

Original Research Article

Impact of kangaroo mother care on phototherapy duration and hospital stay in term neonates with neonatal jaundice: a cross-sectional study from South India

Touheer Pasha, Afraneha R., Hariharasudhan T.*, Shanthi Ramesh

Department of Pediatrics, Sree Balaji Medical College and Hospital, Chrompet, Chennai, Tamil Nadu, India

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*Correspondence:

Dr. Hariharasudhan T.,

E-mail: hariharan2502@gmail.com

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ABSTRACT

Background: Neonatal jaundice affects about 60% of term and 80% of preterm infants, primarily due to immature bilirubin metabolism. Phototherapy is the standard treatment, but prolonged exposure can cause complications such as dehydration, hypocalcemia, and disrupted maternal-infant bonding. Kangaroo mother care (KMC), involving skin-to-skin contact, has emerged as a supportive intervention that may enhance bilirubin excretion and reduce phototherapy duration. Objective was to assess the effect of KMC on phototherapy duration and hospital stay in term neonates with hyperbilirubinemia.

Methods: A cross-sectional observational study was conducted from July 2023 to August 2024 at Sree Balaji Medical College and Hospital. A total of 120 term neonates (gestational age 37-42 weeks, birth weight >2500 gm) with jaundice requiring phototherapy were enrolled. Exclusion criteria included preterm birth, low birth weight, early-onset jaundice, hemolytic disease, or congenital anomalies. Infants were divided into two groups: group A (phototherapy only) and group B (phototherapy + KMC). Data were analyzed using SPSS v27.

Results: The mean phototherapy duration was significantly lower in the KMC group (46.22 ± 2.56 hours) than in the phototherapy-only group (65.13 ± 6.88 hours) ($p=0.02$). Hospital stays were also significantly shorter in the KMC group ($p<0.05$). No adverse events related to KMC were reported. Higher gestational age and maternal education were associated with better outcomes.

Conclusions: KMC is a safe, effective adjunct to phototherapy, reducing treatment duration and hospital stay while supporting mother-infant bonding.

Keywords: Bilirubin clearance, Hyperbilirubinemia, Kangaroo mother care, Neonatal jaundice, Phototherapy, Term neonates

INTRODUCTION

Neonatal jaundice is a common and often benign condition characterized by yellow discoloration of the skin and sclera due to elevated serum bilirubin levels in newborns. It affects approximately 60% of term and up to 80% of preterm infants within the first week of life.¹ While many

cases resolve spontaneously, severe or untreated hyperbilirubinemia may lead to acute bilirubin encephalopathy and kernicterus- conditions associated with irreversible neurological damage such as cerebral palsy and hearing loss.^{2,3} Early identification and appropriate management are critical to prevent such complications.

Phototherapy is the cornerstone of treatment for neonatal hyperbilirubinemia. It works by converting unconjugated bilirubin into water-soluble isomers that are more readily excreted through bile and urine without liver conjugation.⁴ Despite its effectiveness, prolonged phototherapy can result in side effects, including dehydration, skin rashes, hypocalcemia, retinal injury, and increased oxidative stress, potentially contributing to long-term complications like asthma.^{5,6} Additionally, continuous phototherapy may reduce breastfeeding frequency and interfere with mother-infant bonding, which can delay bilirubin excretion.⁷

Kangaroo mother care (KMC), which involves prolonged skin-to-skin contact between a caregiver and a neonate, has been widely recognized as a low-cost, effective intervention in neonatal care. Although originally introduced for preterm and low birth weight infants, KMC has demonstrated a broad range of benefits, including thermal regulation, enhanced maternal bonding, promotion of breastfeeding, and improved cardiorespiratory stability.^{8,9} These factors also contribute to increased feeding frequency and gut motility, thereby supporting bilirubin clearance through reduced enterohepatic circulation.¹⁰

Recent studies have explored KMC's role as an adjunct to phototherapy. A randomized controlled trial by Samra et al demonstrated that term neonates receiving KMC alongside phototherapy had significantly shorter durations of treatment compared to those who received phototherapy alone.¹¹ Similarly, Boundy et al, in a large meta-analysis, reported that KMC was associated with a 40% reduction in the incidence of severe jaundice in preterm infants.¹² Moore et al and Conde-Agudelo et al further confirmed that early skin-to-skin contact enhances the success of breastfeeding and shortens hospital stays- both important in promoting bilirubin excretion.^{13,14}

Despite its advantages, the implementation of KMC remains inconsistent due to challenges such as lack of training, inadequate infrastructure, and cultural perceptions surrounding neonatal care.¹⁵ In resource-constrained settings where access to advanced phototherapy equipment is limited, incorporating KMC into jaundice management protocols could be particularly beneficial.

