

# Maternal Experience of Intermittent Kangaroo Mother Care for Late Preterm Infants: A Mixed-Methods Study in Four Postnatal Wards in China

**Bo Zhang**

Peking University First Hospital

**Jieya Yue**

Peking University First Hospital

**Zhiying Duan**

Peking University First Hospital

**Yingxi Zhao**

University of Oxford

**Sarah Williams**

Save the Children

**Limin Huang**

Hunan Provincial Maternal and Child Health Care Hospital

**Xiaoqin Zhang**

Northwest Women & Children Hospital

**Wenli Wu**

Linyi Maternity and Child Health Care Hospital

**Lin Zhang**

Save the Children

**Jun Liu**

Peking University First Hospital

**Gengli Zhao** (✉ [zhaogengli@sina.com](mailto:zhaogengli@sina.com))

Peking University First Hospital

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## Research article

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# Abstract

**Objective:** To describe how mothers of late preterm infants experienced provision of intermittent kangaroo mother care (KMC) on four postnatal wards in different hospitals in China under a pilot KMC project.

**Methods:** We used a concurrent mixed-methods approach incorporating quantitative and qualitative data. We collected quantitative data covering delivery and maternal experience of and attitude to KMC from 752 mothers who provided KMC to their late preterm newborns on the postnatal wards of four hospitals in different provinces of China. We gathered data from hospital records and maternal questionnaires. Qualitative data was collected from ten semi-structured interviews with nurses, obstetricians, and mothers from two of the participating postnatal wards. We used descriptive analysis for quantitative data and general inductive analysis for qualitative data.

**Results:** Most mothers had not heard of KMC before being introduced to it on the postnatal ward. On average, mothers and newborns stayed on postnatal wards for 3.6 days: during their stay mothers provided an average of 3.5 KMC sessions, an average of 1.1 sessions a day. Each KMC session lasted an average of 68 minutes though there was much variation in length. Common reasons given for discontinuing a KMC session included restroom use, infant crying, and perceived time limitations. Some mothers would have preferred to provide KMC for longer periods of time and nurses encouraged this. Most mothers experienced no difficulty providing KMC, received support from family and medical staff and intended to continue KMC post discharge.

**Conclusion:** In order to improve maternal experience of KMC it is recommended that awareness raising of KMC be included in antenatal care and after birth, longer periods of KMC provision be encouraged, greater privacy be provided for mothers providing KMC on postnatal wards and family members be encouraged to support KMC.

## Background

Kangaroo Mother Care (KMC) originated in Bogota, Colombia in the 1970s. It has been shown to reduce neonatal mortality and morbidity and increase breastfeeding rates when compared to conventional care (1). It is recommended by the World Health Organisation (WHO) as the standard of care for stable preterm newborns and is defined as early, continuous and prolonged skin-to-skin contact between the preterm or low birth weight infant and caregiver, exclusive breastfeeding, and early hospital discharge accompanied by adequate follow-up and support (2).

In 2014 there were an estimated 1,168,126 preterm births in China, representing 7.8% of global preterm births. China is the second highest contributor to global preterm birth numbers (3), despite this KMC is not widely practiced or promoted in China. A few hospitals piloted KMC to varying degrees but there has been no evidence of its routine practice (4) and no standardised guideline had been developed. Major barriers include highly restrictive access or no access of parents to their newborns cared for on neonatal intensive

care units (NICUs) and limited length of hospital stay (one to four days) of mothers and late preterm newborns cared for on postnatal wards (4, 5). Since 2014, the Premature Birth Intervention Programme has worked to raise awareness and promote the uptake of KMC amongst its network of 50-hospitals and has initiated a structured pilot of KMC in eight self-selected hospitals. The pilot incorporated implementation research focused on assessing the feasibility and approach of adopting intermittent KMC in NICUs and postnatal wards, with the hope that evidence and learning could be used to inform the development of a national guideline and promote the scale-up of KMC in hospitals outside of the programme.

In this paper, we aim to describe how mothers of late preterm infants experienced provision of KMC in postnatal wards under this pilot project. By better understanding how mothers perceived KMC initiation, processes, benefits, and challenges we can revise and adapt our procedures and ensure the national guideline considers different local traditions, values and contexts.

