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The effectiveness of Kangaroo Mother Care (KMC) on premature infant health progression in a neonatal care unit in Maternity and Children's Hospital, Jeddah

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Abstract: Background: Preterm birth is considered to be the largest direct cause of neonatal mortality. Of all early neonatal deaths that have occurred within the first 7 days of life, 28% are due to preterm birth. The Kangaroo Mother Care (KMC) decreases risk of mortality, infection severity, increases infant growth, breastfeeding, and mother-infant attachment. The aim of this study is to evaluate the effectiveness of Kangaroo Mother Care on premature health progression in the neonatal care unit in the Maternity and Children's Hospital, Jeddah.

Method: Study Design: A quasi-experimental design was chosen, using data collected via the Kangaroo Mother Care Assessment Flow Sheet.

Setting: Maternity and Children's Hospital (MCH) Al-Mousaa'dya branch, a Ministry of Health (MOH) Governmental hospital, Jeddah, KSA

Sample: A convenient Sample of thirty premature neonates who fulfilled the inclusion criteria who were admitted on the neonatal intensive care unit at the mentioned setting during data collection period. Permission had been obtained from all mothers of participating infants. A control group was used for comparison.

Tools and instruments: The data were collected using the Kangaroo Mother Care Assessment Flow Sheet.

Result: the survival rate of study group is very high as no death was noted, no statistical differences before and after KMC but the data showed that the health status of neonate was stabilized, also findings showed that weight gain increased from 1.36 kg in the first attempt to 1.48 Kg in the fifth attempt. Regarding length of stay, study group neonate had higher length of hospitalization (48±19.87) comparing to other studies

Conclusion: Kangaroo Mother Care maintains all premature neonatal physiological parameters and weight gain while the neonatal length of stay in current study was high compared to other global studies.

Recommendation: There is a necessity to implement KMC at all NICU in Ministry of Health Hospitals, to develop a protocol and guidelines for KMC implementation. To organize continuing nurse training and education program for neonatal intensive care units nurses. Further studies should be conducted on a larger scale in Kingdom of Saudi Arabia for generalizability and to study the factors of prolonged neonatal length of stay on NICU.

Key words: Kangaroo Mother Care (KMC), effectiveness of Kangaroo Care premature neonate, premature health.

INTRODUCTION

In Saudi Arabia, the overall infant mortality rate is currently 13.6 deaths per 1,000 live births in 2017 (1). Preterm birth is considered to be the largest direct cause of neonatal mortality, accounting for an estimated 27% of the 4-million neonatal deaths every year. It causes neuro-developmental impairment resulting in long term disabilities such as cerebral palsy, mental retardation, visual and hearing impairments, as well as more subtle disorders of central nervous system function. These dysfunctions include developmental coordination disorders or minor neuromotor dysfunction, attention deficit-hyperactivity disorder, learning disabilities, language disorders, behavioral problems and social-emotional difficulties. (2)

Preterm birth applies to delivery prior to a gestational age of 37 weeks and is considered as significant antenatal health complications globally in term of associated long and short-term morbidity, mortality, financial consequences in health care institution (3)

According to the WHO, of all early neonatal deaths occurring within the first 7 days of life, 28% are due to preterm birth (4). Preterm labor is now thought to be a syndrome initiated by many risk factors and mechanisms, including infection or inflammation, utero placental ischemia or hemorrhage, uterine over distension, stress, and other immunologically mediated processes (5).

Rey and Martinez implemented for the first time KMC in Bogotá, Colombia. It was established for their preterm newborn infants as an alternative to insufficient power, equipment and incubator care for preterm babies who required feeding and growing only. Kangaroo Care was found to be an inexpensive and very beneficial experience for babies and the mortality rate fell from 70 % to 30 %. (6)(7)

There are many non-medical interventions applied in Neonatal Intensive Care Units NICU, Kangaroo Care is one of them. It is a standardized non-medical protocol-based health care system and one of traditional intervention that offers a highly effective outcome. It is offered for stabilizing preterm or low birth weight infants. In Kangaroo Mother

Care, the mother acts as an incubator, just like the kangaroo ,the mother places her infant vertically in between her breasts and baby's chest in direct skin-to-skin contact for warming (8)

