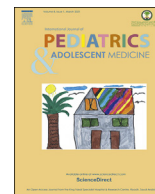


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Original research article

## Kangaroo mother care practice, knowledge, and perception among NICU nurses in Riyadh, Saudi Arabia

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### ABSTRACT

**Background:** The impact of Kangaroo Mother Care (KMC) in neonates is positively reported in the literature. However, several challenges hindered the wide-scale application of this practice.

**Objectives:** To assess the levels of knowledge and competency of kangaroo mother care (KMC) among nurses and to identify the potential barriers to practice.

**Methodology:** Structured web-based questionnaires were submitted to nurses working at neonatal intensive care units (NICUs) located in Riyadh, Saudi Arabia. The participants were asked to answer 23 questions distributed in four main domains, namely, demographic data, knowledge about KMC, practice levels, and barriers to KMC practice. For answers to the knowledge and barriers to practice domains, the mean scores (standard deviations) were calculated to present participants' perceptions and beliefs from 1 (strongly disagree) to 5 (strongly agree).

**Results:** Two hundred nine NICU nurses responded (95.2% females, 89.5% working in a government hospital, 69.9% obtained a Bachelor's degree). The majority of respondents perceived KMC as promoting maternal-infant bonding ( $4.47 \pm 1.3$ ) and enhancing successful breastfeeding ( $4.44 \pm 0.9$ ), while there were considerable uncertainties about KMC application in infants weighing  $< 1000$  g ( $2.21 \pm 1.2$ ). Most of the nurses encouraged parents to perform KMC (92.8%) and provided sufficient information to optimize practice (90%). However, several barriers were apparent, including fear of accidental extubation, lack of time due to workload, familial reluctance to initiate KMC, and lack of privacy during KMC practice.

**Conclusion:** There is reasonable knowledge among NICU nurses, and most of them are actively engaged in practice. There is an urgent need to address the reported barriers through the implementation of clear practice guidelines, provision of suitable educational programs, optimization of staff numbers, and financial support for the development of areas conducive to KMC.

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## 1. Introduction

Although there is a considerable reduction in mortality rates of children below 5 years, neonatal morbidity still accounts for approximately 53% deaths globally [1,2]. Prematurity, defined as birth before gestational age of 37 weeks, and low birth weight

(LBW,  $< 2500$  g) are the leading causes of neonatal mortalities in the United States [3,4] and Europe [5]. Preterm births have been reported to have significant influence on neonatal morbidity, including gastrointestinal, respiratory, nervous, and immunological complications, and mortality rate in Saudi Arabia [6–8]. Healthcare technological advancements have improved outcomes in high-risk infants; however, the advanced technologies essentially involve increased capital. Therefore, it is necessary to implement cost-effective methods of neonatal care, particularly in low- and middle-income countries, as most of these preterm-related complications are inherently preventable. In particular, the application of kangaroo mother care (KMC) seems to provide promising outcomes to reduce the mortality of LBW infants who are clinically

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stable [9–11].

KMC was first introduced in 1978 by Edgar Rey [12] as an alternative neonatal care to incubators for LBW in Bogotá, Colombia. The term was coined owing to the similarities to marsupial caregiving. In such an approach, mothers are considered as “natural incubators” to preserve infants’ body temperature as well as other vital signs through continuous skin-to-skin (SSC) contact, which represents the first and the major domain of KMC. Clinically stable infants are kept between the mother’s breasts below her clothes, and they are placed at the chest. The second domain is the exclusive or nearly exclusive breastfeeding, where the infant benefits from their mother’s milk as the main source of food during mother’s care. Other additional domains, although quite less frequently identified, are early discharge from hospital, irrespective of gestational age or weight, and strict follow-up at home [13].

The impact of KMC on neonatal outcomes was apparent in the literature. Randomized clinical trials have shown that SSC has been associated with improved breastfeeding, ameliorated responses to procedure-induced pain, and stabilized cardiovascular functions [14–16]. Moreover, when compared with conventional care in LBW infants, meta-analyses revealed that KMC has been associated with a 36% reduction of neonatal mortality as well as lower odds of neonatal sepsis, hypoglycemia, hypothermia, and hospital readmission [17,18].