## **Methods**

This study was part of a larger pilot and piece of implementation research on KMC in China, conducted from March 2018 to March 2019. In this study, we used a concurrent mixed-methods approach including quantitative maternal questionnaires and qualitative semi-structured interviews. Detailed information on our approach to quantitative and qualitative data collection has been described in other publications (5, 6). The focus of the current analysis differs from our previously published papers which focused on breastfeeding and barriers and facilitators for KMC adoption.

## **Study setting**

The research was conducted in four level-III hospitals based in different provinces of Southeast and Northwest China. The average number of births per month in the hospitals ranged from 500 to 1,000. In these hospitals when a woman gives birth to a late preterm newborn, born between 34 and 36 weeks and 6 days of pregnancy, current practice is for a paediatrician to assess the newborn, if stable the newborn will be admitted to the postnatal ward with their mother. As part of the pilot technical training sessions on KMC and data collection were provided to medical and nursing staff working on wards participating in the study. Intermittent KMC was recommended to all mothers and families of late preterm infants admitted to participating postnatal wards.

## **Data collection**

During the study period 1007 mothers were admitted to the postnatal wards with late preterm newborns, of these 752 agreed to provide KMC during their hospital stay and agreed to take part in the study. Data collected included maternal socio-demographic information (age, educational attainment, occupation), basic obstetric and neonatal information (Obstetric: parity, presence of obstetric complications, mode of delivery; Neonatal: birth weight and gestation at birth). Nurses also recorded the length of hospital stay

and details of each KMC session provided (start and end time, duration, and reason for stopping) (the data collection form is available in additional file 1).

Before hospital discharge a quantitative survey of maternal attitude to, and experience of KMC was conducted (the survey questionnaire is available in additional file 1). This included whether mothers had encountered any difficulties providing KMC, their preferred duration of and time of day for providing KMC, whether they received family, medical and nursing staff support and whether they intended to continue providing KMC after discharge.

After discharge nurses phoned mothers on the 42nd day post birth and administered a short survey asking whether they had continued to provide intermittent KMC, if so, they enquired about the frequency with which they were providing KMC.

Qualitative data was collected from semi-structured interviews conducted in two of the study postnatal wards from August to September 2018. The two postnatal wards were selected based on convenience. In each ward, the head nurse was assigned as the study coordinator for that site and assisted in the recruitment of a mix of obstetricians, nurses and parents who had experience with intermittent KMC for interview. Interviews were conducted over one to two days on each ward. Each interview lasted about 30–40 minutes, and all interviews were conducted in Mandarin and recorded. Interviews with obstetricians and nurses gathered their perspectives on KMC on postnatal wards and the interview questions were informed by the Consolidated Framework for Implementation Research (CFIR). Interviews with mothers focused on their knowledge of KMC, confidence of practicing KMC, and perceived benefits and barriers of KMC practice.

## **Data analysis**

For quantitative data, we conducted descriptive analyses and presented the basic socio-demographic and delivery-related variables. We presented maternal KMC experience during hospital stay stratified by delivery mode (vaginal delivery or caesarean section). We also compared mothers' preferred and actual duration of KMC sessions. All statistical analyses were performed using Stata V14. and test results were reported significant at a level of 0.05.

Qualitative data from semi-structured interviews were audiotaped and transcribed. For the current analysis, a general inductive analysis approach was used to focus on the experience and process of KMC in postnatal wards (7). Emerging themes and categories were developed by authors examining the transcript repeatedly. We presented the themes in chronological order starting with introduction and initiation of KMC, support during KMC, discontinuance of KMC and perceived benefits and challenges of KMC. Data analysis was conducted in Mandarin and selected thematic codes were translated into English, these are presented in the results section.

## **Results**

### ***Quantitative analysis***

All 752 women who provided KMC to their newborns agreed to take part in the study, data from all these women were included in the analysis (Table 1). Nearly half of the mothers had an educational attainment of university level and above, 63.6% of the mothers were primiparous and 61.6% delivered through caesarean section. Most premature infants admitted to the postnatal ward had a gestational age between 36 weeks and 36 weeks and six days and a birth weight of 2500g or above.