Kangaroo Care is one of the nursing practices with medical provision that can meet the important physical and emotional needs of the preterm such as warmth, stimulation, parental attachment, breastfeeding and safety. Previous research confirmed the KMC effectiveness for promoting the preterm and term infant's health, well-being and encourages the parents' participation in the infant's care. (9) (10) (11) (12)

There are many studies that highlight the importance of KMC in maintaining the premature health and improving the condition, enhancing the body temperature, blood glucose level and in reducing risk of infection (13) Indeed Kangaroo Mother Care has positive effects on premature babies and mothers (14) Worldwide, within the first week of neonatal life, there are around three quarters of neonates will die and the highest risk period is during the first 24 hours (15) (38).

Therefore, the neonatal nurse should provide the appropriate care, and encourage bonding which is considered as one of the utmost benefits with parents especially during the first two weeks of life when the neonate and family are most vulnerable. (15) Moreover when the baby is born premature or with complications or sick and transferred to the neonatal intensive care unit, the parents experience an unstable psychological condition due to overwhelming fear and anxiety (16). They need a lot of support from the staff and need to be involved in care to be close to their infant.

39 % of infants who were admitted into the neonatal intensive care unit (NICU) of Maternity and Children's Hospital are following premature birth (17), which is considered as the highest percentage compared with other health conditions. Accordingly, the premature infant is at high risk for developmental and growing impairment due to immaturity. Moreover these infants require very intensive and delicate care to support their health, psychosocial and developmental needs as well as the needs of their family (18)

The statistics of MCH (17) NICU premature babies' survival rate in comparison to previous years show good improvement over the last 4 years subsequently from 11.6 in 1433h (2011) ,18.9, 27.2 to 55.4 in 1436h (2014).

To enhance the neonatal outcome, the researchers looked for improving the care that was being provided to babies based on new trends and evidence based practice. One such practice was implementing the Kangaroo Mother Care technique. KMC was found to have a valuable and positive impact on the health and condition progress of preterm infants. Hospital length of stay decreased due to improved temperature and cardio respiratory stability, breastfeeding was enhanced, variation in pain responses, sleep

organization, weight gain, and neurodevelopment outcomes(13) .

With the high percentage of premature infants in NICU at MCH and all the strengths and benefits of Kangaroo Mother Care, we find that still most of the hospitals under Ministry of Health here in Saudi Arabia are not applying this valuable technique. Therefore this current study aimed to evaluate the KMC on premature progression before and after the implementation of same here in Maternity and Children's Hospital, NICU, Jeddah.

Specific objectives were:

1. To determine the effectiveness of Kangaroo Mother Care on premature health progression in NICU.
2. To evaluate the premature progression before and after KMC.

METHODOLOGY

Setting:

This study was conducting at Maternity and Children's Hospital (MCH) Al-Mousaa'dya, a Ministry of Health (MOH) hospital, Jeddah, KSA and a major center in obstetrics, gynecology and pediatrics specialty in the western region of the country. The bed capacity of the hospital is 254. It serves to care for all obstetrics, gynecology, pediatric and neonatology patients at all levels, has national recognition, and accredited from Central Board of Accreditation of Health Institutions.

Study design:

Quantitative quasi-experimental, pre-test post-test study design was utilized, using data collected through Kangaroo Mother Care Assessment Flow Sheet.

Study sample/ Population/ Size:

Target population was accessible premature babies on neonatal intensive care unit MCH, Jeddah. A convenient sample of 30 neonates participated in this study.

