

Effect of Kangaroo Mother Care Discharge Guide Program on Mothers and Preterm Neonates Outcomes

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Abstract:

Background: Kangaroo mother care (KMC) is a standardized and protocolized care system for low birth weight, based on skin-to-skin contact between the infant and the mother. The mother's active participation is crucial for effectively implementing kangaroo mother care services to improve physiological stress parameters for neonates. **Aim:** Evaluate the effect of kangaroo mother care discharge guide program on mothers and preterm neonates' outcomes. **Design:** Quasi experimental research study design was utilized. **Setting:** The study was conducted at Postpartum Unit in Women Health Hospital Assuit University. **Sample:** A purposive sample of 100 mothers and their preterm neonates was recruited. **Tools:** Data collection tools included five tools: structured interviewing questionnaire, mothers' knowledge and attitude assessment questionnaires, mothers' observational checklist, and physiological stress parameters sheet of preterm neonates. **Results:** The result of this study revealed that there was highly statistical significance difference in the total means score of knowledge, practice and attitude after receiving kangaroo mother care discharge guide program with p-value 0.001. Additionally, kangaroo mother care showed more stability in physiological stress parameters among preterm neonates. **Conclusion:** The findings of this study support the research hypotheses that mothers who received kangaroo mother care discharge guide program showed a positive effect on level of knowledge, attitude, practice and maintaining preterm neonates' physiological stress parameters as compared to before intervention. **Recommendations:** The neonatal nurse's should apply the KMC discharge guide program to enhance mothers' knowledge, attitude and practice to maintain preterm neonates' physiological stress parameters especially after discharge. Also, work with policymakers and health administrators to develop institution-specific guidelines for KMC implementation and standard operating procedures.

Keywords: Kangaroo mother care discharge guide program, Skin to skin contact, Knowledge, Practice Attitude, Premature neonates, Physiological stress parameters.

Introduction

Low birth weight (LBW) and preterm are closely linked to neonatal morbidity and mortality as a consequence of neonatal hypothermia. Preterm birth complications claim the lives of almost one million children every year. There are 25 and 15 million preterm births and LBW worldwide. Nearly all of them (96%) are found in developing countries. Africa accounts for more than 25% of newborn fatalities worldwide (Cañadas, Carreño, Borja & Bonillo, 2022 and Roba, Binoy & Naganuri, 2017).

Less than 2500 g is considered a LBW. Babies born alive before 37 full weeks of gestation are considered preterm. Caring for LBW neonates impose heavy burden on developing countries. Today, however, World Health Organization (WHO) is formally endorsed Kangaroo Mother Care (KMC) as one of the measures to scale up low cost solutions that could reduce these deaths (WHO, 2003). KMC was initially developed as response to overcrowding, and resources shortage in neonatal critical care units. It was first presented by Rey in 1978 and developed by Martinez and Navarrete until 1994 as an alternative to inadequate and insufficient incubator care for those preterm newborn infants. KMC is defined as a method of holding a small nappy neonate in skin-to skin contact, prone and upright on the mother's chest. The neonate is enclosed in maternal clothing in order to maintain temperature stability (Badr, Mabrouk & El-Shater, 2022 and Badiee, Faramarzi & MiriZadeh, 2014). According to WHO, KMC is defined as early, continuous and prolonged skin-to-skin contact between mother and baby, frequent and exclusive breastfeeding and early discharge from hospital with the father or parents acting as kangaroo care providers (Cañadas, Perales, Martínez, Casado-Belmonte and Carreño, 2022).

KMC is becoming an integral part of the care of premature and LBW infants worldwide. It provides economic savings to families and health care facilities and many physiologic and psycho behavioral benefits to mothers, the preterm and LBW neonates. Additionally, KMC has a lot of benefits to the institution and community (Kim, 2018). It reduces hospital stays for institutions, increases parental involvement with more opportunities for teaching and evaluating, and makes better use of healthcare budgets. It benefits the community by reducing morbidity and mortality, especially in developing countries, and by providing opportunities for prenatal instruction and postpartum follow-up, as well as by using fewer financial resources and promoting overall family health (Cañadas, Carreño, Perales, Borja and Perales, 2022).

For preterm and LBW neonates, it encourages the newborns' well-being and optimal health by tightly controlling the temperature, heart rate, respiratory rate, as well as strengthens the immune system results in fewer risk of nosocomial infection. Additionally, it reduces physiologic and behavioral pain, stress responses, and promotes weight growth. Furthermore it has positive effects on neonates' cognitive development, and earlier discharge (Mirnia, Bostanabad, Asadollahi and Razzaghi, 2017). Neonates who are cared for in a kangaroo pouch receive tactile stimulation from early skin-to-skin contact with their mothers, visual stimulation from eye contact, olfactory stimulation from close skin contact and motor stimulation from nipple sucking, and auditory stimulation from the mother's voice and heartbeat. Additionally, it encourages mother-baby connection, bonding, and attachment, all of which are crucial for the child's emotional and social growth (Naberhuis, Wetzel and Tappenden, 2016).

Mothers' physical and mental health is affected when mother-infant separation occurs as a result of premature neonates being admitted to the neonatal critical care unit. This separation was found to contribute to morbidity, insufficient breast milk volume, poor growth and poor mother-to-infant bonding. The KMC approach can reduce negative psychological stress and help mothers sleep better (Badiee, Faramarzi & MiriZadeh, 2014). Additionally, it increases milk production, doubles the success rate of breastfeeding, and improves a mother's sense of confidence, competence, and satisfaction with relation to caring for her baby which can improve a premature or LBW neonates' chances for survival. In order to lower neonatal mortality and morbidity, mothers play a crucial role in the implementation and practice of KMC (Chen, Wu, Xu & Tung 2022).

