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Research Article

The Impact of Kangaroo Mother Care on the Outcome of Premature Babies at the Regional Hospital Buea

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Abstract

Background: Prematurity and its complications are the leading causes of neonatal death. Kangaroo Mother Care (KMC) is one of the neonatal interventions to prevent these main complications, improve the outcome of preterm babies and reduce neonatal mortality due to prematurity. This study was conducted to assess the impact of KMC on the morbidity and mortality of premature babies in a semi-urban setting in Cameroon.

Method: This study was a hospital-based retrospective cohort study carried out at the Buea Regional Hospital from February to April 2021. The files of neonate patients born before 37 weeks of completed pregnancy and who were hemodynamically stable were extracted and used. Participating babies selected were sorted into two groups: those who were cared for conventionally and those who were cared for through KMC. Some variables were obtained and compared between the 2 cohorts including: prevalence of hospitalisation, complications, duration of hospitalisation, mortality rate, rate of post discharge follow-up, rate of breastfeeding and increase in anthropometric parameters (head circumference, length and weight).

Results: One hundred and twenty four premature babies were retained. Forty four of these were cared for conventionally and 80 cared for through KMC. Admissions significantly increased with KMC p<0.001). The main complications before and after KMC institution were and remained: infection, jaundice, respiratory distress and anaemia. There was a reduction in the frequency of some morbidities with KMC (infection, Necrotic Enterocolitis, hypoglycaemia and feeding difficulties), though the decrease was not statistically significant (p= 0.227, 0.285, 0.353 and 0.123 respectively). The frequency of respiratory distress, apnoea and hypothermia increased with KMC, but the changes were not significant (p= 0.551, 1.000 and 0.131 respectively). There was no significant change in duration of hospitalization between the cohorts (p= 0.637). Mortality rate reduced with KMC, though not significantly (p= 0.786). KMC significantly promoted the practice of exclusive breastfeeding both in hospital and at home (p<0.001). Post-discharge follow-up significantly improved after KMC was instituted (p<0.001). Head circumference and length increased, while weight reduced at discharge with KMC, but the changes were not statistically significant (p= 0.348, 0.118 and 0.438 respectively).

Conclusion: KMC significantly increased admissions in this study. Mortality rate, infection and some other morbidities reduced, anthropometric parameters were better at discharge and post-discharge follow up improved for babies cared for through KMC. Implementation of KMC therefore has a positive effect on the outcome of preterm babies and should be intensified in resource-poor settings.

Keywords: Kangaroo Mother Care; Neonates; Growth; Outcome; Cameroon

Introduction

Preterm birth, as defined by the WHO, refers to all births before 37 completed weeks of gestation. WHO classifies preterm birth into 3 groups: extremely preterm before 28 weeks, very preterm 28-31 weeks + 6 days, and moderate or late prematurity 32-36 weeks+ 6 days of gestation [1]. Of the 15 million preterm babies born globally, about 1 million die due to preterm birth before the age of 5 years. Preterm birth is the leading cause of death among children, accounting for 18% of all deaths among children aged under 5 years and as much as 35% of all deaths among newborns (aged <28 days) [2]. The burden of preterm birth is therefore still high, especially in low and middle income countries [3,4]. In Cameroon, preterm birth complications are the second leading cause of neonatal deaths, accounting for 29% of these deaths [5]. On top of the key clinical/physiological determinants of poor prognosis of preterm births is hypothermia. Hypothermia is a condition that occurs when your body temperature drops below 36.5°C [6]. Preterm babies lose body heat more easily due to low brown fat and high ratio of body surface area to body volume [6,7]. This puts them at risk of life-threatening hypothermia. They need extra energy and care to stay warm and grow. The extra warmth is classically provided through incubators, an equipment whose prohibitive cost makes it of limited deployment in resource-limited contexts [8].

Kangaroo Mother Care (KMC), an effective and safe substitute to incubators in preterm babies, is used to improve newborn survival [6,9].

