



## The Comparative Study of Kangaroo Mother Care in Hospital and at Home

### KEYWORDS

Low Birth Weight newborn, Kangaroo Mother Care, Incubator care

Sahbaei Roy,F

\* Prof. Shushtarian ,S.M

Tehran Medical Branch Islamic Azad University.Tehran Iran

Tehran Medical Branch Islamic Azad University.Tehran Iran

\* is correspondent author

Hematyari ,M

Pourzadi ,N

Pourzadi ,N

Tehran Medical Branch Islamic Azad University.Tehran Iran

Department of Chemistry,Shahid Beheshti University. Tehran Iran

Department of Pharmacy,Shahid Beheshti University.Tehran Iran

**ABSTRACT** *Background: All stable low birth weight newborns are eligible for Kangaroo Care. It can help to regulate vital signs, improve breastfeeding, and enhance infant and mother's sleep.*

*Objective: The aim of present work was to evaluate the possible changes in temperature, heart rate, breathing rate, breastfeeding, sleeping rate, and attachment of mother and infant after the application of KMC.*

*Methods: A randomized controlled trial was performed in 60 LBW neonates with birth weight  $\leq 2$  kg. They were selected from four hospitals. The infants neither had cardiovascular or pulmonary problems nor physical anomalies. The subjects were randomized into three equal groups, one intervention group (KMC-20) received KMC in hospital, and the other (KMC-20) received KMC at home. The control group(CMC-20) received conventional care. KMC groups received Kangaroo Mother Care for at least 6 hours per day in 6 consecutive days under nurses' supervision and the control group received standard care with an incubator care system at hospitals.*

*Results: The results showed breathing rate, Heart rate, temperature and Sleeping time in study groups had significant differences ( $p < 0.001$ ) and for all the above variables the mean of the study groups were more than the control group. Also the result showed nutrition rate in study groups had significant statistical differences after applying KMC ( $p < 0.001$ ) and regarding mother and infant attachment, comparing these three groups showed significant differences ( $p < 0.05$ ) and there are significant differences between the three groups.*

*Conclusions: From the result of present work one can conclude that KMC care is more efficient. The present study has important implications in case of LBW in developing countries, where expensive facilities for conventional care may not be available and where a neonate is kept in the hospital just because of LBW.*

### Introduction

Newborn deaths make up approximately 40% of all deaths of children. This is especially true for infants in developing countries, and the three major causes of their deaths are the birth asphyxia, infections, complications due to prematurity and low birth weight. To achieve the developmental goal one must address and reduce the excessively high neonatal mortality rate. More than 20 million babies are born premature or low birth weight (LBW) each year, with 95% occurring in under developed countries[1-2].

In many countries especially in Asia, nearly 30% of infants are born with low birth weight (LBW) 7 to 8 out of 10 deaths occur in LBW infants. Seventy percent of infant mortality happens in underdeveloped countries. Most of them can be prevented by simple care at home or in the hospital [3]. One of the main reasons that LBW/premature babies are at a greater risk of illness and death is that they lack the ability to control their body temperature; they get cold or hypothermic very quickly [4]. In most countries, the use of incubators is standard for the care of LBW babies. However, incubator care is not widely available in under developing countries, even in limited cases where incubator care is available the use can be challenging. In addition, excess demands from too many LBW newborns and insufficient machines results in many babies sharing one incubator. This practice can lead to increased infection rates and higher mortality and morbidity rates. Unfortunately Incubators are often insufficient for premature and low birth weight newborns and micro-organisms grow because it cannot be adequately clean and, therefore good care of babies is difficult [5].

Poorly trained health personnel or inadequate staff available on a 24-hour basis can also impact the quality of incubator care provided in these settings, also nurseries are crowded and service is insufficient. Since it largely excludes the participation of the mother, incubator care can lead to decreased breastfeeding and maternal newborn bonding. Given the cost of incubators, making incubator care available and accessible to the majority of parents of LBW infants is simply not an option in most under developing countries [6].

