BMC Health Services Research

RESEARCH

Open Access

Barriers and facilitators to utilisation of KMC among preterm babies on CPAP

Tom Didimus Ediamu[1*], Innocent Ayesiga[2], Victoria Nakibuuka[3], Ritah A. Nazziwa[3], Richard Idro[1], Sheba Gitta Nakacubo[4], Lillian Edith Nalwanga[5], Cissy Nampijja[3] and Janipher Nakyanzi[3]

Abstract

Introduction Preterm births are a leading cause of death and illness, with rates rising in Uganda. CPAP helps with respiratory problems, and kangaroo mother care (KMC) stabilises temperature, encourages bonding, and supports health. Yet, KMC for preterm infants on CPAP is rarely used in countries like Uganda. This study explores challenges and enablers for KMC in these cases.

Methods The study used a cross-sectional design with qualitative methods at St. Francis Hospital Nsambya. NICU healthcare workers were conveniently sampled and interviewed until saturation. Data was transcribed, coded, and analysed thematically in Atlas.ti Version 9.

Results The study included 8 respondents with an average age of 34 years (range: 26–48 years). Barriers and facilitators were categorised into factors related to parents, babies, health workers, and health systems. A total of 22 themes and 20 subthemes emerged, covering both barriers and facilitators. Key barriers included issues such as mothers being sick, misinformation about KMC and CPAP, lack of maternal knowledge, negative attitudes towards KMC, and maternal fear. Additional barriers involved critically ill babies, poor attitudes and limited knowledge among health workers, absence of protocols, staffing shortages, equipment limitations, and timing of KMC. Facilitator themes highlighted paternal involvement and awareness efforts, such as education and counselling to improve maternal knowledge; fostering positive health worker attitudes; training; incentives; functional systems; access to information; early CPAP application; availability of KMC spaces in neonatal units; and integrating KMC into routine quality improvement projects.

Conclusion and recommendation Multiple barriers categorised as health worker, baby, maternal, and health system factors still hinder the effective implementation of KMC among preterm babies on CPAP. Understanding these factors and developing category-specific interventions can enhance the utilisation of KMC, thereby improving outcomes for preterm babies.

Clinical trial number Not applicable.

Keywords Kangaroo mother care, Continuous positive airway pressure, Preterm babies, Utilisation, Barriers, And facilitators

*Correspondence:
Tom Didimus Ediamu
ediamut@gmail.com

Full list of author information is available at the end of the article

© The Author(s) 2026. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit http://creativecommons.org/licenses/by-nc-nd/4.0/.

Introduction

Preterm birth remains a significant contributor to neonatal morbidity and mortality globally, despite the 5.26% decrease from 16.06 million to 15.22 million between 1990 and 2019 [1]. The highest burden of preterm deliveries is estimated to be in low- and middle-income countries (LMICs), such as Uganda, where over 220,000 preterm births are estimated, as noted by the Ministry of Health [2]. Complications of prematurity, such as respiratory distress syndrome, often necessitate advanced supportive interventions such as Continuous Positive Airway Pressure (CPAP) therapy in neonatal intensive care units (NICUs). While CPAP improves survival outcomes for preterm infants with respiratory compromise, prolonged hospital stays and technology-dependent care may limit opportunities for bonding and developmental support interventions. Kangaroo Mother Care (KMC), characterised by prolonged skin-to-skin contact, has demonstrated numerous benefits for both the mother and the preterm baby, including enhanced bonding, shorter hospital stays, reduced mortality, and improved weight gain [3]. The World Health Organisation (WHO) has recommended thermal protection through skin-to-skin contact between the mother and the infant as an essential newborn care to minimise newborn mortality [4].

Previous evidence has supported the use of KMC among clinically unstable neonates, including those requiring CPAP and mechanical ventilation, provided careful monitoring and appropriate positioning are maintained [3, 5, 6]. For example, a non-blinded randomised trial demonstrated a 78% reduction in mortality risk among intubated preterm babies following KMC initiation [7]. Another trial involving 3211 infants demonstrated a significantly lower relative mortality risk among preterm infants who were immediately initiated on KMC compared with those on conventional warmers and incubators at 0.77 within 28 days [8]. Further evidence synthesis has demonstrated significant reductions in hospital length of stay among preterm infants who are immediately initiated on KMC compared with those first stabilised [9]. However, the trial and the evidence synthesis have not shown statistically significant differences in mortality, severe infection, or morbidity [8, 9].

Despite the robust evidence base, KMC utilisation remains suboptimal in many NICUs across LMICs, particularly for preterm infants requiring CPAP respiratory support [10–12]. Some of the reasons why KMC is not done among unstable preterm infants include the absence of specialised equipment, like monitors to track in real time the physiological changes among the babies, the fear of interfering with intensive care, and limited human resources to supervise the process. Other reasons include the high workload and the lack of clear protocols and guidelines [12–14]. Worse still, the various barriers and facilitators have not been extensively explored, especially in tertiary health facilities in Uganda. One study examined the barriers and facilitators to KMC implementation among low-birth-weight newborns prior to stabilisation [12]. Despite this information, a significant implementation gap remains in the use of KMC among preterm babies on CPAP, and there is a lack of understanding of the critical barriers hindering its implementation. Therefore, this study aimed to identify the various barriers and facilitators faced by healthcare workers in a Neonatal Intensive Care Unit at a tertiary facility, using a thematic analysis approach. Understanding the balance between these barriers and facilitators is essential for optimising neonatal outcomes in Uganda's tertiary hospitals.

Methods

This was a descriptive cross-sectional study that utilised a qualitative in-depth interview methodology. The study was conducted from July 15th to August 10th 2025, at the NICU of Nsambya Hospital, located in the central business district of Kampala, Uganda. St. Francis Hospital Nsambya is a well-known faith-based, private not-for-profit hospital in Kampala, Uganda. Founded in 1903 by Mother Mary Kevin Dearney and the Little Sisters of St. Francis, it began as a small dispensary for the poor and became a hospital by 1906. It has over 360 beds and serves as a regional referral centre with general and specialised services. Notably, its neonatal unit includes a 10-bed intensive care unit and a 30-bed baby unit, admitting over 2,500 newborns annually. The NICU has two ventilators, seven CPAPs, six monitors, four incubators, four warmers, and two phototherapy units. The baby unit has four CPAPs, four monitors, nine incubators, three warmers, and four phototherapy units. Staff includes two neonatologists, two paediatricians, 15 nurses and midwives, and at least 5 senior house officers and two interns rotating through. The baby unit features an observation area, an isolation section, and a Kangaroo Mother Care (KMC) section.

Health workers who had worked in the NICU for at least a month, had ever participated in implementing the duo-intervention (KMC among CPAP babies), and were available for the study were included. 24 health workers were eligible for inclusion in the study. These were then conveniently sampled and interviewed face-to-face by the research assistant. The interview guide (supplementary file 1) consisted of questions exploring the barriers and facilitators to the utilisation of KMC among preterm babies on CPAP, as guided by previous literature [15–17]. The interview guide was pretested among five midwives in the same unit, who were not included in the final study population. Four of the health workers were on leave, while 6 indicated they were busy and unavailable

for interview. Necessary amendments to the study tool to improve its ability to answer the research questions were made. Data collection was in-depth to ensure that sufficient information is obtained concerning the topic, especially because this is a rare practice within this setting.