Kangaroo Mother Care (KMC) is defined as care of preterm infants carried skin-to-skin with the mother (or other relative/carer, often the father, grandmother, etc.). Its key features include early, continuous and prolonged skin-to-skin contact between the mother/carer and the baby, and exclusive breastfeeding (directly or expressed) [10]. KMC is initiated the in hospital and pursued at home after early discharge, until at least the 40th week of postnatal gestational age.

Concordant studies have demonstrated the benefits of adopting KMC on alleviation of problems of preterm babies such as hypothermia, hypoglycaemia, prolonged hospitalisation and improvement of survival and growth in developing countries [6,11-14].

In Cameroon, KMC was introduced over two decades ago. However, its implementation at the Buea Regional Hospital (BRH), a third category health facility, began in 2019 with the commissioning of a dedicated KMC unit. In this study, we report the impact of the implementation of KMC on the morbidity and outcome (mortality/survival/condition at discharge, etc.) of preterm babies using data before and after the adoption of the KMC method in the institution.

Methods

Study Setting

This was a hospital-based retrospective cohort study at the neonatology unit of the Buea Regional Hospital Annex. The hospital is located in the South West Region of Cameroon and it constitutes the second referral level in the region. Its paediatric unit has a capacity of 20 beds, of which 4 are in the KMC unit. The KMC unit has 3 rooms (KMC room where mothers and patient carers are admitted while carrying out KMC in-hospital; an incubator room; an outpatient room where discharged patients are received for follow-up). Patients admitted in the unit are from premature deliveries at the maternity of the BRH or those received as referrals from across the region.

Data Collection

The files of premature babies admitted in the paediatric unit between August 2018 and September 2019 (12 months before the start of KMC) and October 2019 to September 2020 (12 months after the start of KMC) were used. Premature patients who were admitted during the study period were sorted from the register of patients. Patient files were then sorted from hospital archives. Files that met inclusion criteria; babies born before 37 completed weeks of gestation and cared for either conventionally (before KMC) or through KMC, method were retained. Files of unstable babies (congenital anomalies, prolonged apnoea, cardiorespiratory arrest and oxygen saturations less than 85%) and incomplete files were returned to archives. Data was then retrieved from qualified files and entered in specifically designed data extraction forms. Variables to be analysed included: gestational age, gender, anthropometric measures for growth rate (weight, head circumference, length), duration of hospitalization, complications, adherence to outpatient follow-up, outcome such as morbidity (frequency of jaundice, anaemia, etc.), mortality rates and maternal sociodemographic data. For patients who were cared for conventionally, the Paediatrician's register was reviewed to identify those who came for follow up visits, while for those cared for through KMC, their KMC forms were reviewed for the number of post discharge visits attended.

Data Analysis

Bivariate analyses were done for comparison of data. Quantitative variables were represented using frequencies and tables. Relationships between variables were compared using the Chi square test or Fisher's exact test. For all tested hypotheses, statistical significance was taken at $p<0.05$.

Ethical Consideration

Ethical clearance was obtained from the Institutional Review Board, Faculty of Health Sciences, University of Buea (Ref No: 2021/1280-02/UB/SG/IRB/FHS), followed by administrative clearance from the Regional Delegation of Public Health for the South West Region (Ref No: R11/MINSANTE/SWR/RDPH/PS/530/768), and finally from the Director of the Buea Regional Hospital (Ref No: A5/MPH/SWRDPH/BRH/IRB02).

Results

Study Population

We retained 124 out of 150, including 44 patients before and 80 patients after the institution of KMC. Of these, majority were female (58.9%) with a male to female ratio of about 1:2. The modal age group was the late preterm group (55 patients). In this study, mothers' ages ranged from 13 to 42 years with a mean age of 27 years. Also, most mothers were married (56.5%), employed (62.4%), had secondary school education (49.0%) and were Christians (98.1%).