Although mothers play a unique role in LBW management as the primary caregivers, the healthcare team must collaborate with mothers to improve their caregiving behaviors using a successful implementation of KMC services in order to enhance their knowledge and skills in providing care for healthy neonates to maintain the stability of physiological stress parameters (Mathias, Mianda and Ginindza, 2018). Because of this, the members of the health team give access to education and information during this period a high priority, especially when it is provided by a qualified nurse and is given under ideal circumstances. Since education is a crucial yet complex issue, nurses are essential in identifying the need for mothers. The nurse supports the mothers as they cope and manage LBW. The nurse provides the necessary help and emotional support to the mothers. In addition to providing emotional support and guidance, the role of the neonatal nurse also includes being a skilled

clinician, an educator, a trainer, a champion for KMC, a carer for the infant, a good team player, a problem solver, and a wise manager (Maniago, Almazan and Albougami, 2020).

The KMC program is superior to other systems in terms of cost-effectiveness since it helps mothers to give optimal neonatal care in order to avoid complications. The mother's active participation is crucial, so mothers should get education regarding KMC techniques, frequency, duration, and breastfeeding method. Offer appropriate information, supported in written material, such as handouts or videos, and conduct individual and group introductions on how the kangaroo position is initiated. This will prepare parents, especially mothers to make this contact a pleasant, positive, and effective. So, in order to ascertain their knowledge, practice, and attitude regarding KMC, the current study was carried out on a statistical sample of mothers to evaluate the effect of the KMC discharge guide program on mothers' and preterm neonates' outcomes in terms of knowledge, attitude, practice for mothers, and physiological stress parameters for neonates.

Significance

The most important factor contributing to the alarming rise in neonatal morbidity and mortality, particularly in developing nations where it accounts for 60–90% of newborn death worldwide, is low birth weight and preterm neonates. Despite increased attempts to avoid prematurity, there are still a considerable number of premature births in Egypt. Each year, it might get to about 41,728 babies. These figures might suggest in some way that the rate of neonatal intensive care is high (El-Nagger, El-Azim and Hassan, 2013). One million babies die as a result of the negative effects of preterm delivery. The risk of developmental abnormalities, early growth

retardation, infections, and early mortality in neonates or childhood is increased in low birth weight newborns who are able to survive during the immediate neonatal period (Gomaa, Ahmed and Aboelmagd, 2022).

Morbidity and mortality can however be reduced by appropriate interventions for the management of these neonates which include: skilled care at delivery; basic neonatal resuscitation when needed; attention to thermal control; prevention of hypoglycemia through exclusive early breastfeeding; supplementation with vitamins and minerals; prevention of nosocomial sepsis; and early detection and treatment of illness (Vagha and Swarnkar, 2016). Conventional care of LBW neonates is expensive and needs both trained personnel and permanent logistic support. In developing countries, limited financial and human resources for the care of LBW infants often result in overcrowding, leading to high morbidity and mortality. Thus, there is a need for interventions that reduce neonatal morbidity, mortality and costs, which would be an important advance in care (Sonawane, 2018).

Studies both in developed and developing countries has demonstrated the positive effects of KMC on neonates, including a lower risk of mortality, increased feeding support to increase weight gain, the maintenance of physiological stress parameters like heart rate, respiration, oxygen saturation, and adequate thermoregulation. It also promotes mother-newborn interdependence while reducing behavioral and physiologic responses to pain. As a result, it has beneficial effects on neonates` prevention and management of infection and respiratory problems, has positive effects on neurological, cognitive, emotional, behavioral and social development and

allow for an earlier discharge of babies (Lin, Chu, Chen, Chen, Huang, 2022).

It is fundamental to prepare the parents, especially the mother, before implementing the kangaroo position. In the case of a possible preterm delivery, the benefits of the KMC must be explained. The advantages of KMC should be repeated to motivate the mother to be with her child as much as possible, highlighting KMC as the best option for the newborn to face the transition from intra to extrauterine life. The role of the kangaroo nurse is crucial, as she will be the direct contact for the mothers and the provider of information on the KMC Method. The idea is to constantly engage the mother by trading knowledge, skills and duties related to serving as the child's primary parental figure and attending to all of their physical and emotional needs. Nurses, midwives, and all relevant healthcare providers must also possess the necessary knowledge and attitude to encourage and educate parents to practice and implement KMC. Nursing staff must provide mothers with pertinent KMC education to increase their level of awareness to prevent newborn problems, and nurses must oversee the implementation to ensure success. Therefore, the purpose of this study was to evaluate the effect of kangaroo mother care discharge guide program on mothers and preterm neonates' outcomes.

Methods

Aim:

The primary aim of this study was to evaluate the effect of kangaroo mother care discharge guide program on mothers and preterm neonates' outcomes; including: a) Mothers' outcomes in terms of knowledge, practice and attitude about KMC; b) Preterm neonates' outcomes in terms of physiological stress parameters such as

respiratory rate, heart rate, temperature and oxygen saturation.

Hypotheses:

The following research hypotheses were developed to fulfill the intent of the current study: Mothers and preterm neonates enrolled in kangaroo mother care discharge guide program had a significant:

H₁: Higher level of knowledge, practice and attitude scores after intervention compared to before intervention.

H₂: Improved preterm neonates' physiological stress parameters after intervention compared to before intervention.