Inclusion Criteria	
1.	Infants with a gestational age of 28 to 36 weeks
2.	Infant weight more than 1 Kg
3.	The intervention implementation within the first 48hrs – 5 days
4.	Medically stable infants
5.	Neonatal respiratory support in the form of oxygen supplementation or nasal CPAP was not a contraindication
6.	Infants with firmly secured umbilical arterial or venous lines
Exclusion Criteria	
1.	Infants with chest drains, surgical cases with drains
2.	Unstable with ventilation respiratory support
3.	Post of any major procedures or treatment
4.	Any infant who has had an acute or sudden deterioration

Study period:

During the year of 2016 for 7 months

Data collection tool:

After extensive literature review the tool was adopted from study of Ludington-Hoe,(2008) and modified by the researchers (20). To evaluate the efficiency, reliability and validity of the instruments/tools in this study, the content of the tool was revised by an expert. A focus group was established to review content validity of the tool. The reliability of the developed tool was tested by using Cronbach's alpha test and the reliability coefficient value was 0.69 ~ 0.7. Moreover, a pilot study was conducted on 10 clients who met the inclusion criteria

The kangaroo Mother Care Assessment Flow Sheet (Appendix B)

The Flow Sheet developed after extensive literature review. It consists of two parts as follows:

- Part (1): Infant demographic data assessment
- Part (2): Parameters Monitoring

Data collection process:

First phase, the researchers approached NICU nurses randomly using lottery method to participate in the study and provide a special training program.

The training program started with a letter of invitation given with the informed consent to the participants explaining the study aim and the research procedure. Following this, an educational program was offered which included a lecture, workshop and handout on KMC for all selected nurses who agreed to participate. By the end of the educational program the nurses were evaluated by researchers using competency checklist to ensure the Kangaroo Care technique would be implemented accurately.

Second phase, the researchers approached the mothers of the neonates who fulfilled the inclusion criteria. After obtaining the participation informed consent of infants' mothers who

are were willing to participate in the study, five attempts of Kangaroo Mother Care was implemented according to the description of Mitchell & Hall study (21). Each attempt takes approximately 30 minutes (22), during which the nurse would assess the babies' physiologic parameter such as (heart rate, respiratory rate, oxygen saturation, desaturations, body temperature, blood pressure, weight on admission and discharge and average weight gain) before and after the procedure. At the end of data collection, length of stay in the NICU was calculated.

Data statistical analysis:

The Statistical Package for Social Sciences (SPSS) software version 22.0 used for data entry and analysis. Descriptive statistics (e.g. percentage, number, mean and standard deviation) and tests of significance (e.g., χ^2) to test for the association and/or the difference between two variables applied in the study. P values will be considered as statistically significant if it is less than 0.05

Ethical consideration:

The research proposal for this study was approved by Research and Studies Department of the Directorate of Health Affairs Institutional Review Board, Jeddah (IRB). The researchers designed an invitation letter for nurses on NICU to attend the prepared educational program and participate in the current study.

An informed consent sheet was developed to include all necessary information, purpose and methods of the study to enable mother to decide voluntary participation in the study without exposure to any risks and reassurance of anonymity and confidentiality, privacy of mother, infant and infant's medical record, no names or numbers will appear in the Data Sheet.

RESULTS:

Table (1): Percentage distribution of premature neonate according to their characteristics (n= 30)

Premature neonates' characteristics	Studied sample	
	Number	Percentage
Sex		
Male	10	33.30%
Female	20	66.70%
Gestational age		
28 – 29	10	33.30%
30 – 31	13	43.3%
32 – 33	6	20%
34 – 35	1	3.3%
Admission /Birth Weight		
≤1500	23	76.6 %
1501 < 2000	4	13.3%
2001 < 2500	3	10%
Prematurity Causes		
PROM	8	33.30%
PET/ Eclampsia	17	43.3%
GDM	1	3.3%
Hypothyroidism	1	3.3%
Multiple pregnancies	2	23.4%
Bleeding	1	3.3%