Eight study participants were interviewed until data saturation, at which point no new insights were gained. No repeat interviews were conducted as the initial discussions were thorough in addressing the research question. The interviews lasted between 30 and 60 min and were audio-recorded. Interviews were conducted in a designated room, and non-participants were absent to ensure privacy. During the interviews, the IA took notes in a dedicated notebook to ensure guidance during the analysis. IA has received various pieces of training, such as conducting clinical research and the fundamentals of qualitative research. Additionally, the IA employed multiple probes to elicit detailed information from study participants on the topic. Following interviews, IA and CN transcribed the audio recordings verbatim and cleaned the transcripts by removing duplicate phrases and correcting grammar. These were then analysed by JN, CN, and IA. However, these transcripts were not returned to the study participants for comments, as they were engaged with other duties. Thematic analysis was employed on the clean transcripts, following these six major stages: data familiarisation, coding, theme searching, reviewing the themes, defining and refining, and summarising the extracted information [18]. Data familiarisation involved re-reading the transcripts and comparing them with the audio recordings for clarity, which was done by another individual on the study team who had not participated in the data collection. Additional comparisons with the field notes were made to ensure that these transcripts captured all the information collected. The transcripts were exported to Atlast.ti. for further analysis. Data coding was done by two individuals who continuously read and re-read the transcripts line by line, reflecting on the research questions in Atlas.ti. Ver 9. Sixty-two codes were identified, grouped, and relationships between the codes were identified through code group networks. Themes were identified inductively from the code groups and categorised as presented in the results section. The themes were read and re-read by the study team members to ensure representation, and they were subsequently approved for presentation. Written informed consent was obtained from the study participants before commencement of the interviews.

Table 1 Demographic characteristics of the study participants

No.	Age	Sex	Role	Duration of Practice at the facility
1	48	F	Registered midwife, in charge	8 years
2	28	F	Medical officer, Neonatal resuscitation lead	1 year
3	29	F	Medical officer	2 years
4	38	F	Resident pediatrician	2 years
5	37	F	Neonatal nurse	5 years
6	29	F	Registered midwife	2 years
7	28	F	Resident pediatrician	1 year
8	43	F	Paediatrician/neonatologist	10 years

Results

Nine respondents were interviewed in this study, and their demographic characteristics are summarised in Table 1 below.

The themes and subthemes identified through the analysis in this study were categorised into parental, baby, health worker, and health system factors for ease of comprehension, as described in Table 2 for barriers and Table 3 for facilitators, as follows. These themes and subthemes have been developed in the context of practising KMC when babies are on CPAP.

Barriers

Parental factors

Theme: Sick mothers

Respondents identified this as a major barrier to implementing KMC for babies on CPAP. Three subthemes emerged. Some mothers, especially after cesarean section, may be unavailable for the first three to five days due to recovery, which hinders KMC implementation.

Subtheme 1: Respiratory illnesses among mothers

The study respondents noted that some mothers may be in the Intensive Care Unit, while others may have illnesses such as flu, cough, or sepsis and may not be readily available.

> *You find a mother who is actually sick. They may be having the flu, cough, and she says to me that when I put on a mask, it affects my breathing. I do not breathe well, and she insists she doesn't want to wear a mask, of course, which we do not allow…other mothers have infections like sepsis, open wounds, and skin conditions. These we do not allow.* **Respondent 001; Registered midwife**

Subtheme 2: Mothers with mental illnesses

Some mothers develop different psychological illnesses that impede them from doing KMC when their babies are on CPAP. These illnesses may often arise from the delivery experiences, for example, puerperal psychosis, anxiety about their unstable babies, and postpartum depression.

> *Also, these mothers who have puerperal psychosis, we cannot allow them to do KMC. There was a*

Table 2 Barriers to the implementation of KMC among preterm babies on CPAP

Category	Theme	Subtheme
Parental Factors	Sick mothers	Respiratory illnesses among mothers
		Mothers with mental illnesses
		Mothers experiencing pain after a cesarean section.
	Misinformation about KMC for babies on CPAP among mothers	
	Lack of knowledge about KMC for babies on CPAP among mothers	
	Poor attitudes towards KMC use among babies on CPAP among mothers	
	Fear of doing KMC on babies on CPAP among mothers	
Baby Factors	Extremely sick babies	Jaundiced babies
		Babies with congenital anomalies, abdominal surgeries, and severe distress
		Babies with Intravenous Lines on the Umbilical Stump
		Babies who develop feeding intolerance
		Babies with a poor Silverman Anderson Respiratory Severity Score (SARSS)
		Babies who develop apneic episodes and desaturate during KMC
Health worker factors	Poor attitudes among health works	
	Limited knowledge about utilising KMC and CPAP together	
	Fear among health workers	
Health System factors	Absence of guidelines and protocols	
	Inadequate staffing levels	
	Limited equipment and utilities in the unit	Limited monitors in NICU
		Absent KMC beds and Limited KMC chairs
		Insufficient Kangaroo Wraps
		Limited Space for KMC
Other factors	Duration of the day	

Table 3 Facilitators to the utilisation of KMC among preterm babies on CPAP

Category	Theme	Subtheme
Parental factors	Paternal involvement and sensitisation	
	Enhancing KMC use while babies are on CPAP awareness among mothers through education and counselling	Educating the mothers about KMC use among their preterm babies on CPAP
		Informing mothers about KMC in antenatal
		Utilising peer-to-peer discussions
		Counselling the mothers during labour
Health worker factors	Having a positive attitude to practicing KMC while babies are on CPAP	
	Training health workers on KMC use while babies are CPAP	
	Offering incentives to health workers	
Health system factors	Functional systems in the health institutions	Having the necessary equipment for the procedure
		Increasing the number of healthcare workers
		Availing protocols and guidelines
	Availing Information and Education Content (IEC)	
	Availing the KMC space in the Neonatal units	
	Integrating and following up Quality Improvement (QI) projects in KMC and CPAP for routine care	
Other factors	Early CPAP initiation	

time when a mother almost strangled the baby while doing KMC. The mother caught the baby's neck, and we had to separate the baby from the mother. **Respondent 005; Neonatal Nurse**

Subtheme 3: Mothers experiencing pain following cesarean section

Health workers noted that mothers who undergo cesarean sections often cannot do KMC when their babies are admitted and on CPAP. They complain of pain, can't sit long, and may face complications like incision site sepsis,

making skin-to-skin contact difficult. Most take 5 to 7 days to recover, which affects their ability to do KMC.

> *I think you know the main limitation that comes with mothers who deliver by cesarean section. It is really hard; they are still in pain, and they have incisional pain. Some mothers are "tender loving care" mothers; they take like 2 weeks to heal. You have to first convince them, and then they also can't sit for long. You find that they can only sit for 30 min, and then at the end of the day, you find that you are having only 30 min of KMC, which will not give you the optimal results.* **Respondent 002; Medical officer**

Theme: Misinformation about KMC for babies on CPAP among mothers

Some respondents noted that mothers may not participate in KMC due to a lack of accurate information about the procedure. Some of these mothers rely on lay information and myths surrounding the KMC process, which may hinder their ability to undertake this procedure.