However, several challenges hindered the wide-scale application of KMC. In 2013, a group of neonatal health stakeholders discussed the importance of accelerating KMC implementation to meet the Millennium Development Goals by identifying research priorities, integrating KMC as a part of the Reproductive Maternal Newborn and Child Health package, and addressing barriers to implementation [19]. A multinational study involving four African countries has shown considerable disparities in KMC implementation across neonatal care facilities, while these countries are presumably committed to KMC [20].

Notably, the differences in KMC application are linked to the levels of stakeholder involvement and user engagement [21]. The latter could be promoted through addressing the barriers and improving knowledge levels among nurses working at neonatal intensive care units (NICUs). However, little is known about the knowledge, practice, and attitudes of those nurses as basic members of the treatment team, particularly in the context of socio-cultural variations, which might affect maternal engagement and practice. To the best of our knowledge, no studies have been conducted in Saudi Arabia concerning this topic. Therefore, we aimed at providing an insight into the levels of knowledge, practice, and attitudes of NICU nurses toward KMC care to promote its efficient application and to tailor targeted interventions accordingly.

## 2. Methods

A descriptive cross-sectional study was conducted during the period from March 6 to June 12, 2019, in NICUs located in Riyadh, Saudi Arabia. A structured web-based questionnaire was used to collect data from nurses willing to participate. Nurses from other departments were excluded.

The data collection tool was designed by the authors and was tested for internal consistency using Cronbach’s Alpha test. It comprises four main domains: 1) demographic and work-related data, including gender, age, highest educational level, years of experience in neonatal units, and hospital type; 2) knowledge about KMC, including the impact of KMC on maternal-infant bonding and successful breastfeeding, KMC practice in intubated babies and those weighing <1000 g, and the perceptions about the potential risk of neonatal injuries and infections; 3) KMC practice,

including being previously supervised by an expert while practicing KMC, participation in a relevant continuing education program, and the interactions with parents regarding KMC (through providing information, providing help in practice, or encouraging KMC practice); 4) barriers to KMC practice, including the difficulties in providing privacy for parents during KMC, familial reluctance or discomfort, the personal preference of incubators over KMC, lack of time, difficulties in infant assessment, and fear of accidental extubation or vascular accesses dislodgement.

Statistical Package for Social Sciences (SPSS) version 19.0 for Windows was used for statistical analysis (SPSS Inc., Chicago, IL, USA). Frequencies and percentages were used to present categorical variables, while means and standard deviations (SDs) were used to present continuous variables. For the knowledge and barriers to practice domains, a five-point Likert scale was utilized to present data, ranging from 1 (strongly disagree) to 5 (strongly agree). Subsequently, the mean scores (SDs) were computed and Likert grades were applied for scores in the range of 1–1.79 (Grade 1), 1.80–2.59 (Grade 2), 2.60–3.39 (Grade 3), 3.40–4.19 (Grade 4), and 4.20–5.00 (Grade 5). A *p* value of <0.05 indicated statistical significance.

## 3. Results

### 3.1. Demographic and work-related data

A total of 209 NICU nurses responded. The majority of the respondents were females (95.2%) and worked at an NICU in a government hospital (89.5%) (Nurses from different hospitals were asked). More than two-thirds of the participants were middle-age range (35.4% and 36.8% of them aged between 26–30 and 31–40 years, respectively), while those aged older than 50 years represented only 4.3%. Regarding educational attainment, the majority obtained a diploma (23.4%) followed by a Bachelor’s degree (69.9%), whereas only 1.4% of the respondents had a doctoral degree. However, there were no Master’s degree holders certified among the nurse participants. Working experience at NICUs was reasonable (5–10 years) in 32.1% of respondents and more than 10 years in 28.2% of respondents [Table 1].

### 3.2. Internal consistency of the questionnaire

Analysis of the internal consistency of all items combined (*n* = 23) revealed an acceptable reliability with Cronbach’s alpha = 0.794. On subscale analysis, the Cronbach’s alpha values were good for the practice domain (5 items,  $\alpha$  = 0.808) and acceptable for the knowledge domain (5 items,  $\alpha$  = 0.722) and the barriers to practice domain (8 items,  $\alpha$  = 0.766).