Fortunately, there is an alternative approach to these problems. KMC is a strategy created and developed by a team of pediatricians in the Maternal and Child Institute of Bogota, Colombia. It was invented by Dr. Edgar Rey in 1978, and developed by Dr. Hector Martinez and Dr. Luis Navarrete until 1994, when the Kangaroo foundation was created. Many studies have reported the benefits of KMC in comparison to incubator care [7-8]. KMC regulates the baby's temperature; KMC is more effective than incubator care [9-10]. A randomized controlled trial study in Bogotá, Colombia showed that long term clinical effects of KMC improve successful breastfeeding rates[11]. Also the results of a study in 2010 showed KMC reduces neonatal mortality and morbidity among preterm infants in hospitals with a weight under 2000g. Few studies have showed the effectiveness of KMC at home. In this light a randomized controlled trial in rural Bangladesh looked at home initiation of KMC for all babies showed that KMC was more common among mothers who were taught KMC compared to those who were not[12].

Charpak, et al in his research showed that Heart and res-

piratory rates, respiration, oxygenation, sleep patterns and behavior observed in preterm/LBW infants with skin-to skin contact were better than those observed in infants separated from their mothers[10].Also Prolonged skin-to-skin contact between mother and LBW infant provides effective thermal control and reduced risk of hypothermia[13-14].Gathwala, et al observed in their study a greater tendency towards emotional stability in mothers after KMC. They also reported more feeling of reliability and competence in mothers as compared with mothers whose infants received conventional care in the hospital [15].Bergman,et al found all LBW newborns receiving KMC were stable in the sixth hour, compared with incubator babies. More incubator babies suffered from hypothermia, compared with none of the KMC group and stabilization (cardio-respiratory) score was higher for the KMC group and also the mean temperature was higher in the KMC group in the first hour [14].

Benefits of KMC for premature and LBW infants are compounded and its effect on infants, mothers, hospitals, health care workers and society are shown. It is essential and it must be implemented in developing countries because of its advantages [16].KMC is the early, prolonged, and continuous skin-to-skin contact between mother and her baby, both in the hospital and at home, with support for positioning, breastfeeding, prevention of infections and breathing difficulties. Infant skin to skin contact can help to stabilize heart beats, temperature, breathing, nutrition and sleep [17]. After discharge, the KMC can continue at home with an agreed-upon schedule for follow-up visits at home to monitor the health of the baby. Even KMC can be started initially at home when delivery occurs at home or a low birth weight baby is stable in the hospital and can be discharged from the hospital and go home. Even KMC can be started initially at home when delivery occur at home or low birth baby is stable in hospital and can discharge from hospital and goes home[18].

KMC can be started after birth as soon as the baby is clinically stable, and can be continued at home until the baby is stronger and can be supported by the mother at home .In many hospitals after stabilizing the LBW baby they put her / him in an incubator or start KMC in the hospital while it can be started at home. Providing the spouses of KMC mothers and immediate family members e.g. grandmothers and sisters, with accommodation in the KMC ward, might address the mothers' feelings of being isolated. Resistance to KMC is mainly due to the time that mothers are required to stay in hospitals, also they need to take care of their other children who were at home, and the mothers feel lonely, and isolated from their families, especially in cases where family members are unable to visit them [19, 20].The help of neonatal nurses is considered to be the most important factor in determining whether or not mothers receive KMC at home. Therefore, the successful implementation of KMC at home requires a nursing guide who has been trained in all aspects of KMC, as well as a supportive environment, and a willing mother, if a nurse follows the mother and does KMC at home ,it will be better for mother and her child [21].

In this respect, the aim of this study is to evaluate the possible changes in temperature, heart rate and breathing rate breastfeeding times and sleeping rate and attachment of mother and infants among low-weight after the application of KMC.