> *I think the other big challenge is misinformation concerning kangaroo, because I am sure if they knew all its benefits or most of them, many mothers would be doing kangaroo even while at home.* **Respondent 003; Medical officer**

Theme: Lack of knowledge among mothers concerning KMC use for babies on CPAP

Respondents noted that KMC is challenging when mothers are unfamiliar with the procedure. When these mothers are uninformed about the procedure, they tend to be shy and shy away with various excuses.

> *Mothers rarely know the details concerning KMC while their baby is on CPAP, sometimes you take a lot of time explaining what KMC is and the mother says I will come back tomorrow.* **Respondent 002; Medical officer**

Theme: Poor attitude among mothers towards KMC use among babies on CPAP

Some health workers reported that some mothers' poor attitudes towards KMC also hinder the implementation of these interventions. With poor attitudes, mothers are not always available and keep offering excuses, such as the long duration of KMC, for not engaging in the procedure.

> *Some mothers sometimes do not want to come, they do not want to do KMC, and they keep complaining, I am sitting a lot, they keep getting many calls, so these mothers sometimes limit the intervention and the procedures.* **respondent 005; Neonatal Nurse**

Theme: Fear of doing KMC when babies are on CPAP among mothers

Respondents noted that a major barrier to performing KMC when a baby is on CPAP is the fear among mothers. Some mothers believe they might hurt their babies because they are very small and have many lines and tubes attached. They also fear that doing KMC could dislodge these lines.

> *Some other mothers may be scared to do kangaroo because of the many tubes on the baby, and they fear that when these babies have these tubes, they may hurt them.* **Respondent 003; Medical officer**
>
> *As mothers, most of the time they see the many tubes and they are worried. For us caregivers, we are used to seeing these very many tubes, but imagine there is a mother who has never seen their baby on bubble CPAP, they are encountering these very many tubes for the first time, and then you are telling them to put the baby on their chest so you can tie the baby there, of course, they will fear. Other mothers think that their babies who are on life support are very critically sick, so this perception can also be a challenge.* **Respondent 006; Registered midwife**

Baby factors

Theme: When babies are extremely sick

Respondents noted that babies who are extremely sick may not undergo kangaroo. Three subthemes emerged from this theme:

Subtheme: Jaundiced babies on CPAP are a barrier to KMC

Respondents noted babies with jaundice delay KMC initiation, even on CPAP, due to the need for continuous phototherapy, often starting on the second or third day, a crucial period for KMC.

> *Like those ones having jaundice, you cannot put the baby in a kangaroo when the baby is having jaundice. You have to wait until that jaundice has cleared, and maybe the mother is stable and fit to do.* **Respondent 001; Registered midwife**
>
> *What steals our time is mostly jaundice because you have to do phototherapy for like three days, so it means you are going to start KMC at around day 5.* **Respondent 002; Medical officer**

Subtheme 2: Babies with congenital anomalies, abdominal surgeries, and severe distress

Respondents said it is often challenging to do KMC with babies who have had abdominal surgeries and congenital

malformations. These babies need to be placed prone near the mother's chest and wrapped, which may affect the surgical wound and worsen the baby's condition. However, such cases are rare at the facility.

> *The condition of the baby matters. The babies that have congenital anomalies, for example, mesencephaly, we can't start KMC early…babies actively bleeding, babies that require invasive interventions like ventilation, we may delay initiating KMC.* **Respondent 002; Medical officer**

Subtheme 3: Babies with intravenous lines on the umbilical stamp

The health workers noted that they rarely perform KMC on babies with intravenous lines on the umbilical stump, fearing dislodgment and the spread of infection. They said that these babies are at a high risk of infection through the umbilical stump if it is in direct contact with the mother's skin.

> *But we do not do KMC in cases where we are using the umbilical vein as a line. When the baby is having a UVC, we do not do KMC for fear of infection because this place is open and direct to the mother's skin.* **Respondent 001: Registered midwife**
> *When the baby is having cannulation via the umbilical vein, you can't put them on the KMC, because you can easily dislodge the cannula, which can lead to excessive bleeding.* **Respondent 005; Neonatal Nurse**

Subtheme 4: Babies on CPAP who develop feeding intolerance lead to termination of KMC

Respondents noted that babies may develop feeding intolerance while doing KMC. This eventually leads to termination of the procedure to ensure that the health workers stabilise these preterm babies for better outcomes.

> *In other cases, we have had to delay or terminate the initiation of kangaroo care, for example, when babies develop feeding intolerance midway…after this intolerance, we stop the KMC or feeder, and we see what happens. So, this later increases the number of days the baby has to stay in the hospital.* **Respondent 003; Medical officer**

Subtheme 5: Babies on CPAP with a poor silverman anderson respiratory severity score

Some respondents noted that babies with poor SARSS scores may not be considered for KMC while on CPAP, as they might need mechanical ventilation or other interventions and may not thrive in KMC.

> *Also, for the sick babies, most of the times here the way they monitor the baby's progress is through the SARSS score, they look at different aspects on the airway starting from the nose then the chest, so depending on the baby's score, if the Silverman Anderson Respiratory Severity Score (SARSS) is like 2 or 3 the baby can go in kangaroo because they are not breathing so bad. But if the baby is having a SARSS of like 5 or 6, you can't risk putting that baby in KMC because you may not know what may happen to their breathing, despite them being on CPAP.* **Respondent 006; Registered midwife**

Subtheme 6: Babies on CPAP who develop apneic episodes and desaturate during KMC

Sometimes, these preterm babies experience apneic episodes, which can lead to desaturation. Respondents reported this as one of the barriers to using KMC when these babies are on CPAP. Healthcare workers expressed concerns about desaturation, highlighting adverse events such as organ damage and the baby's death.

> *They get apneic episodes, and for those episodes, we do not recommend kangaroo. I have ever seen some babies get apneic during kangaroo, and in such cases we hold and wait for the baby to stabilise, and then we reinitiate…Because the baby may be in kangaroo and then you see the monitor when the baby is desaturating.* **Respondent 001; Registered midwife**

Health worker factors

Theme: Poor attitudes among health workers

Respondents reported that implementing KMC with CPAP can sometimes be hindered by healthcare workers' attitudes. Most times, this attitude may arise from the fear of the outcomes of having the baby in KMC while they are still on CPAP.

> *I think this is mainly attitude, some may say, no, I am not doing it, because what if I put the baby in a kangaroo when they are on CPAP and their condition deteriorates.* **Respondent 001: Registered midwife**

Theme: Limited knowledge about utilising KMC and CPAP together

A major barrier to implementing KMC and CPAP for preterm babies was limited health worker knowledge. Few knew how to combine KMC with CPAP, and many lacked confidence or involvement due to insufficient knowledge. Respondents noted that health workers typically perform KMC only when the baby is stabilised and off oxygen.