**Table 1. Basic socio-demographic of mothers who performed kangaroo mother care**

	Number (N=752)	Percentage
Age		
< 30	254	33.8%
30-34	294	39.1%
>=35	204	27.1%
Education attainment		
High school	222	29.5%
College	191	25.4%
University & above	339	45.1%
Parity		
Primipara	478	63.6%
Multipara	274	36.4%
Delivery mode		
Vaginal delivery	289	38.4%
C-section	463	61.6%
Pregnancy-related complications		
No	327	43.5%
Yes	425	56.5%
Birth weight		
Normal (>= 2500 g)	656	87.2%
Low weight (< 2500 g)	96	12.8%
Gestational age		
34 – 34 + 6 weeks	2	0.3%
35 – 35 + 6 weeks	108	14.4%
36 – 36 + 6 weeks	642	85.4%

Note: Values are n and %

**Table 2. KMC experience during hospital stay**

	Vaginal delivery (N=289)	C-section (N=463)	Total (N=752)
Length of hospital stay (day, mean±SD)	2.42 (1.25)	4.35 (2.08)	3.60 (2.04)
KMC total frequency (times, mean±SD)	2.73 (1.54)	3.98 (1.61)	3.50 (1.70)
KMC total duration (min, mean±SD)	198.93 (180.22)	274.33 (213.98)	241.12 (205.89)
KMC frequency per day (times, mean±SD)	1.26 (0.79)	0.99 (0.42)	1.09 (0.61)
KMC average duration per session (min, mean±SD)	68.93 (83.27)	66.64 (36.48)	67.52 (58.99)
< 1 hour	92 (31.8%)	208 (44.9%)	300 (39.9%)
1-2 hours	142 (49.1%)	201 (43.3%)	343 (45.6%)
2-4 hours	39 (13.5%)	32 (6.9%)	71 (9.4%)
4-6 hours	7 (2.4%)	1 (0.2%)	8 (1.1%)
6-8 hours	0	5 (1.1%)	5 (0.7%)
>8 hours	9 (3.1%)	16 (3.5%)	25 (3.3%)
Heard of KMC before	55 (19.0%)	86 (18.6%)	141 (18.8%)
Source of KMC knowledge (multiple choice, among those heard of KMC before)			
Medical staff	33 (60.0%)	53 (61.6%)	86 (61.0%)
People with KMC experience	4 (7.3%)	4 (4.7%)	8 (5.7%)
Family and friend	9 (16.4%)	9 (10.5%)	18 (12.8%)
Media	13 (23.6%)	17 (19.8%)	30 (21.3%)
Internet	11 (20.0%)	19 (22.1%)	30 (21.3%)
Experienced difficulty during KMC	23 (8.0%)	60 (13.0%)	83 (11.0%)
Reasons to discontinue KMC (multiple choice)			
Pre-arranged time limitation	81 (28.0%)	118 (25.5%)	199 (26.5%)
Break	52 (18.0%)	89 (19.2%)	141 (18.8%)
Restroom use	139	199	338

	(48.1%)	(43.0%)	(45.0%)
Feeding	59 (20.4%)	102 (22.0%)	161 (21.4%)
Sleeping	50 (17.3%)	75 (16.2%)	125 (16.6%)
Infant crying	111 (38.4%)	161 (34.8%)	272 (36.2%)
Did not pause	23 (8.0%)	31 (6.7%)	54 (7.2%)
Received family support for KMC	276 (95.5%)	442 (95.5%)	718 (95.5%)
Received medical staff support for KMC	278 (96.2%)	437 (94.4%)	715 (95.1%)
Type of support received (multiple choice, among those received support)			
Expressing breast milk	74 (26.6%)	125 (28.6%)	199 (27.8%)
Feeding posture adjustment	191 (68.7%)	279 (63.8%)	470 (65.7%)
Feeding reminder	115 (41.4%)	187 (42.8%)	302 (42.2%)
KMC posture adjustment	253 (91.0%)	391 (89.5%)	644 (90.1%)
Consolation	120 (43.2%)	191 (43.7%)	311 (43.5%)
Infant condition observation guidance	219 (78.8%)	335 (76.7%)	554 (77.5%)
Intention to continue KMC post discharge	271 (93.8%)	431 (93.1%)	702 (93.4%)

Note: Values are n(%).