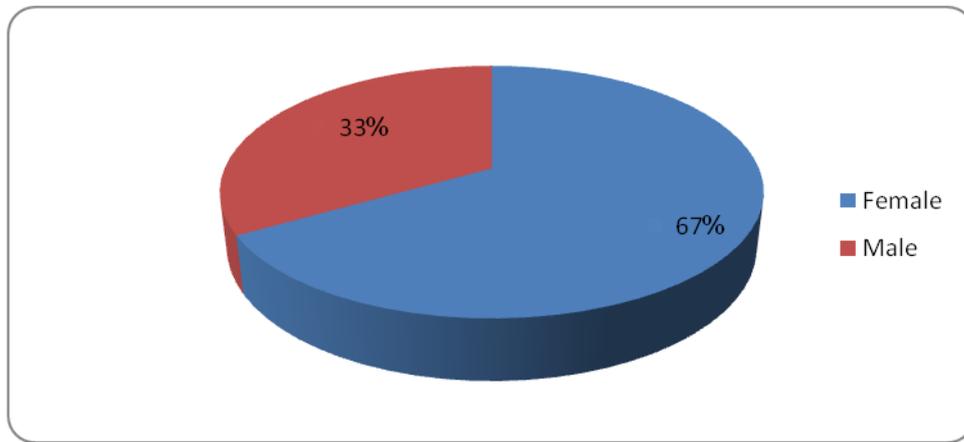


Figure 1. Distribution of the premature babies according to their gender

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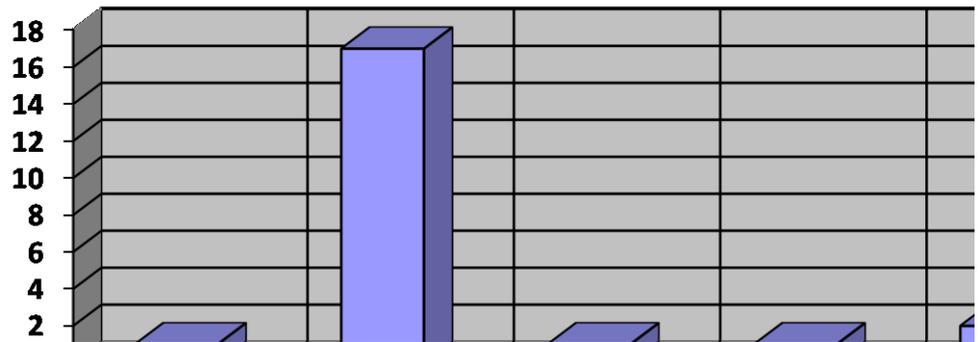


Figure 2: Distribution of the premature babies according to cause of Prematurity

Figure 1 shows that majority of the sample 17 (43.3%) were born premature due to pre-eclampsia, while 1 (3.3%) due to GDM, 1 (3.3%) due to hyperthyroidism, and 1 (3.3%) due to bleeding.

Table (3) Percentage distribution of vital signs mean before and after Kangaroo Mother Care

	1 st Attempt		2 nd Attempt		3 rd Attempt		4 th Attempt		5 th Attempt	
	Pre	Post								
Heart Rate	151	151	160	148	151	151	150	147	149	150
Respiratory Rate	55	54	54	54	54	53	52	53	52	50
Oxygen Saturation	97	98	98	99	99	99	99	99	98	98
Temperature	36.9	36.8	36.9	36.8	36.8	36.7	36.9	36.1	36.8	36.6
Blood pressure	67/41	67/42	62/42	64/38	66/40	65/40	64/39	63/42	66/41	65/39

Table (4) Distribution of the premature babies according to the daily weight gain mean.

	1 st Attempt	2 nd Attempt	3 rd Attempt	4 th Attempt	5 th Attempt
Daily Weight Gain	1.36	1.37	1.43	1.47	1.48

Table 4 shows the mean of the daily weight gain according to the five attempts of Kangaroo Mother Care (KMC). It shows that weight gain increased from 1.36 kg in the first attempt to 1.48 Kg in the fifth attempt.

Table 5. Statistical result of Length of Stay.

Mean	Median	Mode	Minimum	Maximum	Std. Deviation
48	47.00	45(a)	16	104	19.870

A Multiple mode exists. The smallest value is shown.