Now, when it comes to us, the health workers, even ourselves, most of us do not know the efficacy of having these babies do KMC while on CPAP. How many institutions have you gone to that are doing KMC on babies with CPAP? Very few. **Respondent 002; Medical officer**

And also, the knowledge. Some still think that a baby who is on CPAP is not supposed to be on KMC, because the older teaching used to be that KMC should be for stable babies. So, there is a lack of updated knowledge and current knowledge on the use of KMC on babies who are on CPAP. **Respondent 009; neonatologist**

Theme: Fear among the health workers

With limited knowledge among health workers regarding the co-implementation of these procedures, respondents noted that some still fear performing KMC on babies on CPAP. The respondents stated that most of these fears stem from uncertain outcomes, with their focus on the risks of doing KMC, such as desaturation or infection transmission among the babies. This fear among health workers ultimately limits their participation in encouraging mothers to carry out KMC when their babies are on CPAP, thereby reducing its utilisation.

Because even us doctors, before we started the procedure, we had reservations and fear, for example, we thought what if this baby desaturates when the mother is doing KMC? What if the prongs come out…Sometimes we have treated babies, and we feel for the baby more than we feel for the mother. It is more like compassion and empathy, so we end up not initiating because we are worried what if this baby desaturates or gets worse while on KMC. **Respondent 002; Medical officer**

Also, some staff fear trying it out. But here, we have recommended that KMC and CPAP should be done so long as the mother is available. **Respondent 009; neonatologist**

Health system factors

Respondents also noted some barriers arising from the health system, which exists both at the facility and across other neonatal units they have worked in before.

Theme: Absence of guidelines and protocols

Respondents highlighted the lack of guidelines or protocols to guide the implementation of KMC among preterm babies on CPAP. They mentioned that most of the evidence regarding the use of KMC in babies on CPAP is limited within the country. Consequently, there is insufficient evidence to support the development of formal protocols. They also noted that without these protocols, it becomes difficult to integrate the procedure into the local setting.

Also, I have not seen any guidelines and protocols that guide the different processes concerning these interventions. So perhaps they should develop them so that we can follow them. **Respondent 007; Resident pediatrician**

I think we do not have a written protocol/policy because I believe if it is really policy, we should have something written in black and white…So we do not have a written protocol in the unit. And that cuts across to the country. I have not yet found a hospital with the protocol. Actually, many hospitals fear doing KMC on CPAP. **Respondent 009; neonatologist**

Theme: Inadequate staffing levels

Staffing levels emerged as a significant barrier to implementing KMC among preterm babies on CPAP. Respondents noted that a shortage of staff, especially nurses, creates major obstacles to monitoring these preterm infants on CPAP during KMC. Consequently, only a few mothers are allowed to perform KMC while their babies are on CPAP due to limited staff availability. Thus, the respondents argued that a restricted health workforce, particularly nurses, can impede the implementation of KMC for preterm babies on CPAP.

One of the barriers is staffing levels, because we believe if a baby is still on CPAP, they are very sick and they need very close monitoring. So the barriers are with the staffing gap, if you do not have enough nurses to monitor that baby when they are doing KMC, it will be hard because these babies need adequate monitoring. **Respondent 004; Resident pediatrician**

Theme: Limited equipment and utilities in the unit

Subtheme: Limited monitors in the NICU

Respondents observed that the lack of equipment, such as monitors needed for babies on CPAP in KMC, impedes the concurrent implementation of these interventions. They highlighted that babies in KMC require proper monitoring because their condition can change rapidly. Without monitors, health workers may struggle to quickly identify the need for action and to implement other interventions while the baby remains in KMC, which can lead to poor outcomes.

I have seen KMC being done on CPAP as a routine in high-income countries like Sweden. However, we are not yet consistent here due to the lack of certain things, such as monitors to track the progress of

these babies while in KM…Inadequate monitors are a challenge; you do not want a baby to be on KMC and on CPAP without a monitor, or even a pulse oximeter. It is not advisable to do KMC and CPAP, and you are not monitoring. **Respondent 009; neonatologist**

Subtheme 2: Absent KMC beds and limited KMC chairs

Additionally, they noted that equipment such as KMC beds is nonexistent, hindering the implementation. Existing KMC chairs are also locally made, improvised, and are still in short supply. Therefore, KMC among babies on CPAP may be impossible when a ward has more mothers than the available chairs.

So, you realise in Uganda we can afford simple KMC chairs and yet here we have 3. This means that these mothers have to wait for hours, and others do not complete KMC. So, I think that is one of the barriers. **Respondent 002; Medical officer**

For the case of chairs, we have around 3, and this is not enough. Sometimes we had like five mothers who required KMC and we couldn't cater for them all at once. **Respondent 005; Neonatal Nurse**

Subtheme 3: Insufficient kangaroo wraps

Respondents also noted that the unit lacks kangaroo wraps, which are vital for holding the baby close and warmly against the mother's chest. Often, mothers end up improvising with local clothes that are sometimes made of poor-quality materials and do not retain heat well. The outcomes of this approach may therefore be inefficient, undesirable, and sub-optimal among the babies on CPAP.

Maybe the other thing is still about lack of required resources, we do not have sufficient kangaroo cloths and wraps. So, we often advise mothers to buy these wraps, and then some of them tell us they only have money for bills and medicine, and not anything else. So, you find that they cannot effectively do the kangaroo because they do not have the recommended wraps. **Respondent 003; Medical officer**

Subtheme 4: Limited space to practice KMC when babies are on CPAP

Additionally, respondents noted that space is another limitation of doing KMC among babies who are on CPAP. They often say the wards are very small, and sometimes you cannot fit the Kangaroo chairs or beds, which can cause congestion in the NICU. This significantly hinders how many of the mothers and how long they can do KMC while their babies are on CPAP.

The other aspect is space, bed space; we do not have space. Even though the chairs occupy much space, we end up having schedules for mothers like the morning, afternoon, and evening, which sometimes doesn't give effective coverage. **Respondent 003; Medical officer**

I have seen very many units, for example, the baby unit is too squashed up and can't provide space for the mother to do KMC. And it is worse even in some of the government facilities. **Respondent 009; neonatologist**

Other factors

Theme: Duration of the day

Respondents also observed that the duration of the day can hinder the implementation of KMC among babies on CPAP, noting that night hours are less suitable. They stated that during this time, both mothers and health workers can become tired and may not monitor the babies effectively in KMC. Additionally, they remarked that at night, there are very few health workers on duty, which can also affect the quality of monitoring provided to these babies in KMC.

Sometimes monitoring is a challenge because we have told mothers they can't do KMC at night beyond 9 pm because of the limited staff at night to monitor the babies. Because imagine that the baby is in KMC at night and then they desaturate, and then the mother does not know the signs of desaturation, so it gets complicated to implement this intervention, especially in the late-night hours. **Respondent 007; Resident pediatrician**

Facilitators

Respondents reported multiple facilitators to utilising KMC among preterm babies on CPAP, which are categorised into parents, health workers, and health systems, as illustrated in Table 3.

Parental factors

Theme: Paternal involvement and sensitisation

Respondents noted that KMC for babies on CPAP can be safely practised with father involvement, especially when mothers are unavailable. Fathers need education on KMC to ensure effective participation.

