Orginal Article

J Babol Univ Med Sci
Vol 18, Issu 6; Jun 2016. P:15-20

The Effect of Kangaroo Mother Care on the Duration of Phototherapy in Term Infants with Hyperbilirubinemia

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J BabolUniv Med Sci; 18(6); Jun 2016; PP:15-20
Received: Dec 28th 2015, Revised: Jan 6th 2016, Accepted: Mar 2th 2016.

ABSTRACT

BACKGROUND AND OBJECTIVE: Hyperbilirubinemia is a common problem in the neonatal period. Phototherapy is regarded as the most important treatment for this condition. Several factors affect the duration of phototherapy in newborns with jaundice. Considering the scarcity of research on the impact of kangaroo mother care (KMC) on phototherapy duration, in this study, we aimed to determine whether KMC can influence the duration of phototherapy in icteric infants.

METHODS: In this clinical trial, 106 term neonates with hyperbilirubinemia were selected and randomly divided into intervention and control groups. Conventional phototherapy was performed following the same procedure for all the neonates. The subjects were matched in terms of age, sex, and weight and the two groups were breastfed at least every three hours. In the intervention group, KMC was applied during breastfeeding at least six times over 24 h. On the other hand, KMC was not applied in the control group during phototherapy. Bilirubin level was measured at 24, 48, and 72 h after phototherapy. The mean duration of phototherapy and length of hospital stay were compared during the treatment (IRCT: 201505231760N40).

FINDINGS: Age, sex, and the mean bilirubin level at the beginning of the study did not significantly differ between the groups (16.75±0.75 mg/dl in the intervention group and 16.53±0.95 mg/dl in the control group). However, phototherapy duration and the mean length of hospital stay in the intervention group (64.25±17.54 h) were shorter than the control group (91.12±16.26 h) (p=0.000).

CONCLUSION: Concurrent application of KMC and phototherapy can reduce the length of hospital stay among infants treated with phototherapy.

KEY WORDS: *Kangaroo Mother Care, Hyperbilirubinemia, Infant, Phototherapy*.

Please cite this article as follows:

Rasouli Larma'i N, Ahmadpour-kacho M, Zahed Pasha Y, Hajiahmadi M, Mazloomi A. Effect of Kangaroo Mother Care (KMC) on the Duration of Phototherapy in Term Neonates with Hyperbilirubinemia. J Babol Univ Med Sci. 2016;18(6):15-20.

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Introduction

Hyperbilirubinemia is a common problem in the neonatal period. This condition is benign in most cases and can be observed in the first week of life in almost 60% of term and 80% of preterm infants (1). Newborns with severe hyperbilirubinemia are at risk of hearing impairments, and in rare cases, they are exposed to acute encephalopathy, kernicterus, and bilirubinemia (2-5).

The clinical effects of phototherapy, as the most important treatment for hyperbilirubinemia in newborns, have been confirmed in previous studies (6-8). Also, based on studies attempting to reduce the duration of phototherapy, the efficacy of phototherapy depends on three major factors: wavelength, beam light intensity, and the surface area of the infant's body exposed to phototherapy (9). Naturally, phototherapy is more effective if the length of hospital stay for treatment is shorter. Kangaroo mother care (KMC) is a method which seems to influence the effectiveness of phototherapy. The main feature of KMC is the kangaroo position in which the newborn has skin-to-skin contact with the mother and is placed between the mother's breasts. Under certain circumstances, the father or other relatives can replace the mother. Through continuous skin-to-skin contact, KMC can regulate the infant's body temperature, develop his/her cognitive ability, and accelerate his/her response to disease. As a result, this method has been endorsed in both developed and developing countries, including Iran (10).

Today, in addition to continuous KMC, the frequent type is periodically used in neonatal intensive care units (ICUs) (11). With regard to the possible mechanisms of KMC leading to reduced serum bilirubin level, researchers have shown that KMC by facilitating breastfeeding can lead to the early excretion of meconium and prevent bilirubin relapse into the circulatory system through the portal system (12). On one hand, continuous breastfeeding of the newborn can accelerate the process of milk production in the mother and consequently improve the infant's access to a rich source of liquid and calories (13). On the other hand, it has been suggested that the vibration from the mother's breast and abdominal skin, in contact with the infant's body, can potentially accelerate his/her bowel movements and contribute to the excretion of bilirubin through the digestive system. Considering the increasing application of KMC in ICUs for breastfed infants, in this study, we aimed to investigate the effects of phototherapy and KMC in reducing the duration of phototherapy in icteric infants.

Methods

This clinical trial (IRCT: 201505231760 N40) was conducted after obtaining permission from the Ethics Committee of Babol University of Medical Sciences. Healthy term newborns, who were admitted to the neonatal unit of Amirkola Hospital due to neonatal hyperbilirubinemia, were divided into two groups from December 2014 to May 2015. The exclusion criteria were as follows: 1) presentation of jaundice on the first day after birth; 2) breastfeeding jaundice; 3) blood group incompatibility; 4) positive Coombs' test results; and 5) hemolysis. Also, infants with breastfeeding jaundice, which was diagnosed based on the infant's medical history, were excluded from the study. In both groups, phototherapy was performed on 53 neonates (with an equal number of lamps), using the conventional method and a phototherapy device equipped with five lamps (David XHZ-90, China) at a 35-40 cm distance from the infant with a wavelength of 420-480 nm.