Table 2 shows mothers' experience of KMC during their hospital stay, stratified by mode of delivery. On average, mothers and newborns stayed on postnatal wards for 3.6 days and during this time mothers provided an average of 3.5 sessions of KMC, an average of 1.1 sessions a day. The average length of each KMC session was 68 minutes, however there was much variation between mothers. Most mothers provided KMC for between one and two hours (45.6%) or less than one hour (39.9%). Compared with those who gave birth vaginally, mothers who delivered through caesarean section had a longer average hospital stay (4.35 vs. 2.42 days), on a daily basis they provided KMC less frequently (0.99 vs. 1.26 sessions) but provided more sessions of KMC during their hospital stay (3.98 vs. 2.73 sessions). Common reasons mentioned for stopping a session of KMC included restroom use (45% of mothers),

infant crying (36.2%) and a perceived pre-arranged time limitation (26.5%). Most mothers received family support for KMC, and support from medical and nursing staff, this included adjusting the infants' position for KMC (mentioned by 90.1% of mothers who received KMC support), provision of guidance on how to observe the infants condition (77.5%), and feeding posture adjustment (65.7%). Only 18.8% of mothers had heard of KMC before arriving on the postnatal ward. Those who had heard of KMC had heard from medical staff, media, or the internet. Most mothers did not experience any difficulty performing KMC (89.0%)

Table 3 shows mothers' preference for length of KMC sessions and the time of day when they preferred to provide KMC. Over half of the mothers preferred to provide KMC for between one to two hours (55.5%) while approximately a quarter (26.7%) preferred a duration of less than one hour. Morning (34.4%) and afternoon (35.9%) were the times when most mothers preferred to provide KMC to their newborns.

**Table 3. Preferred KMC session duration and time of day**

N=252	
Preferred KMC duration	
< 1 hour	201 (26.7%)
1-2 hours	417 (55.5%)
2-4 hours	77 (10.2%)
4-6 hours	25 (3.3%)
6-8 hours	8 (1.1%)
>8 hours	2 (0.3%)
Others	22 (2.9%)
Preferred time of day	
Morning	259 (34.3%)
Noon	93 (12.4%)
Afternoon	270 (35.9%)
Evening	106 (14.1%)
Others	24 (3.2%)

Note: Values are n (%).

At hospital discharge the majority of mothers (93.4%) intended to continue providing intermittent KMC. Of those mothers who were successfully followed up (n=627) on the 42<sup>nd</sup> day after birth 69.5% (n=436)

reported that they had continued to provide intermittent KMC. The mean average frequency of KMC provision was 1.9 times a day additional file 2 (eTable 1).

### ***Qualitative analysis***

A total of ten semi-structured interviews were conducted during August and September 2018 in two of the participating postnatal wards. Six out of the ten interviewees were nurses involved in the provision of KMC on the ward, two were mothers providing intermittent KMC to their newborns and two were obstetricians – one of whom had recently given birth to a preterm newborn and provided intermittent KMC. Detailed characteristics of the ten interviewees are presented in additional file 3 (eTable 2). Four main themes emerged from the interviews and these are presented below.

### ***Introducing and initiating KMC***

The two hospitals operated differently in terms of when and how they introduce KMC to mothers. One hospital informed women about KMC after birth and on admission to the postnatal ward, the other identified women at risk of preterm birth and informed them about KMC during antenatal care. Information focused on the benefits of KMC including maintenance of body temperature, benefits for digestion and breastfeeding and alleviation of postnatal depression. After informing mothers' about KMC on the postnatal ward, consent for providing KMC was sought, some mothers preferred to discuss KMC with their family before deciding whether to provide it. Nurses emphasized that instead of directly introducing KMC and "forcing" mothers to provide KMC, they would start by discussing the babies' prematurity, prompting mothers to ask about ways in which they could improve their babies' condition. Most mothers agreed to provide KMC, a few refused due to pain associated with a caesarean delivery. After mothers agreed to perform KMC, nurses would prepare the mother and infant, this included reminding mothers to use the restroom, to clean their bodies and prepare them for KMC positions.

"You just tell them what the benefits are, not too deep as they might not understand, just simple words. When they know that it's good for the infant, help maintaining their vital signs, they are quite happy that it can help the infant and promote breast milk secretion, they are quite happy and like to try KMC." – 01 (nurse)

"If the infant turns out to be premature, I would definitely not say you need KMC. I would ask you how're you feeling and your condition as a mother...then if your baby is a premature baby - if yes what's your worry or concern. She might say that I am worried about feeding the baby and its growth. And then I would say that besides regular neonatal care, there's something called KMC, it's a care strategy like a kangaroo.... They usually accept it well if I tell them step by step. If I just come and say that I am going to perform KMC on your infant, she might find it hard to accept." – 03 (nurse)

### ***Health workers support during KMC***

During each KMC session, nurses usually provided support for mothers and their infants, this included taking temperatures before each session, adjusting an infants' posture, and observing for any

abnormalities. Interviewed nurses reported that when mothers were providing KMC, they would spend time with them, supporting them and explaining about newborn care. This prompted more communication and interaction between nurses and mothers and contributed to better nurse mother relationships.

