



The Effect of Oil Massage on Levels of Serum Bilirubin in Term Neonates Undergoing Phototherapy in S.V.R.R.G.G hospital, Tirupati.

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ABSTRACT

Objective: Neonatal hyperbilirubinemia, or jaundice, is a condition where newborn have elevated bilirubin levels, causing yellowing of the skin and eyes. The present study was planned and implemented to evaluate how infant oil massage affects neonates receiving phototherapy for hyperbilirubinemia.

Materials and methods: It is a cross-sectional experimental clinical study. The study population includes Term neonates with indirect hyperbilirubinemia admitted for phototherapy in the Neonatology Unit in the department of Pediatrics, S.V.R.R.G.G hospital, S.V. Medical College. Massage therapy is given with virgin coconut oil obtained by grinding coconuts, according to the International Association of infant massage guidelines, a trained person will give massage to all study group neonates twice a day before meals for 15-20min during which phototherapy is stopped. Bilirubin levels were checked by a standard biochemical protocol.

Results: The results of the present study showed that most of the study population was male neonates (58%) and half of them have presented with jaundice on day 4 of life. It was also found that the mean value of bilirubin concentration was decreased significantly day-wise after birth and the birth weight of the neonate was insignificantly increased from admission and after the treatment. The study also concludes that the bilirubin concentration was decreased better with phototherapy and oil massage. It was also found that, there was an improvement of defecation with phototherapy along with oil massage in day 3 and day 5 age neonates. Most of the neonates showed highest defecation per day then there will be a chance of decrease of bilirubin concentration.

Conclusion: The study also concludes that, the bilirubin concentration was decreased better with phototherapy and oil massage. Even though this study adds to the evidence supporting massage therapy; the advantages of this treatment for neonatal jaundice remain unclear. More research is required to determine the actual impact of these supplemental therapies on the course of neonatal jaundice.

Keywords: Bilirubin, Neonate, Oil massage, Phototherapy, Defecation.

INTRODUCTION

Neonatal hyperbilirubinemia, or jaundice, is a condition where newborn have elevated bilirubin levels, causing yellowing of the skin and eyes. Common causes include physiological jaundice, breastfeeding jaundice, breast milk jaundice, hemolytic disease, and genetic conditions, such as Gilbert's syndrome or Crigler-Najjar syndrome. Risk factors are perinatal Asphyxia, prematurity, birth trauma, Sepsis, sibling with jaundice, blood type incompatibility, inadequate breastfeeding, and certain genetic conditions affecting bilirubin metabolism. The prevalence of neonatal hyperbilirubinemia in India is significant, affecting approximately 60% of full-term and 80% of preterm newborns. Clinically significant hyperbilirubinemia, requiring close monitoring and treatment, is observed in about 10% of newborns. This condition remains a major cause of neonatal morbidity and mortality in the country, highlighting the importance of early detection and effective management strategies¹. Severe prolonged jaundice can lead to dangerous complications like kernicterus and lifelong disability². Diagnosis involves physical examination, bilirubin level assesment, Coombs

test, CBC, and reticulocyte count. Treatment includes ensuring adequate feeding and other options such as phototherapy, exchange transfusion, IVIg. If untreated, severe cases can lead to complications like acute bilirubin encephalopathy or kernicterus, causing permanent neurological damage. Monitoring and timely intervention are crucial for effective management. Treatment of neonatal hyperbilirubinemia includes phototherapy, exchange transfusion, intravenous immunoglobulin (IVIg), and ensuring adequate feeding. Phototherapy, which is the mainstay of treatment for exaggerated physiological jaundice or pathological jaundice has various side effects like dehydration, metabolic derangements (hypocalcemia), damage to genitals, retina, diarrhea and bronze baby syndrome. Phototherapy treats neonatal hyperbilirubinemia by using blue light to convert bilirubin into water-soluble forms. Blue light with wavelengths of 460-490 nm is most effective, and infants are exposed with maximum skin area under the light for optimal results. The light induces structural isomerization, turning bilirubin into lumirubin, which is excreted in bile and urine. This process effectively lowers bilirubin levels preventing neurotoxicity. Thus, finding solutions to reduce the time of phototherapy and finding alternative treatment for the same has always