### 3.3. KMC knowledge

Table 2 shows the frequencies and mean scores of KMC knowledge among NICU nurses. All participants (*n* = 209) responded to the submitted questions in this domain, revealing an overall mean score of  $3.23 \pm 0.65$  (Likert grade 3). The highest mean  $\pm$  SD of agreement was about considering KMC as promoting maternal-infant bonding ( $4.47 \pm 1.3$ ) and enhancing successful breastfeeding ( $4.44 \pm 0.9$ ). On the other hand, there were considerable uncertainties about the practice of KMC in infants weighing <1000 g ( $2.21 \pm 1.2$ ) and the associated risks of neonatal injuries and infections ( $2.44 \pm 1.2$ ) [Table 2].

### 3.4. KMC practice

The highest practice item included encouraging parents in the

**Table 1**  
General and work-related characteristics of the respondents.

Parameter	Value	Frequency	Percentage
Gender	Male	10	4.8
	Female	199	95.2
Age (years)	20–25	10	4.8
	26–30	74	35.4
	31–40	77	36.8
	41–50	39	18.7
	51–60	9	4.3
Highest educational level	Diploma	49	23.4
	Bachelor's	146	69.9
	Master's	11	5.3
	Doctoral	3	1.4
Years of experience in neonatal nursing (years)	1–3	46	22.0
	3–5	37	17.7
	5–10	67	32.1
	>10	59	28.2
Hospital type	Government	187	89.5
	Private	22	10.5

**Table 2**  
Participants' responses regarding KMC knowledge.

Item	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Mean (SD)	Likert grade
KMC promotes maternal-infant bonding	N 17	1	2	35	154	4.47 (1.3)	5
	% 8.1	0.5	1.0	16.7	73.7		
KMC carries risk of neonatal injuries and infections	N 56	67	37	36	13	2.44 (1.2)	2
	% 26.8	32.1	17.7	17.2	6.2		
KMC enhances successful breastfeeding	N 12	0	2	64	131	4.44 (0.9)	5
	% 5.7	0	1.0	30.6	62.7		
KMC should not be practiced in intubated babies	N 42	71	43	41	12	2.57 (1.2)	2
	% 20.1	34.0	20.6	19.6	5.7		
KMC should not be practiced for infants weighing less than 1000 g	N 72	75	18	35	9	2.21 (1.2)	2
	% 34.4	35.9	8.6	16.7	4.3		
<b>Weighted mean</b>						<b>3.23 (0.65)</b>	

performance of KMC (92.8%), followed by providing information about KMC to the parents (90%). Notably, approximately two-thirds of the respondents (67.5%) declared that they have been previously supervised by an expert while performing the KMC technique [Fig. 1].

3.5. Barriers to KMC practice

Table 3 shows the frequencies and mean scores of participants' perceptions regarding barriers to KMC practice. In general, barrier scores were moderate, with a mean Likert Grade 3 score of  $3.13 \pm 0.68$ . The most significant barriers were the fear of accidental extubation ( $3.67 \pm 1.0$ ), familial reluctance to initiate KMC ( $3.41 \pm 0.9$ ), inability to provide adequate time to families during KMC due to busy schedules ( $3.34 \pm 1.3$ ), and parents' discomfort with exposing their chest during KMC ( $3.33 \pm 1.1$ ). Only a small number of respondents agreed that incubators are more beneficial than KMC ( $2.31 \pm 1.1$ ) or facing difficulties in assessing baby's readiness for KMC ( $2.46 \pm 0.9$ ) [Table 3].

4. Discussion

The lack of belief in KMC and the limitations in the knowledge domains among healthcare workers would eventually restrict its uptake by the mothers, fathers, and other caregivers. In the present study, we assessed the nurses' subjective responses regarding knowledge, practice, and attitudes about KMC in healthcare institutions. We found reasonable knowledge levels among NICU nurses, particularly those concerning maternal-neonatal relationships. This is because most of them were engaged in KMC practice,

and they were regularly supervised by the relevant experts. Nevertheless, nurses face several practice barriers related to their working conditions and parents.