Research Design:

Quasi-experimental research design with pre-test and post-test was used. One-group pre-test / post-test research design was used to evaluate causal relationships between intervention and outcomes. It is a method for assessing the effect of an intervention by comparing scores on a variable before and after an intervention of kangaroo mother care discharge guide program (Lo Biondo-Wood & Haber, 2014 and Nieswiadomy, 2012).

Setting:

This study was conducted at Postpartum Unit in Women Health Hospital Assiut University, which a big ward, consists of 6 rooms, two for normal labor, three for cesarean section, and one for septic cases. This hospital has a higher rate of women attendance from both rural and urban areas in Assiut city, and it offers free services to women who live in the Assiut city, Egypt.

Sample:

A purposive sample of 100 mothers and their preterm neonates was recruited for the study. The following mother criteria were

included: a) Willingness to participate, b) Age between 18 - 40 years, c) Mothers of low birth weight and preterm neonates. All mothers who admitted to the intensive care unit after delivery or having serious intraoperative, postoperative problems, such as intraoperative, postoperative rescue, bleeding and amniotic fluid embolism were excluded. Inclusion criteria of LBW neonates were as follows: a) Both sexes, b) Moderate to late preterm (32 to less than 37 weeks of gestational), c) Birth weight of 1500 gm. to 2500 gm., d) Had spontaneous respiration, e) Free from neurological disorders such as hypoxic ischemic, and f) Free from major congenital malformation as congenital heart disease or gastrointestinal anomalies.

Sample size:

The calculation of the sample was done through using (Epi-info statistical package and version 7.2, which designed via the Center for Disease Control and Prevention (CDC) by 80 percent power, the 2.5 value was chosen according the acceptable limit of precision (D) according 95 percent confidence level (C1), with the expected prevalence with 10 percent , the worst acceptable 25 percent. As a result, the size of sample was estimated to be 100 plus 10 percent of the mothers and their preterm neonates to exclude against non-response rate.

Tools:

The following five main tools were used to obtain data relevant to the current study variables:

1- Structured Interviewing Questionnaire:

This tool was designed by the researchers which comprises the following three essential aspects: a) Mothers' Socio-

demographic characteristics such as age, educational level, occupation, and socio-economic level; b) Obstetric history which included: gravidity number, parity number and method of delivery; and c) Neonatal characteristics assessment sheet such as gender, gestational age per weeks, birth weight per gram and 5-minute Apgar score.

2- Mothers' Knowledge Assessment

Questionnaires: the researchers developed it after comprehensive reviewing of the recent relevant literatures (Narciso, Beleza & Imoto, 2022; Ozdel & Sari, 2020 and Mirnia, Bostanabad, Asadollahi & Razzaghi, 2017), to evaluate the mother's level of knowledge about KMC of low birth weight neonates. Thirty questions covering the key items related to procedure were included such as meaning of LBW, risk factors, causes, complications, definition of KMC, importance, right positional technique of KMC and for how long, benefits of KMC for the mothers and neonates, appropriate clothing, appropriate nutrition and frequency of feeding, danger signs which interrupted KMC....etc. **Scoring system:** The incorrect answer was scored 0 and the correct answer was scored 1 with a total score 30. The total knowledge scores for mothers were categorized into: unsatisfactory knowledge (less than 70 percent of total knowledge); and satisfactory knowledge (more than 70 percent).

3- Mothers' Attitude Assessment

Questionnaires: This tool created by researchers after reviewing the literature (Saurabh, Haridas, Nagar &

Gupta, 2021, Rao, Udani & Nanavati, 2008); to evaluate the mother's attitude toward KMC. It included 5 closed-ended yes/no questions on their feelings while performing KMC such as: did you feel that the baby was safe? Did you find KMC to be tiring? Did you think the baby would receive enough warmth? ...etc. **Scoring system:** all statements were scored on a scale from 0 -1 (0= No, 1= Yes) with a total score 5. The total attitude scores were categorized into two levels: a) Negative (less than 70 percent), and b) Positive (more than 70 percent).

4- Mothers' observational checklist: this tool created by researchers after reviewing the literature (Getie, Yismaw and Tiguh, 2022); to assess the mother's level of practice of KMC. The actual and observable activity of mothers in kangaroo mother care was assessed by using an observational checklist which contained 5 observational criteria such as: the baby is dressed in a cap, socks, nappy; placed between the mother's breasts, head of a baby is turned to one side, baby's neck is not too flexed or too extended and the hips are flexed and abducted; a blanket is used to cover the infant; length of skin to skin contact gradually increased....etc. **Scoring system:** For the practice items, the incorrectly done was scored 0, the correctly done was scored 1 with a total score 5. The total practice scores were categorized into two levels: a) Satisfactory practice if the percent score was 60% and above. b) Unsatisfactory less than 60%.

5- Physiological stress parameters sheet of preterm neonates: it was developed

after reviewing the literature (Pravitasari, Widyaningsih & Murti, 2020 and Smith, Bergelson, Constantian, Valsangkar & Chan, 2017); to collect data about physiological stress parameters as respiratory rate, heart rate, body temperature and oxygen saturation.

Validity and Reliability:

Knowledge, practice and attitude Assessment Questionnaires were designed and adapted after extensive literature review and submitted to a panel of five expert staff in the field of maternity and newborn health nursing, pediatric nursing and nursing education. Each one of the experts was asked to examine the instrument for face and content validity. Modifications were carried out according to the judgment of panel.

The reliability was tested to determine the consistency of the measurement tool by administering the questionnaire to 10 mothers who used test-retest. The Cronbach's alpha reliability test ($\alpha = 92\%$) which showed that every of the tools composed of relatively homogenous items like indicated from moderate to the high reliability for each tool. Statistical equation of Cronbach's alpha reliability coefficient normally ranges between 0 and 1; higher estimation more than 0.7 indicate acceptably reliability.