METHODS

This cross-sectional observational study was conducted in the department of pediatrics, Sree Balaji Medical College and Hospital, over a 12-month period from July 2023 to August 2024. A total of 120 term neonates (gestational age 37-42 weeks, birth weight >2500 gm) diagnosed with neonatal hyperbilirubinemia requiring phototherapy were enrolled using purposive sampling. Exclusion criteria included preterm birth, low birth weight, early-onset jaundice (within 24 hours), rapidly rising bilirubin levels (>5 mg/dl/day), requirement for exchange transfusion,

congenital anomalies, hemolytic disease, or a positive Coombs test.

Ethical clearance was obtained from the institutional ethics committee (Ref: 002/SBMCH/IHEC/2023/1985), and informed consent was obtained from parents or guardians.

Participants were divided into two groups: group A received phototherapy alone, while group B received phototherapy with kangaroo mother care (KMC), consisting of intermittent skin-to-skin contact for 6-8 hours per day. Baseline clinical evaluation included gestational age assessment using the New Ballard Score and jaundice grading by the Kramer scale. Socioeconomic status was assessed using the Modified BG Prasad classification (2021 update). Additional data such as maternal age, educational status, feeding patterns, and neonatal stool passage timing were collected via a structured questionnaire.

The primary outcomes were duration of phototherapy (in hours) and length of hospital stay (in days). Data were analyzed using IBM SPSS Statistics v27. Descriptive statistics summarized demographic and clinical parameters. Chi-square tests and t-tests were used for group comparisons, and correlation analysis evaluated associations between variables. A p value <0.05 was considered statistically significant.

RESULTS

The 120 newborns who were admitted to the neonatal intensive care unit (NICU) of Sree Balaji Medical College and Hospital participated in the study. All participants were term neonates with a gestational age of 37 to 42 weeks and a birth weight above 2500 grams. In this study, the male-to-female ratio was 1:1.1. The average age at admission was 3.2 days.

The impact of kangaroo mother care (KMC) was evaluated, and it was found that neonates receiving KMC showed a significant reduction in serum bilirubin levels, compared to those receiving phototherapy alone.

Table 1: Distribution according to gender.

Gender	Frequency	Percentage
Male	62	51.7
Female	58	48.3
Total	120	100

Table 2: Distribution according to mode of delivery.

Mode of delivery	Frequency	Percentage
C-Section	53	43.3
NVD	68	56.7
Total	120	100

Table 3: Distribution according to birth weight.

Birth weight in grams	Frequency	Percentage
2500-3000	64	53.3
3000-3500	30	25.0
>3500	26	21.7
Total	120	100.0

Table 4: Distribution according to gestational age.

Gestational age (weeks)	Frequency	Percentage
37-38	35	29.2
39-40	39	32.5
41-42	46	38.3
Total	120	100.0

Table 6 presents the comparison of hospital stay duration among term neonates with hyperbilirubinemia. Of the 120 neonates enrolled, those who received both phototherapy and kangaroo mother care (KMC) had a mean hospital stay of 3.48 ± 1.28 days, while those who received only phototherapy had a longer mean stay of 3.98 ± 1.32 days. The difference between the two groups was found to be

statistically significant ($p=0.02$). These findings indicate that KMC may help reduce the length of hospital stay in neonates undergoing treatment for jaundice.

Table 5: Distribution according to socioeconomic status.

Socio	Frequency	Percentage
Class- I	20	16.6
Class- II	15	12.5
Class- III	30	25
Class- IV	28	23.3
Class- V	27	22.5
Total	120	100

Table 7 presents the comparison of hospital stay duration among term neonates with hyperbilirubinemia. Of the 120 neonates enrolled, those who received both phototherapy and kangaroo mother care (KMC) had a mean hospital stay of 3.48 ± 1.28 days, while those who received only phototherapy had a longer mean stay of 3.98 ± 1.32 days. The difference between the two groups was found to be statistically significant ($p=0.02$). These findings suggest that KMC may help reduce the length of hospital stay in term neonates undergoing treatment for jaundice.

Table 6: Mean duration of phototherapy in the two groups.