In the intervention group, in addition to standard phototherapy, KMC was applied by the mother. The mother after wearing a special gown laid on a folding bed, while the naked infant (wearing only a diaper and a hat) was placed between her breasts by a nurse. During hospitalization, KMC was applied for 30-45 min at least six times a day in the morning, afternoon, and night. On the other hand, the newborns in the control group (age and weight similar to the intervention group) were only breastfed by the mother, whereas KMC was not applied.

During the study, the serum bilirubin level was measured in both groups among hospitalized infants at the beginning of the study and at 24, 48, and 72 h after admission in Amirkola Hospital, using a bilirubin meter device (Measurement Equipments Co., Iran). After the bilirubin level decreased below 10 mg/dl, phototherapy was terminated and the infant was discharged from the hospital. The duration of phototherapy and length of hospital stay were recorded from admission until discharge. Also, measurements of other variables including birth weight, gender, weight at admission, and age at admission were performed in both intervention and control groups. After data collection, independent t-test and Chi-square test were

performed, using SPSS version 19. P<0.05 was considered statistically significant.

Results

Of a total of 106 infants, 53 (50%) were male and 53 (50%) were female. There was no significant difference between the intervention and control groups in terms of age, weight at admission, gender, and bilirubin level upon admission (table 1). Also, no significant change was reported in the average bilirubin level upon admission between the intervention and control groups, whereas it significantly changed upon discharge (p=0.000). The difference in the mean length of hospital stay was significant in the intervention and control groups (p=0.000) (table 2).

Table 1. Comparison of baseline demographic variables in the intervention and control groups

Variables Groups	Control (N=53)	Intervention (N=53)	Pvalue
Age at admission (days)	1.11±4.26	1.06±4.45	0.375
Wight at admission (g)	266.32±3255.66	256.9±3297.17	0.416
Gender			1.000
Female	27	26	
Male	26	27	

Table 2. Comparison of the mean serum bilirubin level and length of hospital stay in the intervention and control groups

Groups Bilirubin level	Intervention (N=53)	Control (N=53)	Pvalue
At admission	0.75±16.75	0.95±16.53	1
72 h after admission	1.53±9.01	1.11±11.21	0.000
Duration of phototherapy or length of hospital stay	17.54±64.25	16.26±91.12	0.000

Discussion

The findings of the present study showed that use of KMC along with phototherapy could reduce bilirubin level more quickly than phototherapy alone, and consequently, it reduced the length of hospital stay. Therefore, it can be concluded that KMC is an effective method in reducing the length of hospital stay. The results of the present research were consistent with the findings reported by Samra and colleagues, which demonstrated the role of KMC in reducing the duration of phototherapy in the intervention group (14). They found that the concurrent use of phototherapy and KMC could decrease the length of hospital stay from 100 h to 68 h. Also, in Amirkola Hospital, this type of intervention could decrease the length of hospital stay from 91 h to 64 h among infants. On the other hand, Dabiriyan et al. could not confirm the positive effect of KMC and phototherapy on reducing the bilirubin level and consequently the duration of phototherapy (15). The discrepancy between the findings might be attributed to the short-term implementation of KMC in the mentioned study (1 h divided in two 30-min sessions in the evening shift over three consecutive days), while in the present study, the newborns received KMC at least six times in the morning, afternoon, and evening for half an hour. It should be noted that in Samra's study, the infants received KMC three times a day until hyperbilirubinemia was treated (14). One of the features of this study compared to previous research is the concurrent use of KMC and phototherapy; in other words, KMC was performed during each breastfeeding. In order to reduce the duration of phototherapy, Djokomuljanto et al. in Malaysia (16) and Babaei et al. in Iran (17) conducted similar studies to evaluate the effectiveness of a dress code which obligated wearing a white-colored coat around the neonatal unit to improve the efficiency of phototherapy and reduce the period of treatment.

The results revealed that this strategy could increase the effectiveness of phototherapy and reduce the duration of phototherapy and length of hospital stay in neonates. Salehzadeh et al. (18) could also indicate the reduction in bilirubin level and length of hospital stay by using mirror coating in phototherapy. In addition to the above-mentioned interventions, use of drugs alongside phototherapy has been found to be effective in promoting the impact of phototherapy and shortening the length of hospital stay. In this regard, concurrent use of phenobarbital by Pashapour et al. (19), intravenous immunoglobulin by Miqdad and colleagues (20), and clofibrate by Zahedpasha et al. (21) along with phototherapy have been shown to be effective. Although the mentioned interventions were effective in reducing the infants' length of hospital stay, they cannot be ideal alternatives for KMC due to several deficiencies. In fact, KMC not only meets the emotional needs of mothers and improves their comfort (22), but also can lead to better nutrition and

breastfeeding for the infants, increase the excretion of meconium, and prevent bilirubin regression from the digestive system to the blood, which in turn leads to a rapid decline in serum bilirubin level. In conclusion, the current findings showed that use of KMC during breastfeeding, compared with phototherapy alone, could reduce the bilirubin level more quickly and decrease the length of hospital stay among icteric infants hospitalized for phototherapy.

Acknowledgements

Hereby, we would like to thank the Vice-chancellor for Research and Technology of Babol University of Medical Sciences for the financial support. We also extend our gratitude to the staff of the neonatal unit for their assistance with the statistical analysis. We also thank Dr. Poor Nasrollah for performing the experimental tests and Mr. Hossein Jafaripour for his help with the literature review.

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