

Research Article

The effect of Kangaroo Mother Care on the incidence of infection, thermoregulation, and weight gain in neonates admitted in the NICU, at (FMIC) hospital, Kabul, Afghanistan

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Abstract

Background

Being fragile and yet to develop competent immune systems, many premature neonates; are prone to health-related problems, and they require admission in neonatal intensive care (NICU) units. Kangaroo Mother Care (KMC) is a cost-effective alternative to costly incubator/warmer care. Therefore, this study provided evidence about the effects of KMC on the incidence of infection, thermoregulation, and weight gain.

Materials and Methods

A quasi-experimental study has been conducted over three months. The outcome variables were incidence of infection, temperature regulation, and weight gain. The subjects were enrolled with a convenient method of sampling according to inclusion (all stable preterm neonates, weight < 2500g) and exclusion criteria (preterm neonates with medical condition). They were assigned into

two groups (KMC and CC) at different times but in the same season (winter). Each group has been supervised for one and half months and the changes in the baby's weight, temperature, and incidence of any infection have been documented. After the intervention, the data was recorded, tabulated and the results were analyzed statistically by SPSS statistical software (version 16). We described the results with mean, standard deviation, frequency, percentage. We used the independent-test, Chi-Square test to analyze the outcomes.

Findings

There were significant differences in the incidence of infection and weight gain before and after intervention between the two groups. After pretest and posttest the Chi-Square test value obtained 0.005, it shows the difference in incidence of infection between two groups and it was significant, $P \leq 0.001$. There was a difference in weight gain between two groups before and after intervention, so the paired "t" test value obtained (-.775) and it was significant, $P < 0.05$. The thermoregulation among babies changed; however, it wasn't significant $P > 0.05$.

Conclusion

KMC is an effective method of care for preterm babies and it has effect on different aspects of a preterm baby like weight gain, the incidence of infection and we can say in general on their growth and it is a cost-effective method too especially for the neonatal services in developing countries like Afghanistan. This method was affected on gaining weight of babies and positive factor for prevention of infection among preterm babies.

Keywords: Conventional Care (CC); Kangaroo Mother Care (KMC); Low birth weight (LBW); Preterm Baby, weight gain

Background

Globally, 2.8 million newborns die each year worldwide, comprising 44% of under-five child deaths. Newborns in low and middle-income countries (LMICs) like Afghanistan contribute to 98% of this burden [1]. The highest neonatal mortality rates are seen in South Asian countries which result in almost 2 million newborn deaths in the region each year. According to the Afghanistan Demographic Health Survey 2015 (DHS), the mortality rate of children below one-year is 45 per 1000 live birth while a significant percentage (22%) of this mortality is happening during the neonatal period [2]. Preterm birth is the birth of an infant at less than 37 weeks of gestational age. It is the most important cause of neonatal mortality. Each year it consists of about 27% of 4 million neonatal deaths. Globally each year at least 15 million neonates are born preterm [3]. Preterm birth is not only an emotional burden for families but also it is an economic burden on society. The societal cost of premature births in the United States considering its medical costs, educational costs, and lost productivity has been estimated to be at least 26.2 billion dollars each year. The average length of hospital stays for preterm infants is 13 days which is higher than 1.5 days for term infants. The medical costs of hospital stay are higher as well as (\$32,325 compared to \$3,325) [4]. The most common complication of preterm birth is low birth weight. Low birth weight (LBW < 2500 g regardless of gestational age), is an

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important predictor of infant death within 28 days of birth. Overall, it is estimated that 15% to 20% of all births worldwide are LBW, representing more than 20 million births a year, the great majority of them reported in low-and mortality [5]. Neonatal infections account for a significant proportion of neonatal deaths in the first week of life. Infections are one of the three major causes of neonatal mortality and account for approximately a quarter of newborn deaths in the first month of life. In sub-Saharan Africa, South Asia, and Latin America where neonatal infections are more prevalent, the risk of severe bacterial infections in the first month of life is 9.8% [6]. Another main problem that newborns suffer from is hypothermia. One of the most critical factors in the survival of newborn babies is the satisfactory maintenance of their body temperature to prevent hypothermia, which is one of the major complications in the newborn period. Hypothermia is a significant contributory element in neonatal mortality rate (NMR) which is preventable with minimal technological and training interventions. The World Health Organization (WHO) estimates that globally 18 to 42 percent of annual infant deaths are caused by hypothermia [7]. The high neonatal mortality rate in a country reflects the poor availability, poor quality, and quantity of infrastructure and utilization of neonatal care of that country. On the other hand, NICU is one of the cost-intensive and rational uses of neonatal unit services by targeting its utilization for the very low birth weight neonates, and maintenance of community-based home-based newborn care is required [8].