“Also, when the parents are performing KMC, we definitely will provide them some new-born care guidance, and spend more time than average mothers. They will learn more professional knowledge.” – 05 (nurse)

“Sometimes, sometimes I think that the posture is not very comfortable, and then sometimes I will ask the nurse to help me and adjust the posture, the baby will also feel more comfortable.” – 06 (mother)

### **Length of KMC and discontinuing KMC**

Mothers usually attempted to provide KMC for one hour per session, some mothers provided KMC for 20 to 30 minutes as they felt uncomfortable. Other common reasons mentioned for discontinuing a KMC session included mothers needing to use the restroom or having to eat, the baby crying, family visits or hospital procedures such as hearing tests interrupting KMC provision. Nurses mentioned that mothers were instructed to try KMC for at least one hour each session, and therefore most would only attempt to provide one hour of KMC at a time. Nurses tried to encourage mothers to gradually increase the length of KMC provision although it was challenging as mothers and newborns did not stay on the postnatal ward for very long.

“Sometimes KMC is discontinued, why? Because after the nurse set it up, the doctor may come and do some procedure on the baby, or people from child development department may come and test the baby’s hearing, then KMC is discontinued. Without those procedures, parents may persist longer.” – 03 (nurse)

“There’s rarely any that could persist for three or four hours, mostly one to two hours. Mostly due to parental factors. Also likely because we first promoted and introduced KMC to be one hour session each, at least one hour, parents will then feel that one hour is enough...They feel like they have accomplished the task, the nurse told me one hour and I just need to do it for one hour.” – 04 (nurse)

“...They would ask when I should finish, we would say at least one hour, and then they would just aim for one hour. Also people’s perception has not changed, the grandparents heard baby crying, and thought the baby must be feeling unformattable or painful. The grandparents would be nervous and say let me hold the baby and discontinued the KMC.” – 06 (nurse)

### **Mother’s perception of KMC benefits and challenges.**

While there were many benefits mentioned by nurses, there were not many observed benefits primarily due to the limited length of hospital stay. Nurses claimed that babies receiving KMC cried less, grew faster, and fed better, they also said that parents seemed to be happier. When we asked nurses to recall

what mothers said about the benefits of KMC most mentioned better feeding and better emotional bonding.

“...Frankly speaking it’s impossible to have an extremely significant difference...I think (the benefits) will show up when the infant grows up later but it’s hard to see a huge change in the short period.”– 02 (obstetrician)

“(The mother) said that when put in the trolley, the baby did not suck well and might sleep for three to five hours without waking up. As long as you put it on your skin for skin-to-skin contact, the baby shook its head and looked for food.”– 04 (nurse)

“I went through a C-section and when I tried KMC for the first time, I felt very warm as the baby stayed on me, I felt an emotional bonding and the baby felt safer. I also fed him my breast milk, stimulate the secretion is very important and the baby could eat well and grow faster.”– 09 (mother)

There were several challenges mentioned including lack of privacy during KMC and continuation of KMC after hospital discharge.

“It is best to have something covering (me), because there are too many people in the wards, there are also men, the children are naked, and my upper body is almost naked, which is not convenient.” – 10 (mother)

“(Parents) definitely think KMC is good, but the challenge is after discharge. When performing KMC during hospital stay there’s health workers prompting, some people might not adhere to it after they go back home.”– 08 (nurse)

## Discussion

Through analysing quantitative data collected from 752 mothers about their experience of KMC and qualitative data collected from ten semi-structured interviews with nurses, obstetricians and mothers, we investigated mothers’ experience of KMC during hospital stay in the postnatal wards. The majority of mothers found the experience of providing intermittent KMC positive and did not report any difficulties, most reported that they intended to continue providing intermittent KMC post-discharge.