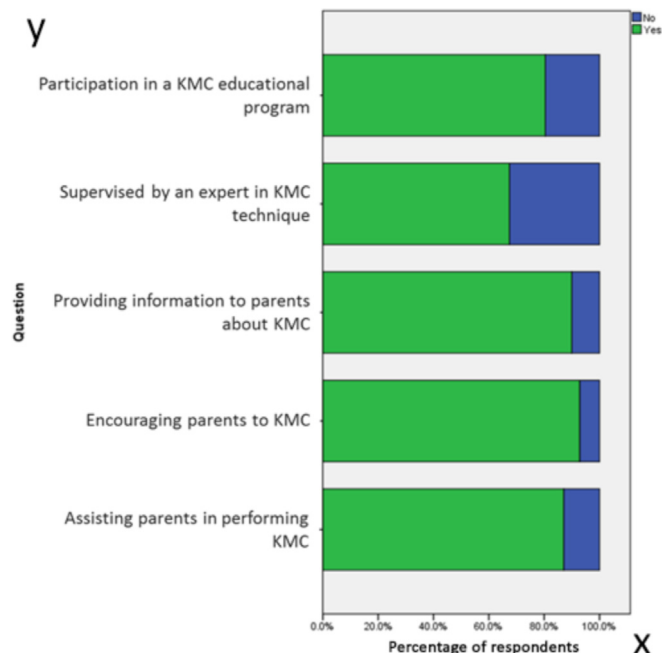


Fig. 1. Responses to the items related to the practice domain.

**Table 3**  
Participants' responses regarding barriers to KMC practice.

Item	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Mean (SD)	Likert grade
Difficulty in providing parents' privacy	N 16 % 7.7	54 25.8	21 10.0	92 44.0	26 12.4	3.28 (1.2)	3
Belief that technology (e.g., incubators) is more beneficial than KMC	N 53 % 25.4	90 43.1	24 11.5	32 15.3	10 4.8	2.31 (1.1)	2
Difficulty assessing baby's readiness for KMC	N 27 % 12.9	101 48.3	40 19.1	40 19.1	1 0.5	2.46 (0.9)	2
Family reluctance to initiate KMC	N 8 % 3.8	35 16.7	45 23.0	100 47.8	18 8.6	3.41 (0.9)	4
Fear of accidental extubation	N 8 % 3.8	28 13.4	24 11.5	115 55.0	34 16.3	3.67 (1.0)	4
Fear of vascular accesses dislodgement	N 13 % 6.2	53 25.4	22 10.5	102 48.8	19 9.1	3.29 (1.1)	3
Inability to provide adequate time to families during KMC because the nurse is busy	N 19 % 9.1	51 24.4	15 7.2	88 42.1	36 17.2	3.34 (1.3)	3
Parents' discomfort with exposing their chest during KMC	N 11 % 5.3	53 25.4	28 13.4	91 43.5	26 12.4	3.33 (1.1)	3
<b>Weighted Mean</b>						<b>3.13</b> <b>(0.68)</b>	

The favorable beliefs in the knowledge domain among NICU nurses, especially the items related to enhancing breastfeeding and improving maternal-infant bonding, are consistent with the findings of most cross-sectional studies in the literature. Shattnawi et al. [22] surveyed NICU nurses (n = 220) in twelve Jordanian public hospitals and revealed that the participants had positive perceptions regarding the impact of KMC on parenting and enhancing the quality of care in NICUs. Similarly, 85% of neonatal nurses (n = 830) were aware about the benefits of KMC for infants and parents upon the completion of an online questionnaire in China [23]. This was supported by studies from other parts of the world such as Brazil [24] and South Africa [25], although small proportions of the nursing staff did not receive KMC training. The improved maternal-infant relationship through SSC was found to maintain infants in quiet sleep with stable and low heart rates, less frequent incidence of apnea, stable body temperature, and improved blood oxygenation [26,27]. Maternal breast milk production is also stimulated, which facilitates more frequent breastfeeding [28]. As a result of improved breastfeeding, infants are less likely to experience gastrointestinal infections and malnutrition, which contribute significantly to neonatal death in developing countries. Additionally, weight gain is improved with short hospital length of stay, preserved physiological stability, and reduced severity of infections.<sup>(28)</sup> However, our participants had marked uncertainties about the association between KMC and the risk of neonatal injuries and infections, a matter that could be further clarified in training programs.

Importantly, in Sweden, knowledge levels and positive attitudes toward practice were more pronounced among nurses working in NICUs (type A), where the mother is allowed to stay with the infant 24 h a day, than among those working in NICUs (type B), where parents have intermittent access to the infant round-the-clock [29]. This underscores the importance of promoting the maternal-infant bonding through enabling mothers to be with their infant at all times. In addition, it seems that the less knowledgeable nurses have relatively limited experience, and hence, they may be hesitant to use KMC. Therefore, Fenwick et al. [30] emphasized the need to reconstruct the mentality of mothers as the "mother/parent–infant dyad" rather than focusing on the infant exclusively.