#### Material and Method

A randomized controlled trial was performed in 60 low birth weight neonates with the birth weight  $\leq$  2 kg divided into two KMC groups and a control group i.e. conventional method of care (CMC).They were selected from four hospitals in Iran: Bouali, Javaheri, Amir and Mahdiye hospitals in Tehran. Infants gestational age was 37 through 40 weeks, determination of infant's gestational age was made by physicians. Subjects weren't recruited in the neonatal intensive care unit; the infants didn't have cardiovascular or pulmonary problems

and had no physical anomalies. Subjects were matched for sex, gestational age, weight, height and mother's delivery type, Apgar score, mother's education, age, occupations and children numbers. Mothers delivered by vaginal route or caesarean section and the mother had no diagnosis of serious illness .The subjects were randomized into three equal groups, one intervention group(KMC-20)received Kangaroo mother care in the hospital, the other(KMC-20) received Kangaroo mother care at home after delivery and discharge from the hospital with personal consent and physician permission .The control group(CMC-20)received conventional care ( incubator care) in the hospitals. Earlier continuous KMC in interventions groups was initiated as soon as possible, and the control group or conventional care was initiated after complete stabilization.

The kangaroo group was subjected to Kangaroo mother care for at least 6 hours per day in 6 continuous days under nurses supervision in hospitals and the other group also received kangaroo care for at least 6 hours per day in 6 continues days under nurses supervision at home. The control group received standard care with incubator care system at hospitals.

Mothers completed a demographic questionnaire regarding age, education, occupation, number of children, and disease's history. Information from hospitals records were used to obtain information about the infant's birth and mother's pregnancy. Another questioner was designed and used for collecting data of vital signs, sleeping and nutrition. In the KMC groups( in hospital and at home), the neonates were given skin-to-skin contact as soon as possible on the mother's chest in an upright position dressed with a cap, socks , diaper and supported from the bottom with a sling. Front open gowns were made available for the mothers and privacy was provided to them. Comfortable chairs and beds were provided to the mothers to do KMC in the nursery or postnatal wards and at home. Skin-to-skin contact was given for 3 hours two times a day, for a total of 6 hours per day in 6 continuous days under nurses or head nurses supervision. Neonates in the control group were given conventional care for 6 hours per day (3 hours, two times a day) in 6 continuous days by nurses under physician care .Mothers in the kangaroo group at home were visited by a research team every day, and they were stayed for two times of kangaroo care, each time 3 hours and followed up for 6 weeks. Mothers also were instructed to hold their infant, using the assigned method for 180 consecutive minutes, two times, at least once daily.

In order to measure mother-infant attachment, the scoring questioner suggested by [Bhakoo et al \(1994\)](#) was used. Body temperature was measured using the Gold Flash clinical thermometer, graduated every 0.1°C. A chronometer was used to check the breathing rate and the time of KMC application. In both KMC groups, mothers were allowed to support their infants at any hour of day and breastfeed those (three continuous hours). Babies were shifted to postnatal wards, once they were stable in study group 1.During the study, all groups were monitored for heart rate, respiratory rate, auxiliary temperature, breast feeding times and sleeping rate per minutes were measured after 3 hours of care.

The evaluations were done twice a day, for six consecutive days, The data was collected after 3hours of KMC in two case groups and the control group .The room was climate controlled with a temperature of 26°C and the relative air humidity was 40%.Infants were placed vertically in front of their mother .The mother was wearing a gown, allowing contact between her skin and the baby's skin. She remained lying down on the bed with the headrest raised to 45°. The infants stayed in kangaroo position for three hours, and then the vital signals and other data were again collected. The first assessment was the body temperature, for three minutes, with the thermometer located in the infant's auxiliary folds, then heart rate was checked and the assessment was completed with measurement of the breathing rate for one minute on

the chronometer. During 3 hours, breast feeding times and sleeping rate per minutes were measured and all data were recorded in the questioner too.

The results obtained for the variables (heart rate, breath rate, temperature, sleeping times and breast feeding times) were taken into consideration, and the variation between the conditions of the two groups of KMC and one group of infants in the incubator was analyzed using the paired data analysis methodology (the Kruskal-Wallis nonparametric test), with a significance level of 5%. This test was applied with the aim of only having one analysis method.

**Results**

Data of sixty low birth weight babies were analyzed. The type of delivery in most of the cases was cesarean i.e. 60% in control group, 60% KMC in hospital (study group 1) and 65% KMC at home (study group 2). The mothers 60% in control group and 65% in KMC in hospital and 70% in KMC at home were high school educated. Most newborns in the control group (65%) and in case group 1 (70%) were boys and in case group 2 the sex population were equal. The average mother's age and weight were matched in all groups.