Ethical and legal considerations:

Official permission to carry out the study was obtained from the research ethics committee in the faculty of nursing - Assiut University, as well as the head manager of the women's health hospital at Assiut University. Written consent for mothers' agreement was obtained after clarification

of the aim of the study. Each mother was free to either participate or not in the current study and had the right to withdraw from the study at any time without any rationale and it will not affect upon process of care. Also, mother was informed that obtained data will not be included in any further studies. Confidentiality and anonymity were confirmed through the coding of all data.

Pilot study:

A pilot study was carried out on 10% of the total sample (ten mothers and their preterm neonates) to assess time required to answer the questions; to judge the feasibility, objectivity, test the ability of the tool to elicit the desired information and to test appropriateness of content, and wording. Based on its outcome, no changes were made. Ten mothers were recruited for the pilot study and contained in the total research sample.

Procedure:

Between April to November 2022, the actual fieldwork was completed. Following a review of pertinent, recent Arabic and English literature encompassing many facets of KMC knowledge and skills in order to address the mothers' and neonates' outcomes, Kangaroo mother care discharge guide program was designed in Arabic. The following three steps were taken in order to collect the data:

1- Assessment:

KMC was only conducted once the mothers capable to sit and walk to take care of the infant. Through a face-to-face interview, the researcher matched each mother by 15 to 30 minutes prior to the start of the program, introduced herself to the

mother at the beginning, then explained the purpose and nature of the study and obtained written consent from each mother to participate in the study. Finally, the researcher assessed the mother's socio-demographic characteristics and the obstetrical history, then mother's knowledge, attitude and practice toward KMC. Additionally, characteristics of preterm neonates were obtained from neonates' medical records and the following physiological stress parameters were measured: heart rate and respiratory rate for a full minute, axillary body temperature by the digital thermometer and SpO₂ saturation before the implementation of KMC discharge guide program .

2- Intervention:

Interventions to improve KMC have been found to be efficient strategies to improve KMC's knowledge and practical competency for mothers. Utilizing a combination of lecture/discussion, audiovisual materials, and demonstration / re-demonstration techniques is an efficient way to educate mothers. A day before implementing KMC, researchers visited the mother and suggested that she take a shower and stop using perfume before coming into touch with the neonates. The two phases of the discharge guide program intervention are as follows:

(A) **The theoretical phase** regarding kangaroo mother care discharge guide program was given to each mother separately and was presented through video film for 25 minutes in a single session. It included knowledge as: (a) The meaning of LBW, (b) Risk factors, causes, and complications of LBW; (c) The definition, importance, and proper positioning technique of

KMC; (d) The requirement, supportive environment and a comfortable room temperature; and (e) Danger signs that interrupted KMC. At the end of session, mother' questions were discussed to correct any misunderstanding and the booklet was given to mother. This booklet includes all the instructions required for KMC including detection, management of the neonatal physiological changes and common problems of neonates and needs.

(B) **The demonstration phase** was used to complete the practical part. Any required care was provided prior kangaroo care sessions to avoid interruption. The mother instructed to perform the KMC techniques for 45 to 60 minutes, at least twice a day. In a private room, the mother was helped to sit in a comfortable chair with a soft backrest and footrest to prevent fatigue. The researchers instructed the mother to take off the upper clothes and put on an open-front gown and mask. Then, the preterm neonate was carefully put naked except for the head and diaper area on the mothers' bare chest with flexed arms and legs as in froglike position, and the head was turned sideways. To ensure neonatal thermal insulation, the researchers wrapped and secured the mother's gown and placed a blanket on the neonates' back to protect them from any air drafts and maintain their normal body temperature. The mother was instructed to hold the neonate's bottom with the right hand while supporting the head and neck with the other hand. With each mother,

demonstration and re-demonstration were employed for three sessions or more before evaluation step. Also, oxygen saturation, respiratory rate, heart rate, and temperature were assessed before transfer neonates from incubator to mother to ensure their medical stability.

3- Evaluation:

The effect of kangaroo mother care discharge guide program on improving mothers' knowledge, attitude and practice toward KMC was evaluated after finishing the intervention immediately before discharge using the same data collection tools. The effect of KMC discharge guide program on maintaining neonates' physiological parameters was evaluated in 30 minutes after intervention.

Statistical analysis

The collected data were scored, tabulated and analyzed using Statistical Package for the Social Science (SPSS) program version 22. Descriptive as well as parametric inferential statistics was utilized to analyze data pertinent to the study. Paired sample t-test was used to analyze data and comparing the mean of the pre- and post-test for the same group, comparison among the qualitative variables was performed by using chi-square.

Results

Statistical findings were presented in the following order: Socio-demographic characteristics, obstetric history and neonatal characteristics; and result that answered the research hypotheses in relation to mothers and neonates' outcomes.

Section I: Socio-demographic characteristics, obstetrical history and neonatal characteristics:

Table (1): Reveals that a total number of 100 married mothers were included in this study. The age of mothers ranged between 18 and 40 years, with a mean age of 30 ± 2.84 years. Moreover, (70 %) were university education. Regarding occupation, (54%) were housewives. As regards socio-economic level, it was observed (72%) of the mothers were belonged to the middle class.

Table (2): (60%) of mothers were primigravida, while (40%) were multigravida with one to three children. According to method of delivery, (85%) of them delivered via normal vaginal delivery.