The basic needs of LBW infants include love, touch, warmth, safety, and security. These needs of these high-risk group infants must be met when they are admitted to NICU. The health team members working in NICU play a vital role in providing individualized comprehensive care for these preterm babies based on their needs. An innovative approach to include the mother in her baby's care in the NICU is Kangaroo Care [9]. Kangaroo Mother Care was first proposed by Rey and Mortinez in 1978 in Bogota, Colombia. It was an alternative to the incubator, where the care of preterm infants was not satisfactory. KMC is a type of care for preterm and premature infants whereby the infant is placed in an upright position against the parent's chest, with early skin-to-skin contact between the parent and infant. KMC has three main components: thermal care, support for exclusive breastfeeding, and early recognition and response to complications. In addition, it is postulated that the baby is colonized by the mother's commensal organisms, reducing the risk of nosocomial infection, especially in a hospital environment [10]. KMC has been recognized to have many benefits such as improving infant physiological function, increasing breastfeeding rate, decreasing the length of hospital stay, minimizing infection, and increasing the baby's daily weight [11]. Despite the evidence about its efficacy, kangaroo care is not widely utilized due to several barriers including an absence of standardized protocols and a lack of knowledge about its benefits. Kangaroo care can become a widespread formalized practice after nurses and parents learn about the technique and its numerous benefits for premature infants [12]. According to the review literature which has been done through the current study, there wasn't any literature about KMC, its implementation, or its benefits in the context of Afghanistan. Furthermore, there are no policies exist for KMC of low-birth-weight/premature newborns, antenatal corticosteroids in the management of preterm labor, or maternity protection [13]. According to the situation of neonatal health and economic status in Afghanistan, the researcher felt the need for conducting a study on KMC and its benefits.

Objective

To compare the effects of KMC and Conventional Care (CC) on the incidence of infection, thermoregulation, and weight gain of neonates admitted in the NICU at FMIC hospital, Kabul, 2019.

Materials and Methods

The research design used for the present is a quasi-experimental pretest and posttest design with a control group. The samples for this study have been selected by adopting the non-probability convenience sampling technique. The investigator has been chosen the sample by using the Inclusion and Exclusion criteria and identified 50 babies admitted to the NICU of the French Medical Institute for Mothers and Children (FMIC) hospital in Kabul. Inclusion criteria was all preterm neonates weight <2500gr, free from medical problem. Inclusion criteria all neonates with medical problem, need to resuscitation oxygen therapy and discharge < one week.

For conducting this research, ethical approval was sought from the Common Ethics Committee (IR.TUMS.FNM.1398.107) of School of Nursing and Midwifery; Tehran University of Medical Sciences and Research and Ethics Committee (E.1119.0100) of Ministry of Public Health of Afghanistan, as well as the Ethics Committee (61-FMIC-ER-19) of FMIC hospital. Informed consent, voluntary participation, and confidentiality have been maintained at the beginning of study. All subjects were assigned into two groups non-randomly, CC (conventional care) as a control group and KMC (kangaroo mother care) as an intervention group at different times to minimize the bias that may happen according to parents' perspectives and because of subjects shortage. The neonates assign to the CC group have been managed under routine NICU care.

Before starting the intervention, the pretest form will be charted. Both group assessed for at least three months in the Winter (separately with each group at a different time supervised so that the first one and half month for the CC (conventional care) group and one and half month for KMC group) at the same season and the changes in baby's weight (the normal weight gain in neonates is about 20-30gr/d but a gain of 10-15g/d is also acceptable as criteria) [14], temperature (developing hypothermia or hyperthermia during the observation time), and incidence of any infection(the sign and symptoms like fever, tachypnea...) was documented.

During hospitalization all routine cares have been observed and documented by the researcher in data collection tools. Before conducting routine care, selecting the subjects according to criteria was done, the consent form was given for mothers to fill it out, and pretest form has been taken. Following up has been done after discharge by telephone connection or home visiting until the specific date for posttest, after 45 days parents were asked to return to the clinic for the posttest to assess all variables. In the cases that the parents couldn't come for follow-up, the researcher has been conducted the posttest by visiting them at their home.