**Tables 1 & 2 indicate different parameters measured in case and control groups.**

**Table 1. Mean/S.D Measurement of Vital signs and sleeping time in different groups under study**

Variables Group	Breath rate	Hearth rate	Tempera- ture	Sleep time
Control	40.05/ 5.76	140.08 / 14.01	37.15/.32	115.81 / 27.75
Case1	44.22/ 4.69	148.31/ 9.93	37.44/.25	138.76/ 24.85
Case2	45.51/ 3.35	148.64/ 9.37	37.54/.28	151.41/ 10.50
p-value	<0.01	<0.01	<0.01	<0.01

**Table 2. Measurement Nutrition rate (%) in different groups**

Nutrition rate Group	0	1	2	3	4	p-value p < .001
control	0	66.7	31.7	1.7	.0	
case1	8	28.8	40.8	26.7	2.9	
case2	0	17.5	40.0	32.5	10.0	

**Discussion**

In a randomized controlled trial we assessed the efficacy of KMC to the vital sign, sleep rate, breastfeeding nutrition rate and mother and infant's attachment in healthy term low birth weight neonates. The purpose of present research was to evaluate the possible changes after application of the Kangaroo Mother Care and to look for the advantages of KMC over the incubator method. The demographic variables were matched and other variables of the KMCs and control group were compared. The two kangaroo groups received similar care but differed in the environment. The study results showed a significantly higher vital sign, sleep

rate, breastfeeding nutrition rate and mother infant's attachment in KMCs group compared to control infants. Based on the results of this study, there was significant differences in mean heart rate, respiratory rate, temperature and sleeping rate after applying skin to skin contact procedures, between the KMC (study) groups and the control group.

This study showed KMC has a better effect on vital signs, sleeping rates and improves attachment between mother and infants. So we demonstrated that KMC increases heart rate, breathing rate, temperature, sleeping rate and the mother and infant's attachment. This supports the works reports by other authors [15, 17, 22-24].

It is observed that KMC increases the respiratory rate to an optimum value. This observation was supported by other researchers in the related field [14]. It is well known fact that the normal respiratory rate in LBW newborns provides greater respiratory comfort for the newborn and stabilizes the heart rate [14, 22]. Comparing the heart rate in the two techniques we found a better regulation of the heart rate in the KMC technique rather than on incubator one, Johnston et al reported the same result which supports the result of present research [25]. Optimum heart rate decrease stress, increases sleep period and produces better brain activity [22,23].

Regarding the temperature, it was significantly increased in KMC infants and a higher auxiliary temperature was recorded. Placement of the infant underneath KMC uniform improved insulation and prevented heat loss [22] and many researchers also found the same result [26-28].

Our study recorded a higher proportion of breastfeeding rates among KMCs groups. The same results obtained by other workers in same field [11, 22, 29-30]. Evidence supports effectiveness of KMC to stabilize low birth weight infants. The goal of high nutritional rate of these infants with less than 2000 grams is to achieve accelerated growth rate. This intervention has not side effects too [31]. Results showed that Infants in the KMC groups had more sleep rate after applying KMC. Sleep is one of the most important growth parameters in LBW babies [23-24, 32-33]. The present study reflects a significant effect on mother and infant attachment and thereby we may conclude that KMC care facilities the attachment. Ludington, et al reported advantage of the kangaroo mother care to measure the effect of KMC on parenting outcome and preterm infant development. Their result showed the importance of body contact for infants [34-35].

The attachment is described as a factor in relationship between mother and infant [36]. KMC could influence the relation between mother and child and decrease the stress between them [37-39, 23].

The parameters studied in KMC group at home showed better results rather than the group receiving the same care at hospital [23-24, 40]. This may be explained by the fact that care at home play a significant role in KMC technique [41]. Naturally the mother at home is more comfortable and This improve the situation [42-45, 35].

**Conclusion**

From the results of present study one can conclude that KMC is a suitable technique for low birth new born infants, particularly if the care is done at home and one more advantage of the technique is in third world countries where reducing medication expenses is very important.

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