Table (3): It was found that (61%) of neonates were boy while (39%) were girl. The mean gestational ages was 32.67 ± 2.152 ; while birth weights mean score was 2181.14 ± 549.146 g with mean 5-minute Apgar score 7.609 ± 1.0567 .

Section II: Mothers and neonates' outcomes:

Figure (1): 93 % of mothers had no knowledge about KMC before; only 7% of mothers had prior knowledge about KMC.

Table (4): After intervention, the majority of mothers had satisfactory knowledge, practices and attitudes of KMC (96, 97, and 93) respectively. When compared to before the intervention, there was a statistically significant increase in overall mean score of knowledge level after intervention (4.54 ± 0.79 and 27.63 ± 2.83) respectively at *p-value* (0.001). In terms of practice level, the current study found a statistically significant increase in overall mean score of practice after intervention as compared to before intervention (1.47 ± 0.48 and 4.62 ± 1.37) respectively at *p-value* (0.001). Additionally, there is a statistically significant improvement in overall mean attitude score after intervention when compared to before

intervention (1.59 ± 0.38 and 4.21 ± 0.92) respectively at *p-value* (0.001).

Figure (2): shows that after intervention, (96 %) of mothers were aware of KMC and had satisfactory knowledge.

Figure (3): demonstrates that (93 %) of mothers had a positive attitude of KMC following the intervention.

Figure (4): reveal that (97 %) of mothers had satisfactory KMC practice following intervention.

Table (5): confirms that the relationship between knowledge, practice and attitude is strong relationship.

Table (6): concerning physiological stress parameters among neonates, it was noticed that preterm neonates exhibited improvement in heart rate, respiratory rate, body temperature and oxygen saturation after 30 minutes of KMC. Additionally, there is a statistically significant improvement in overall mean score after 30 minutes of intervention when compared to before intervention at *p-value* (0.001).

Table (1): Frequency and percentage distribution of socio-demographic characteristics among mothers (n = 100):

Characteristics	No.	%
Age:		
< 20	24	24
20 - 30	66	66
>30- 40	10	10
Mean ± SD	30 ± 2.84	
Educational level:		
Illiteracy	4	4
Read and write	6	6
Secondary education	20	20
University	70	70
Occupation:		
Housewife	54	54
Employment	46	46
Socio-economic level:		
Low class.	8	8
Middle class.	72	72
High class	20	20

Table (2): Frequency and percentage distribution of obstetrical history among mothers (n = 100):

Obstetrical history	No.	%
Gravida:		
Primigravida.	60	60
Multigravida.	40	40
Parity:		
1-3.	86	86
More than 3.	14	14
Method of delivery:		
Normal delivery.	85	85
Cesarean section.	15	15

Table (3): Frequency and percentage distribution of neonatal characteristics (n= 100)

Characteristics	No	%
Gender:		
Girl.	39	39
Boy.	61	61
Mean ± SD for Gestational age/ week	32.67 ± 2.152	
Mean ± SD for Birth weight / g.	2181.14 ± 549.146	
5-minute Apgar score:	7.609 ± 1.0567	

Figure (1): Percentage distribution of mothers based on their exposure to KMC (n = 100):

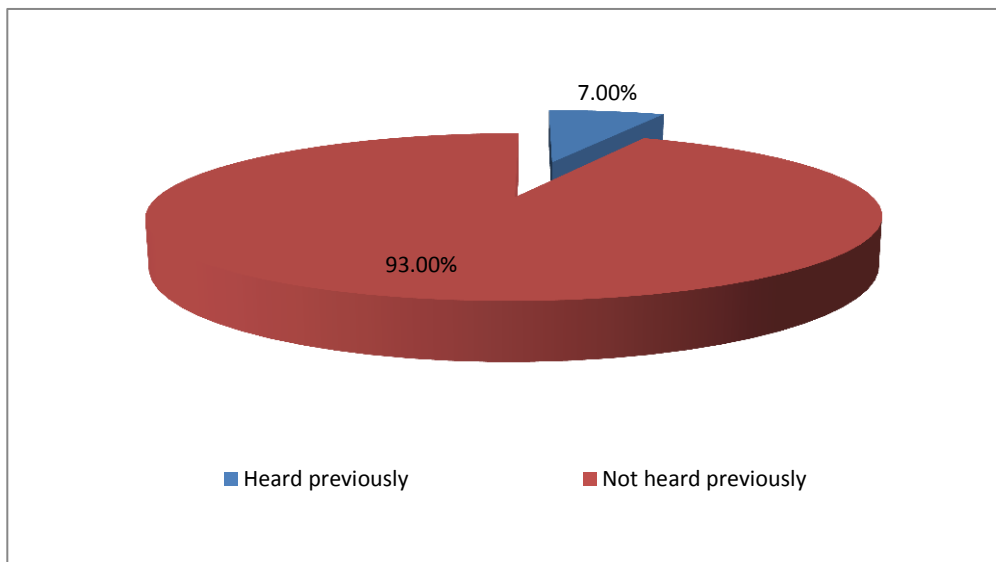


Table (4): Comparison of knowledge, attitude and practice mean score toward KMC before and after intervention among mothers (n = 100):

Variables	Before		After		p -value
	No	%	No	%	
Knowledge:					< 0.001**
Satisfactory	95	95	4	4	
Unsatisfactory	5	5	96	96	
Mean ± SD	4.54 ± 0.79		27.63 ± 2.83		
Practice:					< 0.001**
Unsatisfactory	96	96	3	3	
Satisfactory	4	4	97	97	
Mean ± SD	1.47 ± 0.48		4.62 ± 1.37		
Attitude:					< 0.001**
Positive	6	6	93	93	
Negative	94	94	7	7	
Mean ± SD	1.59 ± 0.38		4.21 ± 0.92		