been a matter of consideration³. Infant massage has been accepted as a supplementary treatment in this regard. Infant massage is a common tradition in India & many other countries. Several studies have reported that it can improve weight gain, sleep pattern, growth & development, autonomic function, reduce infant colic and infant mortality^{4,5}. However, there is no robust clinical evidence indicating that oil massage has a significant impact on reducing bilirubin levels or effectively treating neonatal jaundice. Infant massage, by increasing defecation frequency, can release various spatial isomers of bilirubin by phototherapy and subsequently allow the production of disposable products in the underlying soft tissues by increasing lymphatic drainage and skin blood flow^{6,7}. Even though earlier clinical studies support the use of massaging for reducing neonatal jaundice,^{8,9} the apparent correlation has not been extensively examined among neonates on phototherapy. The present study was planned and implemented to evaluate how infant oil massage affects neonates receiving phototherapy for hyperbilirubinemia.

MATERIALS AND METHODS

Study design: It is a cross-sectional experimental clinical study.

Study Population: The study population includes term neonates with indirect hyperbilirubinemia admitted for phototherapy in the department of Pediatrics, S.V.R.R.G.G hospital, S.V.Medical College.

Study Period: The study was conducted for a period of one year.

Institutional ethics committee: The study was approved by the Institutional ethics committee.

Informed consent: Informed consent was taken from the mother, parents or from their caretaker.

Inclusion criteria:

- Full term neonates of 37-41 weeks gestation, birth to 5 days of age, with birth weight 2.5 to 3.6 kgs with APGAR score 8-10 at birth, receiving phototherapy for hyperbilirubinemia.
- Children of parents who gave consent for participation in the study.

Exclusion Criteria:

- Rh or ABO incompatibility, Biliary atresia, Sub galeal hemorrhage, infections.
- Neonates with major congenital anomalies.
- Contraindications for massaging like sores, cuts, burns, infectious rashes, dislocations, hyperthermia, and swollen joints.

Sample size:

The estimated minimum detectable difference of bilirubin in means is 2mg/dl. The expected standard deviation is

2mg/dl., $1-\beta=0.84$ $\alpha=0.05$. The sample size was calculated by using the below formula. The minimum sample size of each group will be 30 subjects; we will divide the participants into either a study group or control group by systematic randomization and non-blinded technique. So, the total Sample size including 2 groups is 60.

$n = \frac{z^2 \sigma^2}{d^2}$	<ul style="list-style-type: none"> • $Z = 1.96$; $\sigma = 2$; $d = 0.84$; $n = \frac{1.96^2 \cdot 2^2}{0.84^2} = 16.8$ • Design effect = 1.2 • Sample size after design effect = 20.4 • Adjusted sample size considering 10% non-response is 23 (rounded off)
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Method of data collection:

After obtaining the clearance and approval from the Institutional ethics committee, neonates who are fulfilling the inclusion criteria during the study period will be included in the study. They are allotted randomly to study groups receiving both phototherapy and oil massage and a control group who receive only phototherapy. Massage therapy is given with virgin coconut oil obtained by grinding coconuts, according to the International Association of infant massage guidelines. A trained person will give massage to all study group neonates twice a day before meals for 15-20min during which phototherapy is stopped. Serum bilirubin levels were measured every 8-12hrs and rate of decrease in bilirubin levels compared between two groups. During the study, also assessed the weight gain, breast feeding frequency and defecation frequency in two groups for 3 days.

Statistical analysis:

Student's t- test has been used to analyze difference between mean values of two groups. Pearson co-efficient of correlation was used for quantitative variables. SPSS software 23.0 version was used for data analysis.

RESULTS

Table 1: Age-wise and Sex-wise categorization of cases

Neonate age	Sex (Total number = 60)		Total
	Number of Males	Number of Females	
Day 3	14	5	19(31.6%)
Day 4	14	15	29(48.3%)
Day 5	7	5	12(20%)
Total	35 (58.3%)	25 (41.6%)	60

Table 1 showed the age-wise and sex-wise distribution of cases. Majority of the neonates were males and presented on day 4 of life.

Table 2: Categorization of Day 3 aged neonates based on neonate’s blood group

Neonate age Day 3 Blood group	Total number of Day 3 neonates = 19		Total
	Number of Males	Number of Females	
A+	3	1	4
B+	3	0	3
O+	7	4	11
O ⁻	1	0	1
Total	14	5	19

Table 2 depicted the classification of day 3 old neonates based on neonate’s blood group and most of them had O+ blood group.