For this purpose, nurses can be instructed to regularly provide information to the parents and encourage them to KMC practice, as reported by 90–92.8% of the responded nurses in our study. The contribution of nurses as professional individuals with a

continuous and close interaction with mothers should be heavily accentuated. Actually, nurses' support would overcome the maternal fears surrounding their premature infants. Of note, in addition to optimizing the benefits to the infant and the mother, nurses' workload would be remarkably reduced when the parents receive adequate KMC instructions. In this way, KMC practice could be extended to other intermediate care sections to collaborate with NICU staff to avoid unnecessary delays in care providing [29].

The inherent knowledge of nurses regarding KMC is acquired from proper staff education and providing precise and clear guidelines of KMC practice, particularly among LBW and premature neonates [31]. Previous studies indicated that nurses who received supportive education and training can implement KMC for all infants [31,32]. Dalal et al. [33] showed significant associations between the training status of nurses and their knowledge scores of KMC. Nonetheless, personal beliefs of nurses regarding KMC should be taken into consideration while providing these educational programs to ensure the effectiveness of training. The competency of nurses, their perceptions regarding KMC, support for parental visitation, and the interactions with mothers were all significantly improved after a comprehensive simulation-based training programs of KMC skills [34].

Nevertheless, several barriers to KMC have emerged. Nurses in the current study declared difficulties in providing an adequate time to interact with mothers, and they had some concerns about accidental extubation while implementing KMC. Black [35] stated that fear of losing venous access and the lack of protocols and staff experience are apparent obstacles for KMC implementation in preterm infants under mechanical ventilation. Nonetheless, with adequate training, the chances of accidental extubation would be ultimately reduced as reported in a previous study conducted in Brazil [36]. Regarding workload barriers, it has been found that training mother to practice KMC would consume time out of working schedules while reducing time spent with other critically ill patients [21]. Consequently, the numbers of working NICU nurses should be optimized to relieve overload and improve care. However, in a systematic review of studies concerning KMC barriers, some nurses declared that KMC reduced the amount of time spent with each patient [37]. As for other institutional barriers, although most of the nurses in other studies support KMC use, they declared that deficient managerial directions and poor staffing levels hindered KMC practice [38]. Some parents are excluded at distinct times from NICUs for infection control purposes or during medical



rounds [39]. The lack of time due to overload of tasks in NICUs was also reported in Iran [40]. These logistic issues can be overcome by extension of visiting times and implementing targeted assistance approaches.

Familial/parental barriers were apparent in our study. Familial reluctance to initiate KMC was notable, and it was reported in an early study in the United States. This could be addressed by proper education of the parents regarding the benefits and importance of KMC. In addition, maternal discomfort while exposing their chest indicates privacy problems and the lack of adequate spaces allocated for mothers' accommodation. As such, dedicated funding to create suitable environments is warranted to ensure the highest levels of privacy.

In the current study, the knowledge and practice levels of KMC among the most relevant healthcare workers were investigated, which are in continuous contact with mothers/families. However, some limitations should be considered. The responses might reflect bias owing to the cross-sectional design and the self-administered survey. The reasonable knowledge about KMC may be attributable to the fact that most of the NICU nurses are working in tertiary hospitals based in urban areas of Riyadh, and hence, they are highly qualified with prior training and profound experiences. This research was also limited to a specific region in Saudi Arabia, and the results could be generalized to other areas due to sociocultural and financial differences.

## 5. Conclusion

There is reasonable knowledge regarding KMC and proper engagement levels of NICU nurses working in tertiary hospitals in Riyadh, Saudi Arabia. However, KMC should be practiced on larger scales, considering providing education of staff and parents and addressing the major barriers. This could be performed by the engagement of stakeholders to establish clear and targeted guidelines/recommendations, optimize the number of working nurses to avoid workload, and adequate financing to create suitable areas/rooms for KMC practice and to ensure the best levels of mothers' privacy. Moreover, additional studies with a prospective design are warranted to implement KMC training programs and to investigate their effects among nurses, including proper assessment of the potential confounding factors. Furthermore, future studies should be conducted in rural areas, focusing on the knowledge and awareness domains. Finally, nationwide studies could probably provide better insights into several barriers for the development of suitable policies/guidelines.

## Ethical statement

Not applicable for this study.

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