Rate of Hospitalization before and after KMC

There was a significant increase in the rate of hospitalization of preterms from 15% (44 preterms in 298 neonates) before the institution of KMC to 27% (106 preterms in 396 neonates) after.

Period	Number of preterms admitted at BRH(n)	Total number of neonatal admissions at BRH (N)	Percentage of preterm admissions (%)	P-value (95% CI)
Before institution of KMC	44	298	15	0.000
After institution of KMC	106	396	27	

Table 1: Comparison of rate of admission between the two cohorts.

Complications

Overall, there were four main complications before and after the institution of KMC including: infection, jaundice, respiratory distress and anaemia. It was observed that only hypothermia significantly increased in those cared for through KMC during the first 7 days of life. However, in the period following the first week of life, the proportions of some complications (Infection, necrotising enterocolitis, hypoglycaemia, cyanosis and feeding difficulties) reduced, but these reductions were not statistically significant (Table 2).

There was no significant difference in complications per age group (Table 3).

Complications	Before KMC (N=41)	After KMC (N=76)	Chi-square	P-value(95%CI)
Respiratory Distress	24 (58.5)	39 (51.3)	0.559	0.455
Jaundice	23 (56.1)	47 (61.8)	0.366	0.545
Infection	18 (43.9)	44 (57.9)	2.093	0.148
Anaemia	12 (29.3)	25 (32.9)	0.162	0.687
Cyanosis	11 (26.8)	33 (43.4)	3.125	0.077
Apnoea	0 (0.0)	4 (5.3)	2.234	0.135
NEC	3 (7.3)	1 (1.3)	2.905	0.088
Hypothermia	11 (26.8)	35 (46.1)	4.125	0.042
Hypoglycaemia	5 (12.2)	20 (26.3)	3.161	0.075
Feeding difficulties	6 (14.6)	11 (14.5)	0.001	0.981

Table 2: Comparison of complications before and after the institution of KMC in the first 7 days of life.

Complications	Before KMC (N=41)	After KMC (N=75)	Chi-square	P-value (95% CI)
Respiratory distress	0 (0.0)	3 (4.0)	1.684	0.551
Jaundice	1(2.4)	9 (12.0)	3.076	0.095
Infection	11 (26.8)	13 (17.3)	1.457	0.227
Anaemia	6 (14.6)	19 (25.3)	1.795	0.180
Cyanosis	2 (4.9)	0 (0.0)	3.723	0.123
Apnoea	0 (0.0)	1 (1.3)	0.551	1.000
NEC	2 (4.9)	1 (1.3)	1.322	0.285
Hypothermia	4 (9.8)	16 (21.3)	2.490	0.131
Hypoglycaemia	1 (2.4)	0 (0.0)	1.845	0.353
Feeding difficulties	2 (4.9)	0 (0.0)	3.723	0.123

Table 3: Comparison of complications before and after the institution of KMC after day 7 of life.

Duration of Hospitalization

This study indicated that duration of hospitalization did not significantly change between the two cohorts (Table 4).

Period	N	Mean ± SD	F	P-value (95% CI)
Before	44	12.52 ± 10.4	0.224	0.637
After	79	13.37 ± 8.93		

Table 4: Comparison of duration of hospitalization between the cohorts.

Mortality

Mortality Rate before and after KMC: There was a decrease in the proportion of preterms deaths from 29.5% (13 preterm deaths of the 44 preterms admitted) before to 27.4% (29 preterm deaths of the 106 admitted) after KMC was started. This decrease was however not significant (Table 5).

	Number of preterm deaths (n)	Total number of preterms (N)	Percentage of preterm deaths (%)	P-value (95%CI)
Before institution of KMC	13	44	29.5	0.786
After institution of KMC	29	106	27.4	

Table 5: Comparison of overall mortality rate.

Gestational Age Group-Specific Mortality

It was found during this study that, the chance of dying was significantly associated with a low gestational age at birth (Table 6).