There are some fathers who do kangaroo when their wives are sick. Even when they are not sick, some prefer to do so just so their wives can have some rest… some fathers actually do the KMC when adequately sensitised. **Respondent 001; Registered midwife**

Theme: Enhancing KMC use while babies are on CPAP awareness among mothers through educating and counselling

Subtheme 1: Educating mothers about KMC use among their preterm babies on CPAP

Ensuring mothers are educated about KMC benefits while their babies are on CPAP is crucial for practice adoption. Education should cover KMC steps and vigilance for changes in babies during KMC on CPAP. Increased knowledge boosts mothers' confidence.

> *The mothers must be educated about the benefits of KMC. Most of them are familiar with bonding, yet there are many other benefits to KMC. So, if we could educate them more effectively, it would ease the practice…Also, every after the ward round, we talk to those mothers, talk to them about the benefits of KMC, educate them, and also tell them about the treatment plan.* **Respondent 003; Medical officer**
>
> *If we have the mothers trained and counselled adequately on how to do this procedure, reaffirming to them that the procedure is safe even when their babies have a lot of tubes and wires, I think the interventions can be adopted.* **Respondent 007; Resident pediatrician**

Subtheme 2: Informing mothers about KMC in antenatal

Some respondents suggested that mothers should be informed about these procedures during antenatal care. They argued that incorporating this training could prepare them for any outcome, just as they had been told about the delivery methods. Including this training package may help mothers efficiently uptake the procedure, even when their babies are on CPAP, because they understand the benefits.

Subtheme 3: Utilising peer-to-peer discussions

Respondents emphasised that peer-to-peer interactions are crucial for promoting KMC among mothers of preterm babies on CPAP. Mothers who have practised KMC can serve as effective teachers and counsellors for others, sharing experiences and building confidence to better promote these interventions.

> *There can be peer-to-peer discussions or parent counselling, where the parent who has done it shares with another in the presence of a medical person. Through this sharing, parents may gain the confidence to practice the interventions and, most importantly, a deeper understanding of the purpose behind the…Sometimes, obtaining testimonies from parents who have successfully implemented these interventions and achieved results, as captured in video broadcasts, can also enhance the practice of these interventions. Hearing it from another parent who has done it before can be an enabler.* **Respondent 009; neonatologist**

Subtheme 4: Counselling the mothers during labour

Respondents noted that counselling a mother at risk of preterm delivery in the labour ward is vital for increasing knowledge and awareness of KMC. It prepares her mentally and involves a multidisciplinary team, including obstetrics, paediatrics, and neonatology, to improve outcomes.

> *Also, the alertness must be from the obstetrics side, for example, when a mother who is going to give birth and is prone to preterm labour, she needs to be counselled enough, for example, they may tell her that you will have a preterm baby, but you needs to know that you are going to do KMC.* **Respondent 007; Resident pediatrician**

Health worker factors

Theme: Having a positive attitude towards practicing KMC while babies are on CPAP

Respondents argued that health workers with a positive attitude are more likely to engage and encourage KMC among preterm babies on CPAP, leading to better outcomes. These workers can advise mothers on steps and how to identify when babies need extra help.

> *I think maybe for every staff to appreciate the importance of doing kangaroo when the baby is still on CPAP, that means we need to emphasise and encourage everyone to appreciate it. And also change of attitude, those who have negative attitudes on doing kangaroo when the baby on CPAP to change.* **Respondent 001; Registered midwife**

Theme: Training health workers on KMC use while babies are CPAP

Multiple respondents supported continuous training for health workers through refresher courses, arguing that when they are sufficiently knowledgeable, they can effectively participate alongside mothers. The respondents asserted that the training also boosts their confidence in having these preterm babies on CPAP and doing KMC.

> *Train and retrain the health workers in this procedure. We also have trained neonatal resuscitation teams, and these are giving us stable preterm babies who can easily be picked up while on CPAP. Once stable, these babies can then easily be supported with KMC even when they are on CPAP.* **Respondent 002; Medical officer**

We really need refresher courses. Just to refresh our knowledge on KMC and CPAP, because in some other hospitals, it is a myth. Some of us do not know the importance of KMC among babies on CPAP. So we need these courses on neonatal nursing care. **Respondent 007; Resident pediatrician**

Theme: Offering incentives to health workers

Respondents suggested that offering incentives to existing health workers can also enhance their willingness to promote this procedure. They asserted that, given the limited health worker-to-patient ratio, the available health workers can be motivated further by a token.

But also, having some incentives for these existing workers can actually improve their participation in these interventions. For example, if they say that your mother did kangaroo for like 6 h, we are going to have something to add on your pay, oh my God, everyone will be doing that, yes, because that is a motivation, token, and a reward. **Respondent 001; Registered midwife**

Also, if there is an incentive or a motivation, this can improve the implementation rates of these interventions concurrently, because imagine they say for every five babies that you initiate and monitor on CPAP, you will have this token, every health worker will work towards having these babies do KMC when they are on CPAP. Nobody hates a token of appreciation. **Respondent 006; Registered midwife**

Health system factors

Facilitators falling in the health system category were also identified from the study.

Theme: Functional systems in the health institutions

The study respondents noted that functional health systems are vital for ensuring that mothers practice KMC while their babies are on CPAP. They reported different segments of the health system that could enhance this practice.

Subtheme 1: Having the necessary equipment for the procedure

Respondents noted that monitors are necessary for effective CPAP monitoring during KMC, providing vital information on physiological changes in preterm babies. Conventional KMC chairs are also essential for maternal comfort during KMC with CPAP.

So, we need good chairs for those mothers so that they can be comfortable during the entire process. **Respondent 005; Noenatal nurse**

Also, most of the time we need to see that the baby is on a monitor; therefore, if we have many monitors, this can help in implementing the intervention because you can track their vital signs and easily understand the physiological changes that they are experiencing. **Respondent 006; Registered midwife**

Subtheme 2: Increasing the number of healthcare workers

Since health worker shortages were noted, respondents suggested increasing the number of health workers to improve the health worker-to-patient ratio and facilitate babies on CPAP in KMC. These workers are vital for monitoring the baby's progress and changes during KMC.

There is need for increasing the number of staff to monitor these babies, because at least when you know that you have these staff around, each mother and baby can be monitored by at least an equivalent staff to ensure that any changes the baby experiences are identified and corrective action is taken immediately. **Respondent 007; Resident pediatrician**

So if we are to do adequate KMC with CPAP, it goes hand in hand with some improvement in staff numbers. Human resources are needed. In most centres, ideally, CPAP is done in NICU settings; it is supposed to be in the intensive care unit. **Respondent 009; neonatologist**

Subtheme 3: Availing protocols and guidelines

Respondents suggested having protocols that guide health workers on how and when to do KMC when the preterm babies are on CPAP. These protocols are vital because they improve the efficiency of the procedure and enhance health workers' involvement. Additionally, the respondents noted that these guidelines or protocols can guide the health workers on which baby to initiate KMC and also detail any reservations.

Developing protocols on when to start kangaroo, when to hold, when to resume can help improve the efficiency of the intervention. **Respondent 003; Medical officer**

Also, we need to have guidelines that detail the inclusion criteria and when exactly we consider it safe to have a baby in KMC when they are on CPAP. These will eventually help in promoting better outcomes for the preterm babies. **Respondent 006; Registered midwife**

Theme: Availing information and education content (IEC)

Respondents noted that having some IEC on the wards, such as posters, can help remind mothers and health

workers of their roles in promoting KMC for babies on CPAP. They reported that this material may contain information on the benefits of KMC for these babies, which could ultimately enhance their participation in the same procedures.

