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Original Research Article

AN OBSERVATIONAL STUDY ON PRACTICE AND OUTCOMES OF KANGAROO MOTHER CARE IN PRETERM AND LOW BIRTH WEIGHT BABIES IN GOVERNMENT GENERAL HOSPITAL NALGONDA

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ABSTRACT

Background: Low birth weight (LBW) and preterm births are considered a major public health concern in relation to their significant contribution towards the sustainability and well-being of the population. Due to the health care burden, comprehensive interventional procedures for primary prevention are required such as Kangaroo Mother Care (KMC). Kangaroo mother care for preterm infants is also related to better cognitive and motor development at six months. Therefore, the present study was conducted to study the kangaroo mother care practices among postnatal women.

Materials and Methods: A prospective observational study was carried out among 240 postnatal mothers who gave birth to preterm and/or low birth weight infants. Using a semi-structured questionnaire, socio-demographic details were collected. Data regarding proper KMC practices were collected through face-to-face interviews using a standardized questionnaire. For the practice part, direct observation was done when they positioned, breastfed, and ambulated, when the postnatal mothers were in the hospital. Using a digital baby weighing scale, the weight of the infants was recorded at 14- and 28-day follow-up.

Results: The mean age of the study subjects was 23.92 ± 3.81 years. Of the 240 participants, 72.9% had preterm and 27.1% had term deliveries. The mean birth weight was 1934.6 ± 166.1 grams. Proper KMC practices were followed by most: 89.6% had ≥1-hour sessions, 91.3% ensured proper positioning, and 92.5% maintained frog position. However, only 48.3% wrapped the baby properly, and 61.7% maintained hygiene. Overall, 72.9% practiced proper KMC. Mean weight gain was significantly higher (561.5 ± 50.9 grams) in the proper KMC group compared to 509.1 ± 86.3 grams in the improper group.

Conclusion: Kangaroo mother care is a simple, low-cost technique that is well acceptable to mother and family and can be continued at home. Proper kangaroo mother care practices had a significant role in weight gain among infants. Thus, kangaroo mother care is an effective alternative to conventional care for the management of stable low birth weight infants.

Keywords: Low Birth Weight, Preterm, Kangaroo Mother Care, Infants, Weight Gain.

INTRODUCTION

The two major public health concerns during the neonatal period include low birth weight and premature births. 36% of neonatal deaths occur on the day of birth and 73% occur within the first week of life.[1] Additionally, low birth weight neonates account for almost 80% of neonatal mortality, with two-thirds of these cases being preterm births.[2] Prematurity related complications are the leading

cause of neonatal mortality.[3] The United Nations International Children Emergency Fund (UNICEF), estimates that every year, around about 25 million newborns are born low birth weight, and 15 million are born prematurely, with poor nations accounting for nearly 95% of these preterm births. Recent research in low and middle-income nations found that the overall preterm birth rate was 12.6% with a range of 8.6% to 21.8%.[4] 13.6% was the overall LBW rate, with a range of 2.7% to 21.4%. The overall rate of both preterm birth and LBW was 5.5% (ranging from 1.2% to 11.0%).[4] India has a 16.4% prevalence of LBW, according to statistics from National Family Health Survey-4 (NFHS-4).[5]

The primary cause of newborn morbidity in developing nations is term intrauterine growth retardation, as opposed to preterm births, which are more common in the West.[6] Comprehensive interventional techniques for primary prevention, such as Kangaroo Mother Care, are necessary due to the high rate of low birth weight and prematurity, as well as the resulting health care burden.[7] The World Health Organization (WHO) states that early, continuous and extended skin to skin contact between mother and the infant is an essential part of kangaroo mother care.[8] Despite the World Health Organization, Baby Friendly Initiatives, United Nations International Children Emergency Fund, and the American Academy of Pediatrics recommendations for kangaroo mother care, encouraging the mother and adhering to appropriate kangaroo mother practices continue to be extremely difficult. When compared to an incubator care, skin to skin contact between the mother and the infant is a safe, affordable practice that has shown to benefit both mothers and babies. It has a major impact on baby survival, neurodevelopment, and the quality of mother-infant bonding. Kangaroo mother care not only offers excellent care but also helps caregivers to limit the usage of costly equipment like incubators and heaters.[9,10]