Age group	Number of Deaths [n (%)]	Chi-square	P-value (95% CI)
Extreme preterm (<28weeks of gestation) (N=9)	8 (88.9)	25.111	0.000
Very preterm (28-<32weeks of gestation) (N=28)	11 (39.3)		
Moderate preterm (32-<34weeks of gestation) (N=32)	5 (15.6)		
Late preterm (34-<37weeks of gestation) (N=55)	9 (9.1)		

Table 6: Age group-specific mortality.

Post-Discharge Visits

From the results, none of the patients discharged came back for follow-up visits up to the 40th week of corrected gestational age before the institution of KMC. Meanwhile, about two-thirds of those discharged after KMC came back for follow-up visits up to the 40th week of corrected gestational age (Table 7).

Period	Yes [n (%)]	No [n (%)]	P-value (95%CI)
Before	0 (0.0)	31 (100.0)	0.000
After	50 (70.4)	21 (30.4)	

Table 7: Comparison attendance to post discharge visits in the two cohorts.

Feeding in Hospital and at Home

During this study, we realized that exclusive breastfeeding was practiced more after the institution of KMC, both in hospital and at home. Also, fewer babies were mix fed after KMC was started (Table 8).

Type of feeding	Period	Exclusive Breast Milk [n (%)]	Artificial Milk [n (%)]	Mixed Feeding [n (%)]	Chi-square	P-value
Feeding in the hospital	Before (N=31)	10 (32.3)	1 (3.2)	20 (64.5)	32.039	0.000
	After (N=67)	59 (88.1)	0 (0.0)	8 (11.9)		
Feeding at home	After (N=51)	43 (84.3)	-	8 (15.7)		-
	Total	41 (84.3)	-	8 (15.7)		

Table 8: Comparing feeding in both cohorts in hospital and at home.

Anthropometric Parameters at Discharge

We realized in this study that head circumference and length at discharge increased in children that were cared for through KMC, but this increase was not statistically significant. However, the weight at discharge rather reduced after the institution of KMC, but this was also not statistically significant (Table 9).

Parameters	Period	Mean ± SD	T-test	P-value
Weight (/g)	Before	1898.53 ± 451.85	0.778	0.438
	After	1822.35 ± 473.19		
Head circumference (/cm)	Before	31.07 ± 1.52	-0.943	0.348
	After	38.90 ± 44.55		
Length (/cm)	Before	43.10 ± 2.70	-1.346	0.118
	After	44.23 ± 4.13		

Table 9: Comparing anthropometric parameters at discharge in the two cohorts.

Discussion

This study sought to document the impact of the implementation of KMC on the morbidity and outcome of preterm babies using data before and after the adoption of the method at the BRH. The results indicate a marked increase in hospitalizations in the neonatal unit after the introduction of KMC. This could be explained by the fact that KMC serves to admit more babies in the hospital despite the shortage of incubators. Kangaroo method can therefore be used in facilities with limited space and resources.

After the first seven days of life, we realized an increase in the proportions of respiratory distress, apnoea and hypothermia in those cared for through KMC. This could be explained by the fact that mothers did not carry their babies effectively. Mothers are usually the main carers or have few carers who are not always present. With the need to buy drugs and food from time to time, they may have not been carrying their babies for the required duration. In addition, there are few incubators, so mothers cannot keep their babies warm enough while carrying out these other activities. This could also result in decreased stimulation from the mother and hence the increase in apnoea and respiratory distress. This finding is contrary to the findings Adarsh, et al,, Conde, et al., Shanti, et al,, Kanodia P, et al., and Boundy, et al., who found that KMC reduced the incidence of hypothermia and apnoea [14-18]. This was probably due to the fact that some studies had small sample sizes and most studies were conducted in middle or high income countries with resources (incubators).