*Statistically significant *p*-value ≤ 0.001

Figure (2): Percentage distribution of mothers' knowledge regarding KMC before and after intervention (n = 100):

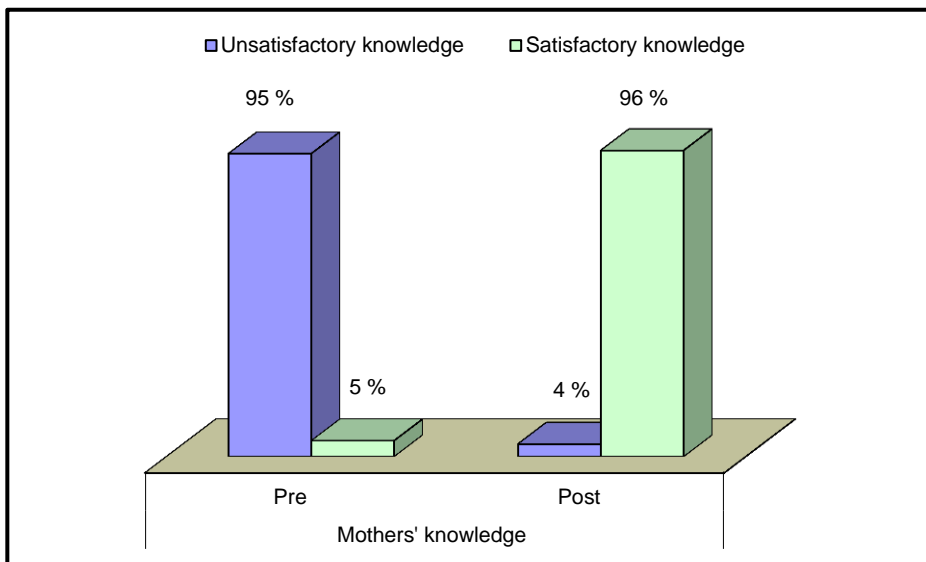


Figure (3): Percentage distribution of mothers' attitude regarding KMC before and after intervention (n = 100):

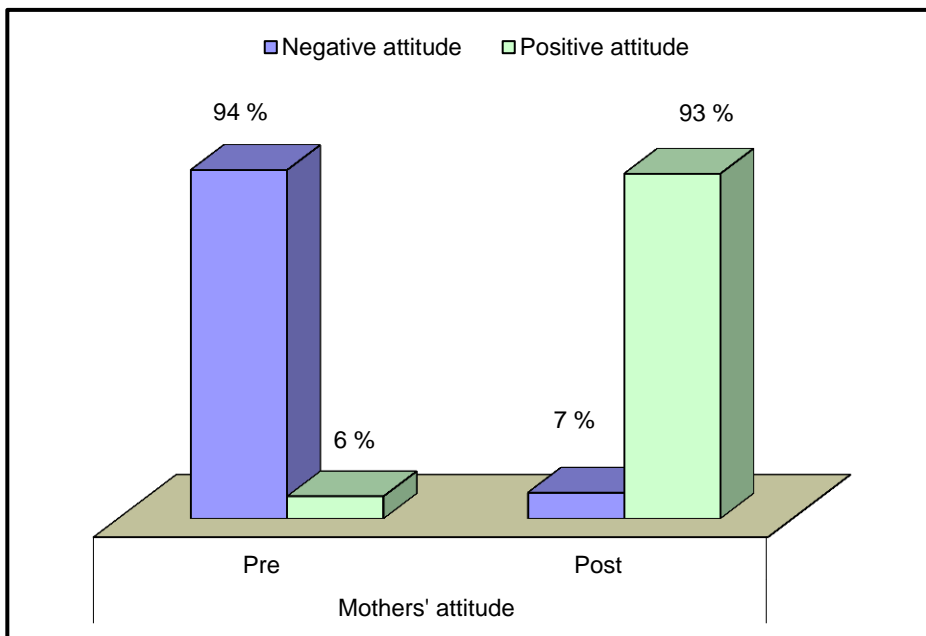


Figure (4): Percentage distribution of mothers’ practice regarding KMC before and after intervention (n = 100):