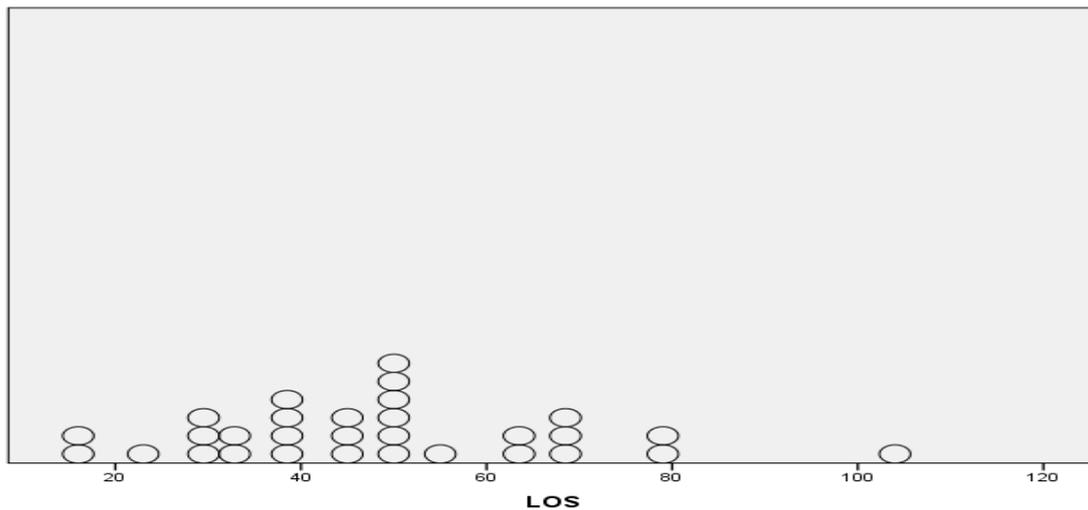


Figure (3)

Figure (3) show the length of stay. The mean was (48) days, median (47) days, mode was (45) days, minimum length of stay was (16) days, maximum length of stay was (104) days and the Std. deviation was (19.870).

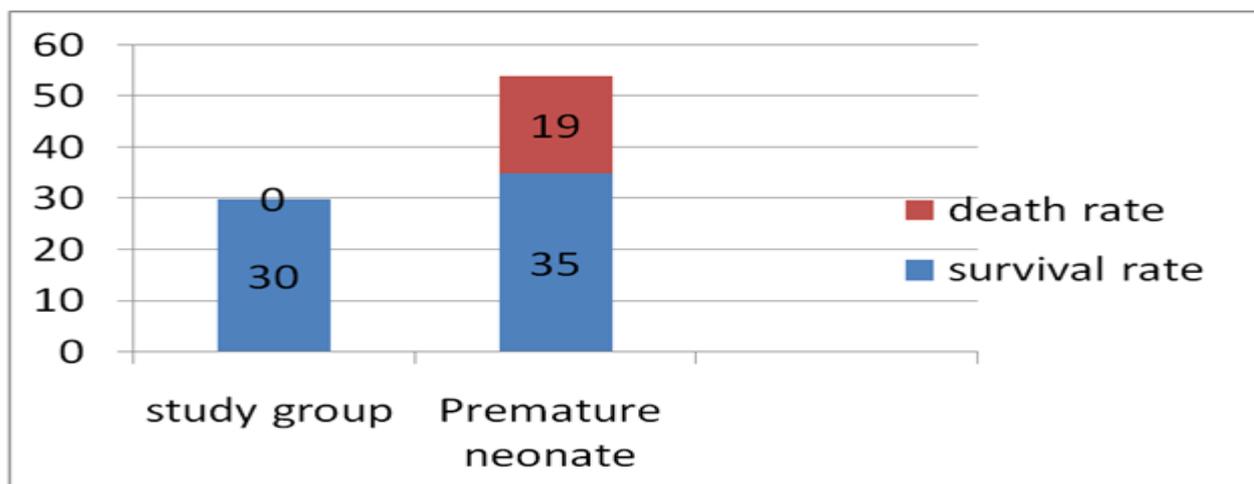


Figure (4) Statistical result of study group survival rate n=84

The total number of premature neonates who were admitted to NICU with gestational age (GA) of 28 – 35 weeks, was 84, 30 cases (36.1%) included in the study, the remaining 54 (63.9 %) were not.

It was found that the survival rate of study group is high as no death was noted between them although 19 (22.6 %) of the premature babies in the control group were died.

DISCUSSION

Preterm birth is one of the main causes of neonatal death. (23) Kangaroo Mother Care is becoming an integral part of the care of premature and low birth weight infants worldwide. Therefore, the main aim of this study was to evaluate the effectiveness of Kangaroo Mother Care on premature health progression in the neonatal care unit in Maternity and Children’s Hospital, Jeddah. According to the characteristics of the premature neonate, approximately two thirds of premature neonates were female and 33.3% of male.