On the other hand, the proportions of infection, necrotizing enterocolitis, cyanosis, feeding difficulties and hypoglycaemia reduced after KMC was started. These reductions are similar to the results of the others authors; Kalhor M, et al., Lawn E, et al., Adarsh, et al., Hoque, et al., Ellen Bounty, et al., and Conde, et al., who all found that KMC significantly reduces morbidity [11,14-16,19,20].

In addition, there was rather an increase in the duration of hospitalization after the institution of KMC which was not statistically significant. This could be explained by the fact that there were outliers in duration of hospitalization. This is similar to the finding of Boundy, et al., who found that duration of hospitalization did not significantly change between those cared for through KMC and those cared for conventionally. This is however different from the results of Jafari, et al., Kondapali, et al., Shanti, et al., and Kalhor, et al., who found that KMC reduced the length of hospital stay [17,19,21,22].

These studies had either half or double our sample size, which could account for the differences.
We realized a drop in mortality rate by 2.1%. This could be explained by the fact that there was a decrease in infection rate and other complications like necrotizing enterocolitis and hypoglycaemia that are significantly associated with death. This is similar to the findings of Lawn E, et al., Conde, et al., and Boundy, et al., who found that KMC substantially reduces neonatal mortality associated with prematurity and its complications [11,15,16].

We also found that mortality was significantly associated with gestational age; the smaller the gestational age, the more likely the patient was to die. Furthermore, post discharge follow up markedly improved after KMC was started. This could be explained by the fact that mothers were more implicated in the care of their babies, and they understood the need to come back for regular checks.

We also found that exclusive breastfeeding significantly improved after the institution of KMC, both in hospital and at home. This is explained by the fact that in kangaroo position, the babies are close to their mothers' breast and can thus feed at will and as many times as possible. This is similar to the results of Adarsh, et al., Kalhor, et al., Heidarzadeh, et al., Conde, et al., Mahmoud, et al., Hoque, et al., Almeida, et al., Ellen Bounty, et al., Tharashree CD, et al., and Kondapali CS, et al., who found that KMC promoted exclusive breastfeeding in preterm newborns [12-16,19,20,22-24].

Finally, our study revealed that anthropometric measurements (length and head circumference) at discharge were better after the institution of KMC compared to before. This could be due to the fact that babies fed better and developed fewer complications after starting KMC. This finding is similar to those of Rekha, et al., Adarsh, et al., Kondapali, et al., Sarparast, et al., Kalhor, et al., Conde, et al., Hoque, et al., Shanti, et al., and Jafari, et al., who found that KMC improved anthropometric measures (length and head circumference) [14,15,17,19-22,25,26].

Weight was rather found to reduce after KMC was started. This could be explained by the fact that the mean duration of hospitalization in both cohorts was between 12 and 14 days and during this period, babies are still in the physiological period of weight gain (they are gaining the weight they lost in the first week of life). So with KMC, smaller babies can be discharged from the hospital. This finding was contrary to those of Rekha, et al., Adarsh, et al., Kondapali, et al., Sarparast, et al., Kalhor, et al., Conde, et al., Hoque, et al., Shanti, et al., Kanodia P, et al., and Jafari, et al., who found that KMC improved weight at discharge [14,15,18-20,22,25,26]. This difference could be due to the fact that in some of these studies, sample size was higher and KMC was initiated earlier.

Strengths and Limitations

Strengths

This is one of the first studies carried out in Cameroon on the impact of KMC on the outcome of preterm babies.

Limitations

Many patient files were either missing or incomplete.

Conclusion

The institution of KMC markedly boosted the ability of the BRH to care for premature babies, as shown by the significant increase in neonatal admissions. There was an overall reduction in complications with the institution of KMC and mortality rate reduced after the institution of KMC. Follow-up after discharge markedly improved with the practice of KMC and exclusive breastfeeding practice was enhanced both in hospital and at home. Growth parameters (length and head circumference) improved at discharge after the institution of KMC, which should be vigorously pursed.

Conflict of Interest

The authors have no conflict of interest to declare.

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