Variables	Phototherapy + KMC	Phototherapy only	P value
Duration of phototherapy (hours)	46.22 $\pm$ 2.56	65.13 $\pm$ 6.88	0.02

Table 7: Mean duration of hospitalization in the two groups.

Variables	Phototherapy + KMC	Phototherapy only	P value
Length of hospital stay (days)	3.48 $\pm$ 1.28	3.98 $\pm$ 1.32	0.02

DISCUSSION

This study evaluated the effect of kangaroo mother care (KMC) alongside phototherapy on reducing both the duration of phototherapy and hospital stay in term neonates with hyperbilirubinemia. Among the 120 neonates enrolled, those receiving KMC exhibited significantly shorter treatment duration and hospitalization compared to the phototherapy-only group, highlighting KMC as an effective, low-cost adjunct in managing neonatal jaundice.

Neonatal jaundice affects nearly 60% of term infants and up to 80% of preterm infants, primarily due to immature bilirubin metabolism and increased red blood cell turnover.^{1,16} Phototherapy is the standard treatment; it converts unconjugated bilirubin into water-soluble isomers for excretion.⁴ However, prolonged phototherapy can lead to dehydration, hypocalcemia, skin irritation, and potential disruption of maternal-infant bonding.^{5,7}

KMC improves breastfeeding, thermal regulation, and physiological stability- factors that accelerate bilirubin clearance via enhanced feeding, bowel motility, and hepatic function.^{8,9} In our study, neonates in the KMC group required significantly fewer hours of phototherapy (46.22 $\pm$ 2.56 versus 65.13 $\pm$ 6.88 hours, $p=0.02$) and shorter hospital stays (3.48 $\pm$ 1.28 versus 3.98 $\pm$ 1.32 days, $p=0.02$). These findings are consistent with previous studies demonstrating reduced phototherapy duration and hospitalization with KMC.^{11,14}

The study focused exclusively on stable term neonates to reduce confounding factors such as prematurity and severe illness. Although this strengthens internal validity, it limits applicability to preterm or critically ill infants- who may have different responses. Future research should include these high-risk populations.

Physiologically, KMC stimulates frequent breastfeeding- leading to increased stooling and reduced enterohepatic circulation- and stabilizes temperature, heart rate, and

oxygen saturation, supporting hepatic conjugation.^{8,10} Oxytocin release during mother-infant skin-to-skin contact may further enhance gut motility.¹⁷

Reducing phototherapy duration is clinically important to minimize risks such as oxidative stress, electrolyte imbalance, and possible long-term outcomes like asthma.^{6,18} KMC not only supports faster recovery but can mitigate these treatment-related complications.

Despite its benefits, KMC implementation faces challenges- particularly in resource-limited settings- including insufficient staff training, cultural resistance, and inadequate infrastructure in NICUs.¹⁵ Addressing these barriers through education, policy-making, and community involvement is essential for widespread adoption.

The study's cross-sectional design does not allow for causality, but the strong associations observed support KMC's effectiveness. Limitations include the lack of long-term follow-up on neurodevelopment or breastfeeding, and a sample size insufficient for subgroup analysis. Future randomized controlled trials with larger, diverse cohorts and extended follow-up are recommended.

In conclusion, integrating kangaroo mother care into neonatal jaundice management significantly reduces phototherapy duration and hospital stay in term neonates. Given its safety, simplicity, and cost-effectiveness, KMC should be considered a standard component of treatment, particularly in settings with limited resources.

This study's cross-sectional design limits the ability to establish causality. The focus on stable term neonates enhances internal validity but restricts generalizability to preterm or critically ill infants. The sample size was insufficient for detailed subgroup analysis, and the absence of long-term follow-up precluded evaluation of sustained outcomes such as neurodevelopment or breastfeeding success. Additionally, as a single-center study, external validity may be limited. Future multicenter randomized trials with larger, diverse cohorts and extended follow-up are recommended.

CONCLUSION

This study demonstrated that kangaroo mother care (KMC), when used alongside phototherapy, significantly reduces both the duration of phototherapy and hospital stay in stable term neonates with hyperbilirubinemia. These findings position KMC as a simple, low-cost, and effective adjunctive therapy that enhances the management of neonatal jaundice by supporting physiological stability, promoting breastfeeding, and accelerating bilirubin clearance.

Incorporating KMC into standard neonatal care has the potential to improve clinical outcomes, minimize

complications of prolonged phototherapy, and optimize resource utilization- especially in low-resource settings.

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