> *Another practice is having some IEC material on the wards, telling the parent how important KMC on CPAP is.* **Respondent 009; neonatologist**

Theme: Availing KMC space in neonatal units

Respondents noted that having sufficient space within the NICU is crucial to minimising congestion and ensuring comfort for both mothers undergoing KMC and healthcare workers monitoring these babies. They recommended that health units should have these aspects in place before constructing neonatal units to facilitate easier monitoring and increased participation among different mothers.

> *Also, providing enough space to do KMC will enhance the procedures and implement them in this setting.* **Respondent 005; Neonatal nurse**
> *But if we can promote more space and organisation and prioritise KMC because the importance of KMC is way above and yet beneficial and cheap.* **Respondent 009; neonatologist**

Theme: Integrating and following up Quality Improvement (QI) projects in KMC and CPAP for routine care

Routine QI projects were also noted as a facilitator to the utilisation of KMC among babies on CPAP. The respondent noted that these QI interventions focused on increasing the utilisation of KMC in the NICU. As a result, various mothers and caretakers have been encouraged to practice KMC even when their babies are on CPAP.

> *We now have a QI project called KMC, and we were supposed to increase our rates from 50 to 90 per cent, but now we have even exceeded the target, and we are now hitting 100 per cent, and these QIs have accelerated the progress of these programs.* **Respondent 002; Medical officer**
> *We have quarterly meetings, where we come and evaluate our input concerning the progress of these projects that have been set. We question our progress and query the improvements required during these projects.* **Respondent 007; Resident pediatrician**

Other factors

Theme: Early CPAP initiation

The respondents further reported that initiating CPAP in the delivery room can yield optimal respiratory outcomes and improve the baby's Silverman-Andersen Respiratory Severity Score (SARSS).

> *Start CPAP early in the delivery room, because for as much as we want to start KMC on these CPAP babies, we need them stable on CPAP...by the time you start this process in the delivery room, you come to the ward, which means you have given good peep to this preterm baby, they are stabilising, from a SARSS of 6, we are on 5 or 4 or 3, which means they are stabilising, and you can start your KMC. So, I think starting CPAP very early and giving good CPAP as early as after delivery is good for better outcomes.* **Respondent 002; Medical officer**
> *Early initiation of CPAP has reduced the number of cases of babies requiring mechanical intervention. It reduces the duration of oxygen; it can reverse and reduce the complications. So, the earlier the CPAP is initiated, the better the prognosis...We have seen the benefits of kangaroo, so sometimes these babies can be on CPAP for some time, like one to 2 weeks, so if we decide to initiate kangaroo after babies' complete CPAP, I do not think we would achieve these goals and benefits of kangaroo.* **Respondent 003; Medical officer**

Discussion

The study extensively provides these barriers and facilitators to KMC utilisation among preterm babies on CPAP. The findings highlight the complex interplay of parental, infant, health worker, and health system factors that shape the uptake of KMC in this high-risk population. This classification is necessary to establish the different multi-level factors through which actionable solutions can be implemented [19]. While KMC is widely recognised as a life-saving intervention for preterm and low birth weight infants and has been estimated to be utilised by over 80% in Uganda, its implementation in neonates requiring CPAP remains inconsistent, reflecting gaps in knowledge, confidence, and institutional support [10]. Our findings agree with some of the recent studies that explored the feasibility of KMC among unstable preterm babies in LMICs such as Ghana [20]. One of the critical barriers identified was the attitudes of some mothers, with some of them being unavailable to do KMC for their babies on CPAP. Cho et al. also reported maternal unavailability around the NICU premises as a critical barrier to implementing this intervention [20]. Some of these mothers were unavailable due to different attributes, such as post-partum illnesses, post-cesarean section, and admissions in other facilities for the mother and baby. Our findings further agree with previous studies in sub-Saharan Africa and South Asia that have documented parental misconceptions, fear of handling small

or fragile infants, and limited understanding of KMC as barriers to practice [21, 22]. However, this study extends the evidence by specifically examining KMC utilisation among preterm babies on CPAP, where concerns about tube dislodgement, desaturation, and safety enhance the existing anxieties. This study closes this gap, as very few studies have explored the use of KMC among babies on CPAP in these low-resource settings [23–25].

While we identified a lack of awareness about KMC implementation for preterm babies on CPAP among health workers, Fong et al. did not find this a critical challenge. The authors instead asserted that integrating KMC into daily workflows and balancing other clinical and non-clinical tasks were challenging for healthcare workers [26]. The lack of awareness and limited knowledge of this procedure in this study further aligns with other studies that highlight the same challenge, hindering its implementation in areas such as Pakistan, Côte d'Ivoire, India, and Iran [16, 17, 27, 28]. This disparity could have been due to the enhanced training health workers received in KMC [26]. However, some of our study results, such as limited resources, equipment (including monitors), limited ward space, and a shortage of healthcare workers to monitor the babies, relate to their findings. This relationship further strengthens the arguments of different NICUs facing more or less similar challenges in implementing KMC among preterm babies who are on CPAP. Therefore, collective action remains necessary to ensure that robust measures are in place to promote the practice, ultimately leading to better outcomes for preterm babies.

Additional results from this study found that limited staff in the neonatal unit can hinder the implementation of KMC among babies who are on CPAP. The few healthcare workers are often associated with poor monitoring practices because they tend to focus on existing and urgent clinical responsibilities. Worse still is when the KMC practice is not integrated into the facility's daily treatment and management protocols. These findings align with multiple studies from other settings that report limited healthcare workers and this factor as a significant barrier [15, 29]. These observations highlight the need for targeted interventions, such as clinical trials or case studies, to evaluate the efficacy of utilising KMC among preterm babies on CPAP. The study identified enhanced maternal awareness and understanding of KMC among preterm babies on CPAP as a critical facilitator for implementing this intervention. This promotion can be achieved through various pathways, including educating mothers, counseling them, and facilitating peer-to-peer discussions [8]. These findings align with another study in Bangladesh, which reported that counselling mothers about neonates is a critical step in encouraging participation in KMC [30]. Chan et al. further asserted that mothers were most likely to perform KMC for their babies if they had different companions [29]. Additionally, the authors stated that having different materials, such as posters, was a significant enabler of KMC practice in KMC wards within health facilities.