Table 3 depicted the classification of day 4 old neonates based on neonate’s blood group and most of them had O+ blood group.

Table 4 depicted the classification of day 5 old neonates based on neonate’s blood group and most of them had O+ blood group.

Table 4: Categorization of Day 5 aged neonates based on neonate’s blood group

Neonate age Day 5 Blood group	Total number of Day 5 neonates = 12		Total
	Number of Males	Number of Females	
A+	1	1	2
B+	1	1	2
O+	2	3	5
O ⁻	0	1	1
B ⁻	1	1	2
Total	5	7	12

Table 3: Categorization of Day 4 aged neonates based on neonate’s blood group

Neonate age Day 4 Blood group	Total number of Day 3 neonates = 29		Total
	Number of Males	Number of Females	
A+	2	1	3
B+	5	2	7
O+	4	12	16
O ⁻	0	1	1
AB+	1	0	1
B ⁻	1	0	1
Total	13	16	29

Table 5: Categorization of Day 3 aged neonates based on mother’s blood group

Blood group	Total number of Day 3 neonates = 19			
	Number of neonate Males with blood group	Mother blood group	Number of neonate Females with blood group	Mother blood group
A+	3	4	1	0
B+	3	4	0	1
O+	7	5	4	4
O ⁻	1	0	0	0
AB+	-	1	-	0
Total	14	14	5	5

Most of the mothers and their neonates (males and females) had O+ blood group among the day 3 old neonates (Table 5).

Table 6: Categorization of Day 4 aged neonates based on mother’s blood group

Blood group	Total number of Day 4 neonates = 29			
	Number of neonate Males with blood group	Mother blood group	Number of neonate Females with blood group	Mother blood group
A+	2	2	1	8
B+	5	6	2	3
O+	4	6	12	4
O ⁻	0	-	1	-
AB+	1	-	0	-
B ⁻	1	-	0	-
Total	13	14	16	15

Most of the mothers possessed B+ and O+ blood groups among the day 4 neonatal age (Table 6).



Table 7: Categorization of Day 5 aged neonates based on mother's blood group

Blood group	Total number of Day 5 neonates = 12			
	Number of neonate Males with blood group	Mother blood group	Number of neonate Females with blood group	Mother blood group
A+	1	-	1	-
B+	1	4	1	2
O+	2	2	3	2
O-	0	-	1	-
B-	1	-	1	-
AB+	0	1	0	1
Total	5	7	7	5

Most of the mothers who have Day 5 age male neonate possess B+ blood group and among the female neonates most of the mothers have B+ and O+ blood group (Table 7).

Table 8: Day-wise decrease in the mean values of serum bilirubin concentration in neonates

Age	Mean value of serum bilirubin on Day 1 of phototherapy	Mean value of serum bilirubin on Day 2 of phototherapy	Mean value of serum bilirubin on Day 3 of phototherapy	P-value
Day 3	18.19947368	14.257895	11.05789474	<0.05
Day 4	17.43103	14.77586	11.28276	
Day 5	17.3	13.8	10.8333	

From Table 8 it was found that, the mean value of bilirubin concentration was decreased significantly day-wise after birth.

Table 9: Mean value of birth weight in neonates

Age	Mean value of birth weight at admission	Mean value of birth weight after the treatment	P-value
Day 3	2.870526316	2.966842105	>0.05
Day 4	2.828276	2.933793	
Day 5	2.745833	2.833333	

From the Table 9 it was found that, the birth weight of the neonate was insignificantly increased from admission and after the treatment (Table 9).

Table 10: Defecation rates with phototherapy and phototherapy with oil massage in Day 3 aged neonates

Age Day 3	Number of Neonates with 4 times of defecation/Day	Number of Neonates with 6 times of defecation/Day	Number of Neonates with 8 times of defecation/Day	Total
Phototherapy	8	0	0	8
Phototherapy with oil massage	1	7	3	11
Total number of cases				19

From the Table 10 it was found that, there was an improvement of defecation with phototherapy along with oil massage in day 3 age neonates and most of the neonates showed 6 times highest defecation per day.