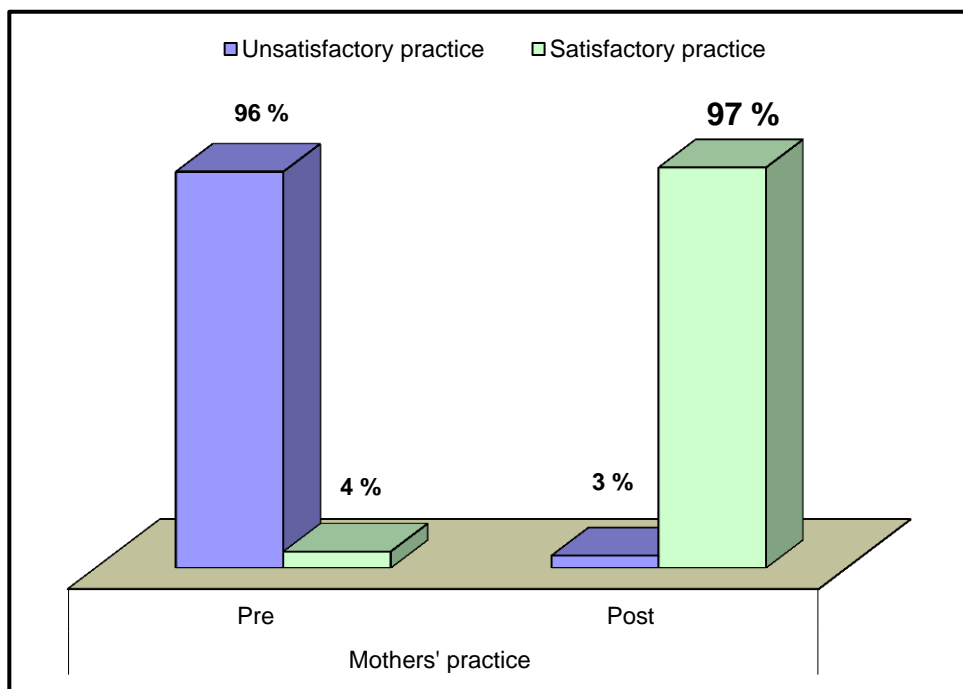


Table (5): Correlation of knowledge, practice and attitude mean score among mothers before and after intervention (n = 100).

Items	Knowledge		
	Pearson Correlation	Significant value	Strength of relation
Practice	181.38	0.001*	Strong correlation
Attitude	204.633	0.001*	Strong correlation

*Correlation is highly significant at the p -value ≤ 0.001 level (2-tailed)

Table (6): Physiological stress parameters mean score among neonates before and 30 min after intervention (n= 100).

Parameters	Before KMC	30 minutes After	p -value
Heart rate.	141.30 ± 19.98	134.90 ± 12.852	< 0.001*
Respiratoryrate.	63.40 ± 35.004	53.10 ± 22.589	< 0.001*
Body temperature.	36.46 ± 0.27	36.89 ± 0.278	< 0.001*
Oxygen saturation.	91.9 ± 3.47	98.5 ± 1.46	< 0.001*

*Statistically significant p -value ≤ 0.001

Discussion

When compared to traditional neonatal care in settings with limited resources, kangaroo mother care has been shown to significantly lower the risk of morbidity and mortality by 40% among hospitalized infants with a birth weight less than 2.0 kg once they are clinically stable. The baby should only be started on KMC once it has stabilized in an incubator or warmer, which can take anywhere between 3 and 7 days (Ozdel and Sar, 2020). In order to improve the outcomes for low birth weight neonates especially in settings with limited resources at developing nations, it is crucial to improve the knowledge, attitudes, and practices of KMC for mothers through information, communication and education.

Kangaroo mother care nurses should take measures to encourage the mothers in successfully implementing KMC while preserving each mother's privacy and dignity. Therefore, the purpose of this study was to evaluate the effect of kangaroo mother care discharge guide program on mothers and preterm neonates' outcomes. The results of this study supported the hypotheses that the knowledge, practice and attitude scores were higher after intervention as compared before. Also, improved physiological stress parameters in preterm neonates following intervention. The results discussion is divided into two main sections, which are as follows: (I) Socio-demographic characteristics, obstetric history and neonatal characteristics, and (II) Evaluation of mothers and neonates' outcomes.

Section I: Socio-demographic characteristics, obstetric history and neonatal characteristics:

For this study, a purposeful sample of 100 married mothers was chosen; their ages ranged from 18 to 40 years, with a mean age of 30 ± 2.84 years. Additionally, more than a two third of them had finished university degree, indicating that educated mothers may be more accepting of KMC. Furthermore, more than one-thirds was middle class housewives. This result was in line with Saurabh, Haridas, Nagar and Gupta (2021) who noticed that around one third of mothers were older than 30 years. Literacy rates were around half of them. Approximately half of mothers were employed. About three quarter of them were belonged to the middle class.

According to obstetrical history, more than half of the mothers were primigravida with one to three children, more than two thirds of the mother delivered via normal vaginal delivery, a result that is familiar to Gulati, Bhat, Maben and Soans (2019), who observed more than two third of the mothers delivered via normal vaginal delivery. According the mothers' hearing about KMC, only seven percent of mothers reported having prior awareness of KMC, which is consistent with the findings of Roba, Binoy and Naganuri (2017), who reported that less than one quarter of mothers were familiar with knowledge regarding KMC before.

Regarding neonatal characteristics, it was found that more than half of neonates boys were found to be moderate to late preterm with gestational ages averaging 32 to less than 37 weeks with mean $32.67 \pm$

2.152 weeks; while birth weights mean score was 2181.14 ± 549.146 g with mean 5-minute Apgar scores 7.609 ± 1.0567 . This result consistent with Chen, Wu, Xu and Tung (2022) who found that newborns ranging from less than 25 weeks to term were registered. The birth weight ranged from 818 gram to 1800 grams.

Section II: Evaluation of mothers and neonates' outcomes:

The current study assessed the knowledge, attitude and practice of KMC among post-natal mothers of preterm LBW neonates. The finding of the present study showed that following discharge guide program, mothers had a high awareness and knowledge of KMC. Before and after the intervention, there was a significant difference in the mean score for knowledge ($p < 0.001$). From point of view, mothers become motivated when they realize that by keeping their preterm LBW neonates warm and minimizing cold injuries, they are helping to ensure their survival. A mother is more likely to be inclined to provide KMC for the neonate if she is aware of its benefit for her neonate. Also, the level of knowledge was raised more effectively in the current study when information was provided utilizing multiple methods, such as a coloured booklet and an informational video. This result supports the study hypothesis which suggested that the mothers enrolled in KMC discharge guide program had a significant higher level of knowledge after intervention compared to before intervention. These findings are reinforced by a David, Mary and Jane (2018) study, which found that mothers' acceptability and

level of knowledge rose after receiving KMC training. The KMC session with written, video material and continuous education improves mother's knowledge and compliance to follow-up, according to additional research conducted by Sindhu (2007) and Neelimarani (2010). This study finding was supported by Mohamed and Kamel (2018) who found that the health education based intervention had a significant effect on the improvement of patients' knowledge.