Our study focused on mothers of late preterm infants on the postnatal wards, the majority of whom had infants of normal-birth-weight ( $\geq 2500$  g) born at a 36 – 36 + 6 weeks gestational age, therefore the length of hospital stay was relatively short (3.60 days). Most low-birth-weight infants ( $< 2500$  g) were cared for on neonatal wards or in neonatal intensive care units, according to hospital policy. Late preterm infants are at a higher risk of mortality and morbidity than term infants (8) and have lower rates of breastfeeding (9). KMC could bring potential benefits to late preterm newborns and their mothers including improved breastfeeding rates and better maternal recovery from birth-related fatigue (6,10–14). The challenges of introducing, initiating and continuing kangaroo mother care on postnatal wards could differ from those faced on neonatal units with early preterm newborns. Most of the mothers in our study

had not heard of KMC before, the length of stay on the postnatal ward was relatively short and due to the larger size (over 2500g) of many of the newborns in our study, they may not have tolerated long periods of KMC as well as smaller newborns (15,16). Intermittent KMC was promoted instead of continuous KMC, which has been more commonly used in resource-rich countries for varying periods of time (17,18).

The majority of mothers provided Intermittent KMC for less-than-two-hours per session, once a day. While many mothers preferred to continue KMC for longer each time, a number of reasons led to provision being discontinued, these included parents' discomfort, restroom use, infant crying, interruptions so that necessary nursing care could take place and perceived time limitations. Providing KMC for longer sessions has been described in another publication as impeding activities including use of restrooms and eating which are mentioned as common reasons for stopping KMC sessions (17). Although research suggests that KMC reduces crying in preterm infants (19), mothers and other family members (especially grandparents) in our study perceived crying as a sign of discomfort and some discontinued KMC as a result. Incidence of infants crying could be due to the larger size of our study population with most of the newborns weighing over 2500g. Compared to early preterm newborns larger newborns are better able to regulate their own body temperature and may only tolerate short periods of KMC (15,16). Care procedures were another reason given for discontinuation of KMC, as doctors or medical staff needed to perform certain activities, with better planning and scheduling of medical procedures and checks this cause of discontinuation could be avoided. An important reason for discontinuation of KMC sessions was the one hour "time limitation" commonly mentioned by mothers and health workers as the standard duration. One hour of KMC was a minimum recommendation set by the Premature Birth Intervention Programme based on available literature and experience from other countries (13,17). Therefore, mothers may have felt obligated to persist with KMC for one hour and many discontinued after this time. Despite nurses encouraging mothers to increase the duration of KMC provision, it was challenging due to the extremely limited length of hospital stay. Our survey of mothers' preference for KMC practices indicated that mothers preferred KMC sessions between 1-2 hours in length, and preferred to provide KMC in the morning or afternoon, this information will inform our future work on intermittent KMC on postnatal wards in China.

Our findings indicate that most mothers did not experience difficulty performing KMC, with support from nurses and family members, KMC was perceived to promote emotional bonding and improve feeding, both commonly reported in literature (17,20). Due to the provision of support for KMC such as postural adjustment and guidance on newborn observation nurses spent more time with mothers providing KMC and whilst there provided information on other aspects of newborn care. Nurses felt this increased, maternal satisfaction and improved the relationship between nurses and mothers. However, it should be noted that providing KMC support increases the workload of health workers, especially nurses (5), which should be taken into account when planning for KMC implementation on postnatal wards.

While most mothers (93.4%) intended to continue provision of KMC post discharge, in the follow-up survey, 42 days after birth, only 69.5% of mothers reported that they had continued to provide intermittent KMC. The difference between the number of mothers who intend to continue providing intermittent KMC

after discharge and the number who do requires further investigation as it may indicate a need for follow up and support for KMC provision after hospital discharge.

Less than 20 % of participating mothers had heard of KMC before being informed about it on the postnatal ward. Of those who had heard of KMC before, 61% reported medical staff as their source of information and 20% had heard of KMC through the media and internet. Lack of awareness of KMC amongst new mothers is not unique to China, a study in India found that most mothers had not heard of KMC before being informed about it by a health worker (21). Some of the nurses interviewed in our study recommended introducing the concept of KMC during antenatal care while others felt this could be done immediately after delivery. KMC as a method of care for preterm newborns in China is still relatively new and its practice is not widespread. If more mothers and premature newborns are to benefit from KMC health workers have a key role to play in awareness raising, championing and informing parents about the benefits of KMC.