For intervention group after group assignment taking samples none randomly, solving ethical points, and taking consent from parents. Mothers were educated by the researcher for how to perform the KMC; the education was done one by one for every mother by the researcher by showing them in an educational video. KMC was done intermittently two times daily for at least sixty minutes by mothers. Mothers educated that the intervention should not end less than sixty minutes because frequent changes make babies stressful. For the

correct position of the baby during the KMC, babies have been placed upright on mother's chest between the mother's breasts on either abdomen; cover the baby's back with the dress or blanket which have used for mothers to protect from side draft and slipping. The baby's head was turned to one side, in a slightly extended position. The hips and arms had been flexed in a frog position [15]. The abdomen of the baby was not constricted to maintain enough space for abdominal breathing and the mother's breathing can stimulate the baby. To monitoring, the baby's condition, and baby's axillary temperature checked before and after KMC, all vital sign measurements considered in observation [16]. Babies in KMC position can retain normal body temperature of 36.5°C to 37.4°C. Because hypothermia is rare in KMC infants but it can occur (World Health Organization, 2003). The normal heart rate of a full-term newborn should be ranging from 120 to 160 beats per minute. The normal respiratory rate of a baby should be between 30 and 60 breaths per minute without apnea. The baby's lips and face should not turn blue. Oxygen saturation should be above 90 percent. The prone position is one of the risk factors of Sudden Infant Death Syndrome [16]. All these issues considered in each step of intervention.

At the time of discharge all parents have been educated to inform the researcher or refer to the clinic in case of any problem happens to their babies during the follow-up time [18]. For following up after discharging of the baby and mother, the researcher assessed the KMC as routine by telephone or visiting mothers at home that they conduct the KMC at home or not. During every home visiting or assessing by telephone which has done once a day; mothers have been asked for any baby's condition in case of sign and symptoms if developed in baby; it consider as an alarm for infection process or illness and documented by the researcher. After the specific time (45 days) mothers were asked to return the baby to the clinic for reassessment and conducting the posttest process.

During worldwide problem of Covid19 in the middle of the study the researcher obligated to suffice for telephone connection and online contact once a day during follow up, this condition was the worst condition which wasn't anticipated before. All term of study was done with observance of health protocols. Fortunately, there wasn't any positive case of Covid19 between infants and their mothers.

For the better supervision and performing of intervention the researcher passed the KMC performance workshop and passed observation period on Children Medical Center, Tehran University of Medical Science and has been certified to educate others.

Data analysis

Data were analyzed using SPSS software version 16. The rate of weight gain and temperature regulation has been reported by Mean ± SD. The rate of infection has been reported by frequency and percentage. The comparison between two groups was conduct by independent samples t-test and Chi-square test based on normality of distribution and comparison of variables between two groups.

Results

Incidence of infection	Posttest				Total in percentage Frequency	Chi-Square Test P-Value
	Control		Intervention			
	No	%	No	%		
Positive	12	24%	3	6%	30%	(0.005)
Negative	13	26%	22	44%	70%	
Total	25	50%	25	50%	100%	

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Negative	13	26%	22	44%	70%	
Total	25	50%	25	50%	100%	

Table 1: The comparison of frequency and the distribution of the incidence of infection in two groups after the intervention. The result of pretest was negative in both groups.

Discussion

The number of infections in the control group 12 was more than the number of infections in the intervention group 3. According to the Chi-Square test, there is a significant difference between groups in the rate of infections, $P < 0.05$. Therefore our study's findings show that KMC can be effective on the incidence of infection among preterm neonates. Some factors related to this finding such as better mother infant bonding, frequent breast feeding and better communication with doctors and nurses and increasing the knowledge of mothers about the different health-related problems of preterm neonates. Similar to our finding in a study that assessed the effect of KMC on the incidence of infection, Swarnkar K et al. 2016, conducted a non-randomized clinical trial on the effect of Kangaroo Mother Care on growth and morbidity pattern in Low-Birth-Weight Infants. They found that the number of infected preterm babies in the KMC group was less than the CC group [17].

The mean weight gain in the KMC group was more than the mean weight gain of the control. This result was statistically significant $P < 0.05$. The factors may related to this finding such as increased the rate of breastfeeding, increased mothers' self-confidence about caring their infants and infants energy saving. Similar results were also seen in a study by Mwendwa et al. 2012, in Kenya who conducted an unblended randomized control trial to assess the impact of partial kangaroo mother care on growth rates and duration of hospital stay of low birth weight infants. They stated that the KMC group infants achieved a higher mean weight gain of 23.6g/kg/d compared to 18.1 g/kg/d in the control group infants, ($P < 0.001$) [18].