Regarding the cause of prematurity, results of this current study shows that majority of the sample 17 (43.3%)were

born premature due to pre-eclampsia which is supported by Heintz & Tirkkonen, (24), who identified that severe preeclampsia is characterized by progressive deterioration in both maternal and fetal conditions and the highest rate of prematurity.

Though there were no statistical differences before and after KMC, the current study data showed that health status of neonate was stabilized during all study period which is congruent with Ludington-Hoe, (25) and Verma studies (26).

However, the current study findings were not consistent with some studies such as Bera, Ghosh, Singh, (27) (21) which revealed improvement in all four recorded physiological parameters (Axillary temperature, respiration rate (RR/ min), heart rate (HR/ min), and oxygen saturation (SpO2) immediately before and after KMC for 3 consecutive days.

Results of this study clearly showed that the survival rate of study group is high as no death was noted, similar to study of Chan et.al (2016) and Vesel et.al (2016). (28) (29)

Findings indicated that the mean weight gain increased approximately 120 grams from the first attempt to the fifth attempt. This is supported by several studies. Samara et al. Cattaneo A, et al. Kangaroo Mother Care for low birth weight infants: a randomized controlled trial in different settings. *Acta Paediatrica*, 1998, 87:976-98 (2013), study reported that among important benefits of KMC an average weight gain per day in the KMC babies to be 23.99 g (31). Also the result of El-Nagger et al. (2013), showed that the weight gain of 50% of premature infants' at discharge, was increased by approximately more than 100 grams (21). Another study of Vahidi, et al. (2014), mentioned the weight gain in KMC group was 12.28 g per day while it was 9.65 g in conventional group (30). Furthermore a report from WHO (2003) summarized other studies in congruent with the current study. These two-cohort studies conducted in Colombia revealed slower weight gain in KMC infants when compared with the control group, and another randomized controlled trial RCT, KMC infants showed a slightly larger daily weight gain while receiving KMC during hospitalization (33) and a study of Rekha (2013) in line with current study, showed proven increment of premature weight gain with KMC. (34)

Regarding length of stay, the premature neonate study group had higher length of hospitalization (48 ± 19.87) comparing to other studies, which is in contrast with many global studies (35) (36). Several factors may contribute to the neonatal length of hospitalization during the study period. Firstly, an important factor was the infection outbreaks that occurred during this period. Secondly, the limited resources and deficiency of unified protocol for medical and nursing management. Lastly, uncontrolled neonatal admission rates due to shortage of beds and over booking of labor cases.

After five attempts of KMC sessions the researchers noticed that mothers had more comfortable bonds with their babies and KMC, reducing their fear and empowering them to care for their babies. Some mothers requested to continue practicing KMC with their babies and they may request to prolong the period of KMC more than the specified 30 minutes.

This was similar to another study which revealed that the KMC increases and improves the attachment and bonding between parents and their babies. Moreover both mother and baby share a deep psychological connection. (15)(11)(37)

CONCLUSION & RECOMMENDATIONS

The present study concluded that Kangaroo Mother Care maintains all premature neonatal physiological parameters and weight gain while the neonatal length of stay in current study was high compared to other global studies. The results of this study led to the recommendation to develop a protocol and guideline for KMC implementation, the necessity to implement KMC at all NICU in Ministry of Health Hospitals, organize continuing nurse training and education program for neonatal intensive care units', increase mother awareness of KMC during antenatal and postnatal period. Further studies should be conducted in a larger scale throughout Kingdom of Saudi Arabia for generalizability and the factors of neonatal length of stay at NICU.

It is recommended that the length of stay of the premature babies be further studied.

LIMITATION

There were several limitations of this study as follows:

- Small sample size due to lack of mother commitment to the KMC sessions, discharge of neonate from unit before finishing the 5 attempts of KMC and the restriction of inclusion criteria in cases selection because most cases were excluded.
- The shortage of nursing staff in the unit.
- Infection outbreak among NICU cases.
- Changing unit location and transfer of patients and staff due to renovation.

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