Our study is the first to document maternal experience and practice of KMC in China's postnatal wards and has implications for clinical practice in China, including informing the development of national guidelines and aiding KMC scale-up. We previously reported on barriers and facilitators to KMC adoption in five hospitals in China (5) that information is an aid to understanding the contextual and individual factors that influence the decision to initiate KMC, this paper is more relevant to the procedural aspects of KMC implementation and we hope it will inform practice to improve mothers' experience of KMC. For hospitals implementing or planning to implement intermittent KMC for late preterm newborns on postnatal wards we suggest the following recommendations based on our findings.:

- Health workers should raise awareness of KMC amongst pregnant women and new mothers during antenatal care and as soon as possible after the birth of premature newborns.
- Media and internet platforms should be used to disseminate information and raise awareness about KMC and its benefits.
- Mothers should be encouraged to provide KMC for as long as possible and as long as their newborns will tolerate.
- KMC should be facilitated on postnatal wards through ensuring privacy for mothers and newborns during KMC, adjusting the schedule of medical and nursing care procedures around KMC, and encouraging family members to support mothers to provide KMC.

Several limitations should be considered when interpreting these results. Firstly, all hospitals included in the study are tertiary hospitals - including general teaching hospitals and maternal and child health care hospitals and are located in major urban cities. The experience of KMC in lower-level health care facilities may be different. Secondly, the sample size for our qualitative research was relatively small and a larger sample size would have given us a more reliable representation of maternal experience, however this was mitigated in some way by triangulation of qualitative data with quantitative data.

Our study of late preterm infants cared for on the postnatal ward included newborns most of whom were not of low birth weight, this is because it was these premature newborns who were admitted to the postnatal wards. To reduce separation of mothers and their stable late preterm newborns of low birth weight there is a need for further research to assess the feasibility of caring for smaller preterm newborns on postnatal wards.

## Conclusion

In this mixed-methods study, we found that intermittent KMC was provided to late preterm newborns in short sessions during a brief hospital stay on postnatal wards. A number of factors led to discontinuation of KMC sessions, these included interruption for medical or nursing care tasks, restroom use, perceived set time limitations and infant crying. The majority of mothers did not report difficulty in providing KMC and intended to continue provision of intermittent KMC post-discharge. In order to improve maternal experience of KMC it is recommended that awareness raising of KMC be included in antenatal care and soon after the birth of preterm newborns, longer periods of KMC provision be encouraged, greater privacy be provided on postnatal wards for mothers providing KMC and family members be encouraged to support KMC.

## List Of Abbreviations

KMC, Kangaroo mother care

## Declarations

**Ethics approval and consent to participate:** Ethical approval was obtained by Peking University First Hospital Biomedical Research Ethics Committee. All participants gave written consent or oral consent.

**Consent for publication:** Not applicable

**Availability of data and materials:** The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

**Competing interests:** The authors declare that they have no competing interests.

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**Authors' contributions:** BZ, JY and YZ conceived of the analysis. BZ, LH, XZ, WW and GZ led the data collection process. BZ and YZ produced the estimates, created figures and tables and wrote the first draft of the manuscript. SW, JY, JL and GZ provided critical feedback on the first draft of the manuscript. LZ managed the production process. All authors read and approved the final manuscript.