Table 11: Defecation rates with phototherapy and phototherapy with oil massage in Day 4 aged neonates

Age Day 4	Number of Neonates with 2 times of defecation /Day	Number of Neonates with 3 times of defecation /Day	Number of Neonates with 4 times of defecation /Day	Number of Neonates with 5 times of defecation /Day	Number of Neonates with 6 times of defecation /Day	Number of Neonates with 7 times of defecation /Day	Number of Neonates with 8 times of defecation/Day	Total
Phototherapy	1	1	16	0	0	0	0	18
Phototherapy with oil massage	0	0	0	1	6	1	3	11
Total number of cases								29

From the Table 11 it was found that, there was an improvement of defecation with phototherapy alone in day 4 age neonates and most of the neonates showed 4 times highest defecation per day.

Table 12: Defecation rates with phototherapy and phototherapy with oil massage in Day 5 aged neonates

Age Day 5	Number of Neonates with 3 times of defecation/Day	Number of Neonates with 4 times of defecation/Day	Number of Neonates with 5 times of defecation/Day	Number of Neonates with 6 times of defecation/Day	Total
Phototherapy	1	4	0	0	5
Phototherapy with oil massage	0	0	1	6	7
Total number of cases					12

From the Table 12 it was found that, there was an improvement of defecation with phototherapy and oil massage in day 5 age neonates and most of the neonates showed 6 times highest defecation rate per day.

DISCUSSION

The results of the present study showed that most of the study population was male neonates and most of them were day 4 old. It was also found that the mean value of bilirubin concentration was decreased significantly day-wise after birth and the birth weight of the neonate was not significantly increased from admission and after the treatment. The study also concludes that, the bilirubin concentration was decreased better with phototherapy and oil massage. The results were in accordance with the findings of previous studies by Feng et al. 2007¹⁰ and found that, there was a significant reduction in the transcutaneous bilirubin level of the neonates after fifth day of receiving massage. Similar results were reported by Kianmehr et al. 2014¹¹ and showed that, the bilirubin level was at 17.89 ± 2.12 mg/dl in the massage group on the day of admission to the study, it stood at 17.87 ± 2.46 mg/dl in the control group ($P=0.98$), which was not significant statistically. From the present study it was also found that the birth weight of the neonate was not significantly increased from admission and after the treatment. This result is consistent with some reports of previous studies¹²⁻¹⁴. But according to current research, preterm infants who undergo moderate-pressure massage three times a day for five days may gain more weight because of the massage therapy. In the latter trial, the authors hypothesized that increase in vagal activity or insulin/IGF-1 levels may have contributed to weight gain after massage. These factors may have also reduced stress and stomach motility, resulting in more effective food absorption. In the present study, the small sample size may have contributed to the lack of a discernible rise in body weight gain following massage. Furthermore, it's probable that the massage treatment session was too brief to encourage the release of insulin and IGF-1. It was also found that, there was an improvement of defecation with phototherapy along with oil massage in day 3 and day 5 aged neonates and showed highest defecation rate per day had decreased bilirubin concentration. However, in day 4 neonates, most of them responded to phototherapy than phototherapy and oil massage. Although massage therapy can encourage the passage of meconium, prior studies have shown that the majority of newborns pass their first faeces within 24 hours after delivery⁸. By the third day of therapy, we noticed a

much-increased frequency of defecation in the massage group, which could potentially be explained by this. Massage therapy can enhance the frequency of bowel movements and the elimination of meconium¹⁵⁻¹⁶. It is also possible that a neonate's increased frequency of bowel movements will decrease the enterohepatic circulation of bilirubin. However, the current study had limited numbers of participating neonates and brief massage therapy sessions; these constraints might have compromised the validity of statistical tests or obscured other significant relationships. Future studies ought to look at the application of massage therapy for extended periods of time.

CONCLUSION

The present study had concluded that the mean value of bilirubin concentration was decreased significantly day-wise after birth and the birth weight of the neonate was not significantly increased from admission and after the treatment. The study also concludes that, the bilirubin concentration was decreased better with phototherapy and oil massage. Even though this study adds to the evidence supporting massage therapy, the advantages of this treatment for neonatal jaundice remain unclear. More research is required to determine the actual impact of these supplemental therapies on the course of neonatal jaundice.

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