The findings of the attitude showed that approximately three-quarters of KMC had a negative attitude prior to the discharge guide program, but that virtually all of them had a positive attitude following discharge guide program. The total mean attitude score has improved statistically when compared to before the intervention. After intervention, the vast majority of them had a positive attitude toward the KMC because giving mothers accurate and well-presented knowledge improved their experience, increased their confidence, and helped them form stronger bonds with their neonates. Mothers also felt more involved in the care of their neonates as a result. This result supports the study hypothesis which suggested that the mothers enrolled in KMC discharge guide program had a significant higher level of attitude scores after intervention compared to before intervention. This result was congruent with the findings of Roba, Binoy and Naganuri (2017) who came to the same conclusion that educational guidelines were effective in modifying mothers' attitudes. They noted that all mothers felt close to their babies and

gained confidence in caring for their neonate as a result of improved knowledge and practice.

Adequate KMC education is crucial for adoption and long-term acceptance of level of practice. In this study, the majority of mothers' practical skill is unsatisfactory prior to any intervention. Mothers' KMC practice were positively impacted by their understanding of the knowledge; following the intervention, virtually all of them had high levels of practice, with p value < 0.001 . This result supports the study hypothesis which suggested that the mothers enrolled in KMC discharge guide program had a significant higher level of practice scores after intervention compared to before intervention. This findings supported by Nore'n, Nyqvist, Rubertsson and Blomqvist (2018) who found that mothers' practices improved after teaching programs. Hence, other researchers recommended that preterm neonates require special attention in relation to care to reduce mortality and morbidity rate by using KMC technique (Cañadas, Perales, Martínez, Casado-Belmonte and Carreño, 2022).

Due to their delayed development, premature neonates frequently experience cardiopulmonary instability. In this regard, the findings of the current study showed that KMC were successful in stabilizing the physiological stress parameters of the preterm neonates. Neonatal preterm babies that got KMC showed more stable heart rate, respiration rate, body temperature and oxygen saturation. This result supports the study hypothesis which suggested that the neonates received KMC techniques had a

significant improved physiological stress parameters after intervention compared to before intervention. The current study's findings are in line with those of Ozdel and Sar (2020), who came to the conclusion that KMC may more effectively and positively enhance biological stability in preterm neonates than did conventional care. Moreover, Bera et al. (2014) was stated that the application of KMC had positive effects on physiological stress parameters among neonates. In contrast, Cho et al. (2016) found that while there was a significant difference in the respiratory rates in the group receiving KMC, there was no significant difference in SpO_2 levels.

It is true that keeping the neonates in skin contact with the mother will prevent heat loss. Increasing temperatures, particularly for LBW and premature neonates with a tendency to hypothermia is beneficial and improves the treatment outcomes. With heat loss, the metabolic rate and oxygen demand rise, which causes physiological and metabolic instability, homeostatic issues, an aggravation of apnea, and impaired weight gain (Badr, Mabrouk and El-Shater, 2022). This confirms that KMC is one of the cost-effective therapies which are a simple yet effective way to reduce many complications, especially in LBW neonates. The study also showed a strong correlation between knowledge, practice, and attitude. The findings of the current study confirmed the stated hypotheses that there was a significant difference in the level of knowledge, practice, and attitude positively toward KMC among mothers and improved preterm

neonates' physiological stress parameters after the implementation of discharge guideline program as compared to before the intervention. As a result, awareness about KMC is the cornerstone of educational activities by the health care team. KMC discharge guideline program is the brightest hope to save preterm life as an integral part of nurses' care who have a vital role in the management of mothers during preterm care. Additionally, it is imperative to implement policies that lower the risk of preterm morbidity and mortality.

Conclusion

The aim of the study was to evaluate the effect of kangaroo mother care discharge guide program on mothers and preterm neonates' outcomes. The findings of the study revealed that KMC discharge guide program had positive effect on mothers' knowledge, attitude and practice toward KMC, despite the fact that they were not aware of KMC method prior to hospitalization. Also, KMC has a positive effect on LBW neonates' physiological stress parameters with improvement in preterm neonates' heart rate, respiratory rate, and body temperature after 30 minutes of KMC. Awareness on KMC method among mothers before discharge from hospital is very important considering that KMC could help reduce neonatal mortality. The results of this study should demonstrate why it is necessary to strengthen KMC utilization at the hospital level and raise the rate of KMC for infants who are eligible. The results of this study will help mothers to have adequate knowledge on KMC as well as a positive attitude and practice for better

neonate's outcome after discharge from hospital.

Recommendations

According on study findings, the following recommendations were proposed: a) For a wider generalization of findings, the study can be replicated on large probability samples and at other settings; b) It incorporates KMC the curriculum and extracurricular training content into the midwife nurse and neonatal nurse; c) The nurses should apply KMC discharge guide program to enhance mothers' knowledge, attitude and practice; d) There should be more nurse training programs on KMC; e) Further research is required to determine the impact of KMC on mothers' psychological well-being and the long-term effect of KMC in low birth weight and preterm infants. f) Facilities that support KMC should be provided, together with on-site training and clear guidelines or standard operating procedures for each relevant ward, by policymakers and healthcare providers. g) Engagement of key stakeholders is also a key factor in the success of KMC implementation.

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