Mother-child bonding and self efficacy are enhanced when a mother and her infant have skin to skin contact, which also reduces postpartum depression symptoms in mother.[11,12] Low birth weight babies receiving KMC have improved respiratory and heart regulation, have effective oxygenation and daily weight gain.[13] Additionally, it helps the newborn initiate breastfeeding early and effectively,[14] and thereby, effective breastfeeding lowers the risk of necrotizing enterocolitis, one of the main causes of death in preterm babies.[15,16] Improved cognitive and motor development at six months of age is also linked to kangaroo mother care for preterm newborns.[11] In addition to the health benefits for mothers and newborns, KMC has a significant role in lowering postpartum hospital stay, which lowers overall healthcare costs and benefits the parents financially. [10]Compared to infants receiving standard care, preterm and LBW babies who received KMC spent less time in the hospital.[17] Thus, the present research was carried for studying the kangaroo mother care practices among postnatal women.

MATERIALS AND METHODS

Over the course of 18 months, this prospective observational study was conducted at Government Medical College's Special Newborn Care Unit (SNCU) in the Department of Pediatrics, Nalgonda. Convenient sampling method was the one that was used for sampling.

Sample Size: Based on the study conducted by Pusdekar YV et al,[4] the combined prevalence of preterm and/or low birth weight was taken at 17.3%. Estimated prevalence (p) = 17.3%, Confidence interval (CI) = 95%, Absolute precision (d) = 5%.Using the standard formula for proportion = $[(Z\alpha/2)2 \times p \times q] / d2$. Sample size (n) = $(Z\alpha/2)2 \times p \times (1-p) / d2$= (1.96×1.96) ×17.3×82.7 / 5 x 5= 5496.2 / 25 = 219.8. Taking an additional 10% of cases, the final sample size for the present study was rounded to 240.

Inclusion Criteria

1. Normal post-natal mothers having pre-term or LBW infants.
2. Infants who breathe on their own.

Exclusion Criteria

3. Infants with life-threatening disease.
4. Infants with congenital malformations.
5. Mothers who refused to give consent for the study.
6. Infants with birth weight above 2500 grams.

Ethical Clearance and Consent: The Government medical college, Nalgonda ethics committee granted institutional ethical committee clearance prior to study commencement. For this study, parents of infants who took part gave their informed and written consent.

Method of Collection of Data: Postnatal mothers who gave preterm and/or LBW were selected consecutively until the desired sample size was obtained. In cases of multiple births, one baby was selected by lottery method for the study. Postnatal mothers who agreed to participate in the study received training on kangaroo mother care techniques, including how to properly position and secure the baby in the kangaroo position, duration of KMC stay, how to feed the baby during KMC, how to dress both mothers and babies, how to maintain personal hygiene, and how to properly wrap the baby after KMC. It was recommended that all postnatal mothers begin KMC while they were in the hospital and continue for 28 days. Phone numbers of all the mothers who accepted for the study were collected and they were contacted for subsequent visits.

A semi-structured questionnaire was used to collect socio-demographic information. The mother's age, level of education, occupation status, urban/rural residence and socioeconomic status were among the socio-demographic information gathered. Revision of Prasad's socioeconomic status classification

revised for the year 2021 was used for classification of socioeconomic status of the study subjects (Table 1).

Table 1: Prasad's socioeconomic status classification revised

Social class	Revised classification for 2021 (₹. /month)
I (Upper class)	≥ 7770
II (Upper middle class)	3808 – 7769
III (Middle class)	2253 – 3808
IV (Lower middle class)	1166 – 2253
V (Lower class)	< 1169

The following data regarding the delivery and baby details was collected using a semi-structured questionnaire: Type of delivery, Gestational age at birth, Gender of baby, Birth weight. The questionnaire for the kangaroo mother care practices was developed from the practical guide of kangaroo mother care by WHO. Postnatal mothers who gave consent for the study were trained in KMC regarding minimum sessions for attachment of baby, positioning of the infant in a binder, head position, securing the baby with the binder, dressing during KMC (gloves/socks), How to move the baby in and out of the binder correctly, maintaining personal hygiene, proper wrapping of the baby after KMC. Data regarding proper KMC practices were collected through face-to-face interviews using a standardized questionnaire. For the practice part, direct observation was done when they positioned, breastfed, and ambulated, when the postnatal mothers were in the hospital. Using a digital baby weighing scale, the weight of the infants was recorded at 14- and 28-day follow-up.

