, the majority of the neonates were in active sleep state (70% and 53.3%) respectively in the before intervention and the control groups while, the majority of neonates in after intervention group were in quiet alert state (86%). Neonatal oil massage therapy might be used as an effective for improving behavioral state of LBW neonates.

Maturity

According to the results of the present study, it was recognized that there was no significant difference of maturity level in terms of posture, square window, arm recoil, popliteal angel, scarf sign and heel to toe score on 8th, 15th, 22nd and 29th day of observations among three group at df 28 at 0.05 level of significance. The study findings are consistent with another study, the study result revealed that, there was no statistically significant difference was observed in the neurobehavioral assessment between all three subgroups in term babies as well as in preterm

babies(Sankaranarayanan et al., 2005).

Association of weight gain and maturity with selected demographic variables

According to the results of the present study, there are significant difference in weight gain ($t=2.37$) and maturity ($t=2.45$) between two groups of gestational age of coconut oil group, which are higher than table value (2.31) at df 8 at 0.05 level of significance. The study findings are consistent with another study, which was conducted in Vellore(Indumathi & Pandiammal, 2019). The study result revealed that, the 'chi' square value of neonates variables such as gestational age and at birth weight were associated with physical parameters such as weight gain at $p<0.05$ level. According to the results of the present study, in olive oil group and control group, there were no significant difference of weight gain and maturity of LBW newborns with selected demographic variables such as birth weight and gestational age of newborns at $p<0.05$ level. The study findings are consistent with another study, which was conducted in Saudi Arabia(Sally & Singh, 2017). The study result revealed that, the calculated 'chi' square values of demographic variables of newborn such as birth weight and gestational age were not associated with weight gain at $p<0.05$ level.

Comparison between coconut oil and olive oil group

The independent 't'-test values of weight, length, head and chest circumference are 2.07, 0.15, 0.92 and 0.61. The obtained values are lower than the table value ($t_{18} = 2.10$) at 0.05 level of significance. So, there is no significant difference of weight gain, length, head and chest circumference on 29th day of observation between coconut oil group and olive oil group. The independent 't'-tests value of sleep score of 8th, 15th, 22nd and 29th day of observations are 0.31, 0.49, 0.44 and 0.60. The independent 't'-test values of cry score of 15th and 22nd day of observations are 0.87 and 1.25. The obtained values of sleep and cry are lower than the table value ($t_{18} = 2.10$) at 0.05 level of significance. So, there are no significant difference of sleep and cry between coconut oil group and olive oil group.

CONCLUSION

The conclusion is based on study findings and interpretation. Present study has revealed that both coconut oil and olive oil massage are significantly effective for increasing weight gain, improving sleep pattern and reducing cry in LBW newborns compared to control group. Oil massage is a safe and beneficial for LBW newborns. Coconut oil is used for massaging in NICU and SNCU, Kolkata, West Bengal. Coconut oil is cost effective, easily acceptable to mothers and can be continued at home rather than olive oil. So, by educating and encouraging mothers inform the community about the benefits of Coconut oil massage for LBW newborns.

REFERENCES

- UNICEF & WHO. (2019). Low birthweight estimates. *World Health Organization*, 4(3), 3–9.
- Kumar, S., Kumar, R., Tewari, A., Richa, R., Charaborty, S. N., & Som, T. K. (2018). Prevalence and determinants of low birth weight : An experience from a secondary referral unit Of Burdwan District , West Bengal (India). *Journal of Dental and Medical Sciences*, 17(3), 54–59. <https://doi.org/10.9790/0853-1703015459>

- Tanigasalam, V., Bhat, B. V., Adhisivam, B., Balachander, B., & Kumar, H. (2019). *Prevalence of Hypothermia among Low Birth Weight Neonates in a Tertiary Care Center in India*. 4(December), 168–172.
- Kulkarni, A., Kaushik, J. S., Gupta, P., Sharma, H., & Agrawal, R. K. (2010). Massage and touch therapy in neonates: The current evidence. *Indian Pediatrics*, 47(9), 771–776. <https://doi.org/10.1007/s13312-010-0114-2>
- Duffy, J. L., Ferguson, R. M., & Darmstadt, G. L. (2012). Opportunities for improving, adapting and introducing emollient therapy and improved newborn skin care practices in Africa. *Journal of Tropical Pediatrics*, 58(2), 88–95. <https://doi.org/10.1093/tropej/fmr039>
- Dhar, S., Malakar, R., & Banerjee, R. (2013). Oil massage in babies: Indian perspectives. *Indian Journal of Paediatric Dermatology*, 14(1), 1. <https://doi.org/10.4103/2319-7250.116838>
- Anitha Mary Oyasisa, B. (2011). *Evidence in Nursing (Obstetrics and Gynaecological Nursing) Effectiveness of Oil Massage on Selected Behavioral Responses Among Normal Newborns in Selected Urban Areas, Salem Degree of Master of Sc.*
- Sally, E., & Singh, J. (2017). Effectiveness of coconut oil massage on weight gain among low birth weight newborns. *International Journal of Innovative Research in Medical Science*, 02(03), 630–634. <https://doi.org/10.23958/ijirms/vol02-i03/11>
- Indumathi, A., & Pandiammal, P. (2019). *Effectiveness of oil massage on physical parameters among low birth weight babies at selected hospitals in Vellore*. 5(4), 425–429.
- M., K. P. R. (2015). Effectiveness of Oil Massage on Weight Gain and Selected Physiological Parameters among Preterm Babies in Selected Hospitals. *International Journal of Science and Research (IJSR)*, 4(4), 1137–1141. <https://www.ijsr.net/archive/v4i4/SUB153289.pdf>
- Shawky Mahmud, H., Abd Elhamid Dabash, S., Mohamed Ahmed, E., Mohamed Kamel, R., Salah Ismail, S., Assistant Professor, S., & Professor, S. (2016). *Effects of Oil Massage Therapy on Anthropometric Parameters and Behavioral State of Stable Low Birth Weight Neonates*. 4(6), 33–42. www.impactjournals.us
- Arora, J., Kumar, A., & Ramji, S. (2005). Effect of oil massage on growth and neurobehavior in very low birth weight preterm neonates. *Indian Pediatrics*, 42(11), 1092–1100.
- Sankaranarayanan, K., Mondkar, J. A., Chauhan, M. M., Mascarenhas, B. M., Mainkar, A. R., & Salvi, R. Y. (2005). Oil massage in neonates: An open randomized controlled study of coconut versus mineral oil. *Indian Pediatrics*, 42(9), 877–884.