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## References

1. Furman L. Kangaroo mother care 20 years later: Connecting infants and families. *Pediatrics*. 2017;139(1):e20163332.
2. World Health Organization. WHO recommendations on interventions to improve preterm birth outcomes [Internet]. 2015 [cited 2019 Dec 4]. Available from: [https://www.who.int/reproductivehealth/publications/maternal\\_perinatal\\_health/preterm-birth-guideline/en/](https://www.who.int/reproductivehealth/publications/maternal_perinatal_health/preterm-birth-guideline/en/)
3. Chawanpaiboon S, Vogel JP, Moller A-B, Lumbiganon P, Petzold M, Hogan D, et al. Global, regional, and national estimates of levels of preterm birth in 2014: a systematic review and modelling analysis. *The Lancet Global Health*. 2019 Jan 1;7(1):e37–46.
4. Zhang Y, Deng Q, Zhu B, Li Q, Wang F, Wang H, et al. Neonatal intensive care nurses' knowledge and beliefs regarding kangaroo care in China: a national survey. *BMJ Open*. 2018 Aug 1;8(8):e021740.
5. Yue J, Liu J, Williams S, Zhang B, Zhao Y, Zhang Q, et al. Barriers and facilitators of kangaroo mother care adoption in five Chinese hospitals: a qualitative study. *BMC Public Health*. 2020 Aug 13;20(1):1234.
6. Zhang B, Duan Z, Zhao Y, Williams S, Wall S, Huang L, et al. Intermittent kangaroo mother care and the practice of breastfeeding late preterm infants: results from four hospitals in different provinces of China. *International Breastfeeding Journal*. 2020 Jul 17;15(1):64.
7. Thomas DR. A General Inductive Approach for Analyzing Qualitative Evaluation Data. *American Journal of Evaluation*. 2006 Jun 1;27(2):237–46.
8. Engle WA, Tomashek KM, Wallman C, Committee on Fetus and Newborn, American Academy of Pediatrics. 'Late-preterm' infants: a population at risk. *Pediatrics*. 2007 Dec;120(6):1390–401.
9. Pike M, Kritzinger A, Krüger E. Breastfeeding characteristics of late-preterm infants in a kangaroo mother care unit. *Breastfeeding Medicine*. 2017 Sep 20;12(10):637–44.
10. Hake-Brooks SJ, Anderson GC. Kangaroo care and breastfeeding of mother-preterm infant dyads 0-18 months: a randomized, controlled trial. *Neonatal Netw*. 2008 Jun;27(3):151–9.
11. Gianni ML, Bezze E, Sannino P, Stori E, Plevani L, Roggero P, et al. Facilitators and barriers of breastfeeding late preterm infants according to mothers' experiences. *BMC Pediatrics*. 2016 Nov 8;16(1):179.
12. Ludington-Hoe SM, Anderson GC, Simpson S, Hollingsead A, Argote LA, Rey H. Birth-Related Fatigue in 34–36-Week Preterm Neonates: Rapid Recovery With Very Early Kangaroo (Skin-to-Skin) Care. *Journal of Obstetric, Gynecologic & Neonatal Nursing*. 1999 Jan 1;28(1):94–103.
13. Nyqvist KH, Anderson GC, Bergman N, Cattaneo A, Charpak N, Davanzo R, et al. Towards universal Kangaroo Mother Care: recommendations and report from the First European conference and Seventh International Workshop on Kangaroo Mother Care. *Acta Paediatr*. 2010 Jun;99(6):820–6.
14. Gregson S, Blacker J. Kangaroo care in pre-term or low birth weight babies in a postnatal ward. *British journal of midwifery*. 2011;19(9):568–577.

15. Charpak N, Angel MI, Banker D, Bergh A-M, Bertolotto AM, Leon-Mendoza SD, et al. Strategies discussed at the XIIth international conference on Kangaroo mother care for implementation on a countrywide scale. *Acta Paediatrica* [Internet]. [cited 2020 Aug 23];n/a(n/a). Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/apa.15214>
16. WHO | Kangaroo mother care: a practical guide [Internet]. WHO. World Health Organization; 2003 [cited 2020 Oct 21]. Available from: [http://www.who.int/maternal\\_child\\_adolescent/documents/9241590351/en/](http://www.who.int/maternal_child_adolescent/documents/9241590351/en/)
17. Anderzén-Carlsson A, Lamy ZC, Eriksson M. Parental experiences of providing skin-to-skin care to their newborn infant—Part 1: A qualitative systematic review. *International Journal of Qualitative Studies on Health and Well-being*. 2014 Jan 1;9(1):24906.
18. Baley J, Newborn C on FA. Skin-to-Skin Care for Term and Preterm Infants in the Neonatal ICU. *Pediatrics*. 2015 Sep 1;136(3):596–9.
19. Kostandy RR, Ludington-Hoe SM, Cong X, Abouelfetoh A, Bronson C, Stankus A, et al. Kangaroo Care (skin contact) reduces crying response to pain in preterm neonates: pilot results. *Pain Manag Nurs*. 2008 Jun;9(2):55–65.
20. Gregson S, Blacker J. Kangaroo care in pre-term or low birth weight babies in a postnatal ward. *British journal of midwifery*. 2011;19(9):568–577.
21. Muddu GK, Boju SL, Chodavarapu R. Knowledge and Awareness about Benefits of Kangaroo Mother Care. *Indian J Pediatr*. 2013 Oct 1;80(10):799–803.

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