Data Analysis: The data collected was entered into a spreadsheet in Microsoft Excel 2013. The IBM Statistical Package for Social Sciences (IBM SPSS) version 23 software was used to examine the data that was collected. Categorical variables were presented as absolute values and percentages, continuous variables were represented as mean ± standard deviation (SD). Charts and graphs were created using Microsoft Excel 2013. To determine whether there was a significant difference between the two groups, the chi-square test and the unpaired t-test were used. The most important practices influencing newborn weight increase were identified using linear regression analysis. Statistical significance was defined as a P-value of less than 0.05.

RESULTS

Out of the total of 240 cases included in the study, most common age group was 21 – 25 years (46.3%). The distribution of cases based on the age group is depicted in Table 2. The mean age of the study subjects was 23.92 ± 3.81 years with an age range of 18 – 35 years. The majority of the study subjects belong to 21 – 25 years (46.3%) followed by 26 – 30 years (26.3%). 6.7% of study subjects were 31 – 35 years old.

Table 2: Distribution of study subjects based on age

Age group	Number of subjects	Percentage
18 – 20 years	50	20.8%
21 – 25 years	111	46.3%
26 – 30 years	63	26.3%
31 – 35 years	16	6.7%
Total	240	100%
Mean age = 23.92 ± 3.81 years (18 – 35 years)		

Among the 240 study subjects, 5% were illiterate, 20% had primary education, and 23.8% had studied up to the intermediate level (Table 3). Of the total, 27.1% were working mothers, while 72.9% were housewives. Additionally, 81.2% belonged to rural areas, and 18.8% were from urban areas.

Table 3: Distribution of study subjects based on education status

Education status	Number of subjects	Percentage
Illiterate	12	5%
Primary school	48	20%
Intermediate	57	23.8%
Degree & above	123	51.2%
Total	240	100%

Based on the BG Prasad 2021 classification, the majority of study subjects (63.3%) belonged to the lower middle socioeconomic class. About 18.8% were from the middle class, while 17.9% were from the upper middle class (Table 4). This distribution highlights that most participants came from economically modest backgrounds, which may influence access to healthcare.

Table 4: Distribution of study subjects based on socioeconomic status

Socioeconomic status (BG Prasad 2021 classification)	Number of subjects	Percentage
Upper middle	43	17.9%
Middle	45	18.8%
Lower middle	195	63.3%
Total	240	100%

Out of 240 participants, 60.4% underwent Lower Segment Caesarean Section (LSCS), while 39.6% had vaginal deliveries. Among the 240 births, 52.5% were female and 47.5% were male, indicating a slight female predominance in the study population. Table 5 depicts that out of 240 study subjects, 72.9% were preterm births, while 27.1% were term deliveries. The mean gestational age at birth was 35.4 ± 2.2 weeks. Regarding birth weight, 72.9% of newborns weighed between 2001–2499 grams, and 27.1% weighed between 1501–2000 grams. The mean birth weight was 1934.6 ± 166.1 grams, indicating a predominance of low birth weight and preterm births in the study population.

Table 5: Distribution of study subjects based on gestational age at birth

	Number of subjects	Percentage
Gestational age at birth		
Term	65	27.1%
Pre-term	175	72.9%
Total	240	100%
Mean gestational age at birth = 35.4 ± 2.2 weeks		
Birth weight		
1501 – 2000 grams	65	27.1%
2001 – 2499 grams	175	72.9%
Total	240	100%
Mean birth weight = 1934.6 ± 166.1 grams		

Among the 240 study subjects, 89.6% followed the minimum KMC session of at least 1 hour post-attachment (Table 6). Proper infant positioning was observed in 91.3% and 92.5% maintained the recommended posture (head in extended and frog-leg posture). About 77.9% secured the baby with a binder, while 80.4% ensured appropriate dressing (gloves/socks). Correct handling of the baby in and out of the binder was noted in 72.1%. Personal hygiene was maintained by 61.7%, and only 48.3% properly wrapped the baby post-KMC.