Respondents in this study highlighted enablers such as implementing CPAP in delivery rooms. Some of these factors included health system factors, such as enhancing staffing levels, implementing guidelines and protocols for this procedure, IEC material, and ensuring the KMC space is available. Without structured guidance, practice often relies on individual providers' discretion, leading to variability in implementation and missed opportunities to optimise care. Also, early CPAP initiation in delivery rooms has demonstrated significant improvements in the SARSS score of preterm babies by the time they are admitted to the neonatal intensive care unit. Additionally, this early initiation minimises the need for mechanical ventilation and surfactant provision, reduces the risk of bronchopulmonary dysplasia, and decreases the incidence of early neonatal mortality [31–34]. In limited-resource settings, harnessing these benefits further creates an avenue for implementing KMC among preterm babies, thus promoting better outcomes. This study further recognises that the contribution of fathers is a potential facilitator of KMC, especially when mothers are ill, fatigued, or emotionally distressed. Multiple studies have demonstrated the benefits of KMC performed by fathers; however, few have evaluated its impact during CPAP [35–37]. Therefore, future studies could prioritise exploring the effect of father skin-to-skin care or even compare the outcomes of Kangaroo father care with KMC in these low-resource settings. Overall, the respondents in this study asserted that KMC among preterm babies on CPAP is feasible, following addressing some of the existing challenges among parents, health workers, and the healthcare system. Implementing KMC among preterm babies on CPAP is relevant for achieving better neonatal outcomes, including reduced mortality, improved cost-effectiveness, and enhanced neonatal care within the region.

Study limitations

The study findings reflect the opinions of health workers in a NICU at one of the country's non-profit, large-volume tertiary hospitals. This may limit the generalisability of these findings, especially to other facilities, such as the lower health centres. To mitigate this, future studies should consider interviewing parents, hospital administrators from different health facilities, and Ministry of Health officials, especially the commissioner for maternal and newborn health.

Study implications

Addressing the barriers identified requires a multifaceted approach: (1) health worker training and development of CPAP-specific KMC guidelines, (2) Parental sensitisation during antenatal and postnatal care [30], (3) improved infrastructure and staffing within the neonatal units to support safe practice, and (4) integration of KMC into national neonatal quality improvement frameworks and policies. Strengthening these areas could accelerate progress toward reducing preventable neonatal mortality and align with global commitments under the Newborn Action Plan.

Conclusion and recommendation

KMC among preterm babies on CPAP is feasible, and different stakeholders must identify the various tasks for the implementation of these interventions. This study provides rich qualitative insights into the underexplored area of KMC utilisation among preterm infants on CPAP, offering perspectives from health workers directly involved in neonatal care. We recommend establishing guidelines and protocols concerning the conduction of KMC among preterm babies on CPAP. These guidelines must include specific parameters, such as weight, vital signs, SARSS score, and KMC duration. However, sufficient evidence concerning the feasibility is also required during the development of these guidelines or protocols. We also recommend continuous training sessions for healthcare workers in NICU settings to understand the different dynamics involved in encouraging KMC among preterm infants on CPAP. The training can cover areas such as identifying changes in preterm infants during KMC and establishing criteria for initiating KMC when the infant is on CPAP, among others.

Abbreviations

KMC	Kangaroo Mother Care
CPAP	Continuous Positive Airway Pressure
NICU	Neonatal Intensive Care Unit
UVC	Umbilical Vein Cannula
SARSS	Silverman Anderson Respiratory Severity Score

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12913-026-15153-2.

Supplementary Material 1

Acknowledgements

The study acknowledges all participants and appreciates them for taking time out of their busy schedules to provide information on the topic in focus.

Author contributions

TDE & IA conceptualized the study. VN, RN, and RI reviewed the protocol and the second manuscript draft. IA, CN, LEN, and JN coordinated data collection and analysis. TDE & IA developed the first manuscript draft.SNG provided technical editing of the manuscript. All authors reviewed the manuscript draft, made necessary amendments, and approved it for submission for publication.

Funding

No funding was obtained for this study.

Data availability

Data and transcripts from this study are available from the corresponding author following a reasonable request.

Declarations

Ethics approval and consent to participate

The study was approved by St. Francis Hospital Nsambya Research Ethics Committee and obtained approval number SFHN/REC/409. Administrative clearance was further obtained from the Department of Clinical Services at St. Francis Nsambya Hospital to access the facility. All research activities, such as data collection and analysis, were conducted in accordance with the Declaration of Helsinki, which promotes ethical principles. All study participants were informed about the study, and written informed consent was obtained before the interviews began.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]Department of Pediatrics, Makerere University College of Health Sciences, Kampala, Uganda
[2]Department of Community Health, Mbarara University of Science and Technology, Mbarara, Uganda
[3]Department of Paediatrics and Neonatology, St. Francis Hospital Nsambya, Kampala, Uganda
[4]Department of Research, Global Health Partnerships/THET, Kampala, Uganda
[5]Department of Nursing, Mbarara University of Science and Technology, Mbarara, Uganda

Received: 28 December 2025 / Accepted: 13 July 2026
Published online: 22 July 2026

References

1. Cao G, Liu J, Liu M. Global, regional, and national incidence and mortality of neonatal preterm birth, 1990–2019. JAMA Pediatr. 2022;176(8):787–96.
2. Morukileng J, Mugwanya W, Mutumba R, Katusiime M, Job M. Incidence of preterm birth admissions on the rise in Uganda: Implications for the health-care system. 2022. https://uniph.go.ug/incidence-of-preterm-births-admissions-on-the-rise-in-uganda-implications-for-the-health-care-system/ Accessed on 10 April 2026.
3. Li J, Wang H, Yang J, Chen X, Cao A, Yang C, Xiong X. Kangaroo mother care enhances exclusive breastmilk feeding and shortens time to achieve full enteral feeding in extremely preterm infants requiring non-invasive assisted ventilation. Int Breastfeed J. 2024;19(1):52.
4. WHO, Newborn Mortality. 2024. https://www.who.int/news-room/fact-sheets/detail/newborn-mortality Accessed 10 April 2026.
5. Xie X, Chen X, Sun P, Cao A, Zhuang Y, Xiong X, Yang C. Kangaroo mother care reduces noninvasive ventilation and total oxygen support duration in extremely low birth weight infants. Am J Perinatol. 2021;38(08):791–5.
6. Sehgal A, Yeomans EJ, Nixon GM. Kangaroo mother care improves cardio-respiratory physiology in preterm infants: an observational study. Archives Disease Childhood-Fetal Neonatal Ed. 2024;109(6):628–33.
7. Baton SM, Villanueva-Uy ME, De Leon-Mendoza S. Effectiveness of kangaroo mother care in intubated preterm neonates 28 to 36 weeks gestational age, weighing 600 to 2000 grams at birth: a randomized controlled trial. Cogn Dev. 2021;18:19.
8. WHO Immediate KMC Study Group. Immediate kangaroo mother care and survival of infants with low birth weight. N Engl J Med. 2021;384(21):2028–38.