The findings of this study about changes in thermoregulation weren't statistically significant. The reasons for this finding may be some factors such as immature skin layers and the mother's unfamiliarity with the method of KMC which effect on the implementation of the method perfectly and small space and crowded ward. Supporting the findings of the current study related to the effect of KMC on thermoregulation, Jafari M, et al. 2014 conducted a clinical study to assess the effect of kangaroo mother care on weight gain, hospital stay length, and controlling the temperature of preterm neonates with low birth weight in neonatal intensive care units of selected hospitals in Iran. Her findings showed positive effects of KMC on all physiological terms of preterm infants. But the changes in thermoregulation were not statistically significant [19]. However, there are many studies that their findings show a positive relationship between KMC and thermoregulation in comparison to the findings of the current study. An RCT was conducted in the USA by Ramani M, et al. to assess the effectiveness of KMC on preventing neonatal hypothermia. Their findings showed that there were not any hypothermia episodes in the KMC group [20].

Groups	Mean	SD	“t” test value	P-Value	df	t	p-value	Weight gain				
								Mean	SD	T test value	P-value	
Daily weight gain												
Control	.010	.006	-5.04	.000	24	-8/000	<0.001	0.47	0.27	-5.048	(0.000)	
Intervention	.019	.005			24	-17/021	<0.001	0.85	0.25			

Table 2: The table shows the comparison of daily weight gain between two groups, the results of the paired “t” tests comparing the weight gain in two groups before and after the intervention, the comparison of the Mean and Standard Deviation of weight gain after the intervention period and “t” test values.

Babies temperature	Pretest				Total in percentage Frequency	Chi-Square Test P-Value	Posttest				Total in percentage /frequency	Chi-Square test/ P-value
	Control		Intervention				Control		Intervention			
	No	%	No	%			No	%	No	%		
Hypothermia	16	64%	4	16%	40% 20	0.001	8	32%	2	8%	20% 10	(0.074)
Normothermia	9	36%	21	84%	60% 30		17	68%	23	92%	80% 40	
Total	25	50%	25	50%	100% 50		25	50%	25	50%	100% 50	

Table 3: The comparison of frequency and distribution of temperature regulation between two groups before/after the intervention.

Conclusion

This was a quasi-experimental study to assess the effect of Kangaroo Mother Care on the incidence of infection, thermoregulation, and weight gain among neonates who were admitted in the NICU. There were significant differences between the two groups before and after the intervention regarding the infection incidence. The KMC affects the incidence of infection and it can prevent various illnesses. KMC had a positive effect on babies’ weight gain and there were significant differences between the amounts of babies’ weight gain. According to the result of this study regarding the effect of KMC on babies’ body temperature and thermoregulation, there wasn’t a significant difference after intervention among the two groups. As this study was done for short periods with small sample size the generalization of the results will make problem and as well as this study was the first study in Afghanistan so further researches are needed regarding its acceptability in Afghanistan.

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Author’s contribution

Begjani. J, conducted and led the design of the study and helped in data analyzing. Mirlashary. J, provided advice on the design of the study. Noori. A, conducted the study and wrote the manuscript.

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Not applicable

Availability of data and materials

The data set used during the study is available to the authors.

Declarations

Ethics approval and consent to participate

The article is the result of the thesis for MSc degree in Neonatal Intensive Care. It was approved by the ethics committee of the of School of Nursing and Midwifery of Tehran University of Medical Sciences with the code of ethics (IR.TUMS.FNM.1398.107), Common Ethics Committee of the FMIC hospital with the code of ethics (61-FMIC-ER-19) and approval obtained from Research and Ethics Committee of Ministry Of Public Health of Afghanistan with the code of ethics (E.1119.0100). The researcher informed all of the participants about the course of study, being free to participate or withdraw from the study. Written consent form was obtained from all participants. KMC was performed with full respect for privacy and ethical codes, without compromising the newborn’s treatment and care process.

Consent for publication

We agree submit this article to the journal and, if accepted, to its publication in this journal. We warrant that this article is original, dose not contravene on any copyright and any other proprietary right of any third party, is not under consideration by another journal, and has not been previously published.

Competing interest

The authors express that they have no competing interest.

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