Table 6: Distribution of study subjects based on kangaroo mother care practices

KMC practices	Number of subjects	Percentage
Minimum Session of 1 hour after attachment of the baby	215	89.6%
Proper positioning of the infant	219	91.3%
Head in extended and frog position	222	92.5%
Securing the baby properly with a binder	187	77.9%
Dressing during KMC (gloves/socks)	193	80.4%
Moving the baby in and out of the binder correctly	173	72.1%
Maintaining Personal Hygiene	148	61.7%
Proper wrapping of the baby after KMC	116	48.3%

Mothers who practiced at least 6 of the 8 mentioned kangaroo mother care practices (as shown in Table 6) were classified as following proper KMC practice. Overall, among 240 subjects, 72.9% were practicing proper kangaroo mother care and 27.1% were practicing improper kangaroo mother care.

The association of improper Kangaroo Mother Care (KMC) practices based on the mother's age revealed that 22% of mothers aged 18–20 years, 29.7% in the 21–25 years group, 27% in the 26–30 years group, and 25% in the 31–35 years group practiced improper KMC. Statistical analysis showed no significant association between maternal age and KMC practices. Similarly, improper KMC practices were noted in 25% of illiterate mothers, 33.3% with primary education, 26.3% with intermediate education, and 25.2% among those with a degree, with no significant association between education level and KMC practices. Among housewives, 24.6% practiced improper KMC compared to 33.8% of working mothers, however, these differences were not statistically significant.

Similarly, 26.7% of urban mothers and 27.2% of rural mothers showed improper KMC practices with no significant association based on residential status. Based on the socioeconomic status, improper practices were observed in 22.8% of lower-middle, 26.3% of middle, and 37.2% of upper-middle class mothers the differences were not statistically significant. Based on the gender of infants, improper KMC was practiced by 30.2% of mothers of female infants and 23.7% with male infants, without a significant association. The mean birth weight of the infants was 1934 ± 166 grams. At 2 weeks, it increased to 2046 ± 169 grams, and by 4 weeks, to 2481 ± 175 grams. The mean daily weight gain was

15.3 ± 1.7 grams/day from birth to 2 weeks, and 31.9 ± 2.9 grams/day from 2 to 4 weeks. Overall, the average weight gain over 4 weeks was 23.6 ± 1.7 grams/day.

Table 7: Relation between weight gain and Kangaroo Mother Care practices

Weight gain	Kangaroo mother care practices		p-value
	Improper	Proper	
From birth to 2 weeks (grams)	102.9 ± 26.9	115.0 ± 24.3	0.001
From 2 weeks to 4 weeks (grams)	406.1 ± 72.6	446.5 ± 41.5	0.000
Birth to 4 weeks (grams)	509.1 ± 86.3	561.5 ± 50.9	0.000

In mothers who followed appropriate Kangaroo mother care practices, the infants mean weight increase at the conclusion of the research period was 561.5 ± 50.9 grams, while in mothers who did not, it was 509.1 ± 86.3 grams(Table 7). There was a statistically significant difference with high mean weight gain in babies who received proper Kangaroo mother care practices.

Table 8: Linear regression analysis showing KMC practices in relation to weight gain

KMC practices	Standardized Coefficients (Beta)	T Value	p-value
Minimum Session of 1 hour after attachment of the baby	0.011	0.171	0.864
Proper positioning of the infant	-0.176	-2.751	0.006
Head in extended and frog position	-0.105	-1.664	0.097
Securing the baby properly with a binder	-0.125	-1.975	0.049
Dressing during KMC (gloves/socks)	-0.063	-1.004	0.317
Moving the baby in and out of the binder correctly	0.003	0.043	0.965
Maintaining Personal Hygiene	-0.132	-2.095	0.037
Proper wrapping of the baby after KMC	-0.158	-2.508	0.013
Constant	17.193	0.000	

Among the kangaroo mother care practices, proper positioning of the infant, securing the baby properly with a binder, maintaining personal hygiene, and proper wrapping of the baby after KMC were found to be the significant factors affecting weight gain among infants (Table 8).