9. Conde-Agudelo A, Belizán JM, Diaz-Rossello J. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. Cochrane database Syst reviews. 2011(3).
10. Lawal TV, Lawal DI, Adeleye OJ. Determinants of Kangaroo Mother Care among low-birth-weight infants in low resource settings. PLOS global public health. 2023;3(9):e0002015.
11. Okai E, Fair F, Konadu HD, Darteh EK, Soltani H. Feasibility of the use of Kangaroo mother care in the transfer of preterm and low-birth-weight infants: a two-arm nonrandomized controlled cluster feasibility study of neonatal transport in Cape Coast, Ghana. BMC Pediatr. 2024;24(1):842.
12. Tumukunde VS, Katongole J, Namukwaya S, Medvedev MM, Nyirenda M, Tann CJ, Seeley J, Lawn JE. Kangaroo mother care prior to clinical stabilisation: Implementation barriers and facilitators reported by caregivers and healthcare providers in Uganda. PLOS Global Public Health. 2024;4(7):e0002856.
13. Morgan MC, Nambuya H, Waiswa P, Tann C, Elbourne D, Seeley J, Allen E, Lawn JE. Kangaroo mother care for clinically unstable neonates weighing ≤ 2000 g: Is it feasible at a hospital in Uganda? J global health. 2018;8(1):010701.
14. Medvedev MM, Tumukunde V, Mambule I, Tann CJ, Waiswa P, Canter RR, Hansen CH, Ekirapa-Kiracho E, Katumba K, Pitt C, Greco G. Operationalising kangaroo Mother care before stabilisation amongst low birth Weight Neonates in Africa (OMWaNA): protocol for a randomised controlled trial to examine mortality impact in Uganda. Trials. 2020;21(1):126.
15. Chan G, Bergelson I, Smith ER, Skotnes T, Wall S. Barriers and enablers of kangaroo mother care implementation from a health systems perspective: a systematic review. Health Policy Plann. 2017;32(10):1466–75.
16. Kourouma KR, Agbré-Yacé ML, Doukouré D, Cissé L, Some-Méazieu C, Ouattara J, Tano-Kamelan A. Konan Kouakou V. Barriers and facilitators to kangaroo mother care implementation in Cote d'Ivoire: a qualitative study. BMC Health Serv Res. 2021;21(1):1211.
17. Jamali QZ, Shah R, Shahid F, Fatima A, Khalsa S, Spacek J, Regmi P. Barriers and enablers for practicing kangaroo mother care (KMC) in rural Sindh, Pakistan. PLoS ONE. 2019;14(6):e0213225.
18. Ahmed SK, Mohammed RA, Nashwan AJ, Ibrahim RH, Abdalla AQ, Ameen BM, Khdhir RM. Using thematic analysis in qualitative research. J Med Surg Public Health. 2025;6:100198.
19. Kinshella ML, Hiwa T, Pickerill K, Vidler M, Dube Q, Goldfarb D, Nyondo-Mipando AL, Kawaza K. Barriers and facilitators of facility-based kangaroo mother care in sub-Saharan Africa: a systematic review. BMC Pregnancy Childbirth. 2021;21(1):176.
20. Cho YC, Gai A, Diallo BA, Samateh AL, Lawn JE, Martinez-Alvarez M, Brotherton H. Barriers and enablers to kangaroo mother care prior to stability from perspectives of Gambian health workers: A qualitative study. Front Pead. 2022;10:966904.
21. Bilal SM, Tadele H, Abebo TA, Tadesse BT, Muleta M, W/Gebriel F, Alemayehu A, Haji Y, Kassa DH, Astatkie A, Asefa A. Barriers for kangaroo mother care (KMC) acceptance, and practices in southern Ethiopia: a model for scaling up uptake and adherence using qualitative study. BMC Pregnancy Childbirth. 2021;21(1):25.
22. Cai Q, Zhou Y, Chen D, Wang F, Xu X. Parental perceptions and experiences of kangaroo care for preterm infants in neonatal intensive care units in China: a qualitative study. BMC Pregnancy Childbirth. 2024;24(1):499.
23. Punasanvala PH, Parekh AN, Gohil JR, Pujari S. Kangaroo mother care in Preterm baby receiving assisted respiratory support (CPAP): a case-control trial. Int J Contemp Pediatr. 2018;5(3):1008–12.
24. Ricero-Luistro CP, Villanueva-Uy ME, Libadia AG, De Leon-Mendoza S. Effectiveness of kangaroo mother care in reducing morbidity and mortality among preterm neonates on nasal continuous positive airway pressure: a randomized controlled trial. Acta Med Philipp. 2021;55(9):1–7.
25. Ismail MS, Mohmmed RG. The Effectiveness of Application of Kangaroo Mother Care on Preterm Infants in Intensive Care Units at Khartoum State Hospitals–Sudan. Port Said Sci J Nurs. 2022;9(3):26–42.
26. Fong WC, Foong SC, Ho JJ, Tan PY, Leong JJ, Baskaran M. Exploring factors influencing the uptake of Kangaroo mother care: key informant interviews with healthcare workers. BMC Pregnancy Childbirth. 2025;25(1):790.
27. Washington M, Macaden L, Smith A, Selvam S, Mony PK. Determinants of kangaroo Mother Care uptake for small babies along the Health Facility to Community Continuum in Karnataka, India. Global Health: Sci Pract. 2023;11(3).
28. Mohammadi M, Sattarzadeh N, Heidarzadeh M, Hosseini MB, Hakimi S. Implementation barriers for practicing continuous kangaroo mother care from the perspective of neonatologists and nurses. J caring Sci. 2021;10(3):137.
29. Naloli M, Ssenyonga LV, Kagoya EK, Nteziyaremye J, Nekaka R. Kangaroo mother care: a qualitative study on the practice and experiences of mothers of preterm neonates in a tertiary teaching hospital in eastern Uganda. Int J Res health Sci Nurs. 2021;7(11):1890.
30. Sjömar J, Blomqvist YT, Talha TU, Rahman SM, Målqvist M. 'Counselling is the only thing to do': healthcare providers' experience of Kangaroo Mother Care in Bangladesh–a qualitative study. BMJ Public Health. 2024;2(2).
31. Ramaswamy VV, Abiramalatha T, Bandyopadhyay T, Shaik NB, Cavallin F, Roehr CC, Trevisanuto D. Delivery room CPAP in improving outcomes of preterm neonates in low-and middle-income countries: a systematic review and network meta-analysis. Resuscitation. 2022;170:250–63.
32. Shayani LA, da Silva Marães VR. Bubble CPAP as first ventilatory choice in extremely premature infants: Relation to outcomes and bronchopulmonary dysplasia. J Neonatal Nurs. 2024;30(4):368–74.
33. Gruber V, Tracy MB, Hinder MK, Morakeas S, Dronavalli M, Drevhammar T. What CPAP to use in the delivery room? Bench comparison of two methods to provide continuous positive airways pressure in neonates. BMJ Paediatrics Open. 2024;8(1):e002948.
34. Bolaji O, Dedeke IO, Ajigbotosho SO, Nakibuuka V, Nakyanzi J, Nkuranga JB, Henderson P, Selam H, Edwards EM, Ehret DE, Muparamoto M. Immediate care at birth and neonatal resuscitation in the African Neonatal Network. J Afr Neonatology. 2025;3(3):107–13.
35. Deng Q, Li Q, Wang H, Sun H, Xu X. Early father-infant skin-to-skin contact and its effect on the neurodevelopmental outcomes of moderately preterm infants in China: study protocol for a randomized controlled trial. Trials. 2018;19(1):701.
36. Kuo SF, Chen IH, Chen SR, Chen KH, Fernandez RS. The effect of paternal skin-to-skin care: a systematic review and meta-analysis of randomized control trials. Adv Neonatal Care. 2022;22(1):E22–32.
37. Srinath BK, Shah J, Kumar P, Shah PS. Kangaroo care by fathers and mothers: comparison of physiological and stress responses in preterm infants. J Perinatol. 2016;36(5):401–4.

Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.