DISCUSSION

This 18 month prospective observational study was carried out at the Government Medical College, Nalgonda, Telangana, among postnatal mothers who choose Kangaroo Mother Care (KMC) after giving birth to preterm or low birth weight (LBW) babies. The purpose of the study was to assess how maternal KMC practices affected the weight increase of the newborn. Based on the study's findings, the mean age of the mothers was 23.92 ± 3.81 years. The results of Dawar et al,[18] and Ramesh et al,[19] who documented a similar distribution of cases from 20 to 25 years, were consistent with the findings of our study. Following a review of the educational background of the mothers, 23.8% had intermediate education, 20% had primary education and 5% were illiterate. Of the 240 mothers, housewives were 72.9% and 27.1% were employed. The majority of the cases in the studies conducted by Roba et al,[20] Kassahum et al,[21] and Jamie et al,[22] were housewives. Following socioeconomic analysis, found that 18.8% of the cases in the current study were middle class, 63.3% were in the lower-middle class, and 17.9% were upper-middle class. We also found that 81.2% of the women in this study were from rural areas. Similar distributions of cases from rural areas and socioeconomic classes were observed in other related research done by Dawar et al,[18] and Ramesh et al.[19] Of the 240 mothers included in the study, 60.4% delivered via Caesarean section and 39.6% via vaginal delivery. Although data from other studies have shown that there were more cases of vaginal delivery as compared to caesarean section.[20,21,22] Of those who were born, 47.5% were male and 52.5% were female. Of these, preterm and term births occurred in 72.9% and 27.1% of babies, respectively. The mean birth weight of the cohort was 1934.6 ± 166.1 grams. The mean weight gain from birth to 2 weeks was 15.3 ± 1.7 grams/day and from 2 weeks to 4 weeks was 31.9 ± 2.9 grams/day. Overall, at 4 weeks, the weight gain was 23.6 ± 1.7 grams/day. Cattaneo et al,[23] reported similar findings in weight gain. Dawar et al,[18] reported that the mean gain after four weeks was 12.5 grams/kg/day. In a study by Suman et al,[24] mean weight gain was 23.9 grams/day. Subedi K et al,[25] observed that babies had a good weight gain of an average of 30 grams/day.

At the end of the study period, the mean weight gain of the babies was 561.5 ± 50.9 grams in the group who practiced proper Kangaroo mother care practices, and 509.1 ± 86.3 grams in the group who did not practice proper Kangaroo mother care practices. There was a statistically significant difference with high mean weight gain in the group who practiced proper Kangaroo mother care. Sarma et al,[26] also reported that the mean daily weight gain was significantly higher in the KMC group, 22.1 ± 2.5 grams/day when compared to the non-KMC group. Suman et al,[24] also reported that the mean weight gain was significantly higher in the KMC group 23.9 ± 9.8 grams/day when compared to the

non-KMC group 15.8 ± 8.2 grams/day. Additionally, Ramesh et al,[19] found that when appropriate KMC practices were followed, the mean weight gain was high. The KMC practice assessment showed that 89.6% of mothers provided a minimum of one-hour KMC sessions, 91.3% ensured proper infant positioning, and 92.5% maintained frog positioning. However, only 48.3% practiced proper wrapping and 61.7% maintained personal hygiene. In comparison, Jamie et al,[22] found lower adherence rates to KMC protocols. In conclusion, we found infants whose mothers followed proper KMC gained significantly more (561.5 ± 50.9 g) than those with improper KMC (509.1 ± 86.3 g). Key KMC practices contributing to weight gain included infant positioning, binder use, personal hygiene, and wrapping post-KMC.

CONCLUSION

Kangaroo mother care is an easy, inexpensive method that can be used at home and is accepted by the mother and her family. When it comes to low birth weight babies early weight gain, KMC is a helpful approach. Additional benefits of this method include its affordability, encouragement of exclusive breastfeeding, boosted self-assurance when caring for young infants and the development of strong mother-infant bonds. Infant weight increase is largely influenced by appropriate kangaroo mother care practices. Therefore, Kangaroo mother care is an effective replacement to standard care for the management of stable low birth weight newborns. This is a feasible solution in the Indian context and can be carried at home.

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