

# Outcome of Kangaroo Mother Care in Preterm, Low Birth Weight Neonates; A Randomized Control Trial

Nadeem Ahmad<sup>1</sup>, Syeda Shireen Gul<sup>2</sup>, Muhammad Hayat Khan<sup>3</sup>, Fasih Hashmi<sup>4</sup>, Azka Batool<sup>5</sup>,  
Ambreen Fatima<sup>6</sup>

<sup>1,3,6</sup> Senior Fellow, <sup>2</sup>HOD Dept. of Neonatology, <sup>4</sup>Research Associate, <sup>5</sup>Senior Resident

<sup>1,2,3,6</sup>Department of Neonatology, Children hospital, Pakistan Institute of Medical Sciences PIMS, Islamabad

<sup>4</sup>AIOU, Islamabad, <sup>5</sup>Dept of Obs & Gynae MCH PIMS

## Author's Contribution

<sup>1</sup>Study plan, manuscript writing

<sup>2</sup>Overall supervise the research project, review all the steps

<sup>3</sup>Data collection, research methodology writing, <sup>4</sup>Data analysis, result interpretation and writing, <sup>5</sup> Manuscript writing

<sup>6</sup>Data collection, active participation in active methodology

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## Address of Correspondent

Dr. Nadeem Ahmad  
Neonatology Dept. PIMS,  
Islamabad  
drnadeemahmad@hotmail.com

## ABSTRACT

**Objective:** To compare the mean weight gain, duration of hospital stay and mortality rate in preterm/low birth weight neonates given Kangaroo Mother Care as compared to neonates not given KMC admitted in Neonatology Dept.

**Methodology:** Randomized Control Trial study was conducted in the department of Neonatology, Children hospital, Pakistan Institute of Medical Sciences (PIMS), Islamabad from July to December, 2021. The neonates admitted in Neonatology department due to prematurity or low birth weight with no hemodynamic instability were included in the study. The selected neonates were divided into two groups. Group A neonates were given Kangaroo Mother Care whereas the neonates of group B were given conventional care.

**Results:** Overall 60 neonates were included in the study. The both groups were unbiased with respect to base line characteristics i.e. gestational age, Age at start of the study, birth weight, length and OFC. The results showed that the both groups were not significantly different with respect to duration of hospital stay, proportion of early discharge from hospital with p value 0.171 and 0.152 respectively. There was no significant improvement found in neonatal length and OFC at any time till the last follow-up after 2 week between two groups, whereas neonatal weight was significantly increased in KMC group at second follow-up with p value 0.036.

**Conclusion:** KMC was found to be effective for weight gain in neonates as compared to the conventional care.

**Key words:** Kangaroo Mother Care, Low birth weight, Neonate hospital stay, Preterm

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## Introduction

According to recent estimates, approximately 4 million infants lose their lives per annum in the early 4 weeks of their lives.<sup>1</sup> Low birth weight is one of the major causes of death in newly born infants. Low birth weight (LBW) is a particular condition in which the weight of the infant is less than 2500 g, according to the guidelines issued by the World Health Organization (WHO).<sup>2</sup> Developing countries are facing serious issues coping with the incidence as well as mortality caused by low birth weight.

LBW contributes to about 60 to 80 percent of all the fatalities occurring in newborn population.<sup>3</sup>

Maternal age has a direct impact on pregnancy outcomes. If the age of the mother is less than 20 years or the age of the mother is more than 30 years, then there is a higher risk that the mother will give birth to a low-birth-weight infant.<sup>4</sup>

Although many advancements have been brought in the fields of obstetrics and neonatal care, the rate of preterm/LBW births is still increasing throughout the world, accounting for almost 10.6 percent of all live

births.<sup>8</sup> During recent past years, preterm birth cases have increased in different parts of the world.<sup>9</sup> Studies have also reported that the inadequate body mass index (BMI) of mother prior to conception and the gaining of immense weight during pregnancy are important reasons for causing low birth weight.<sup>10</sup>

Evidence showed that risk of such complications can be reduced with kangaroo mother care; very little research has been done in this aspect in Pakistan. The aim of this study is to determine the effectiveness of KMC in resource limited country like Pakistan.

## Methodology

This randomized control trial was planned in Department of neonatology, Children hospital, Pakistan Institute of Medical Sciences (PIMS), Islamabad from July to December, 2021. The study was carried out after approval of ethical board of the hospital. 60 stable preterm infants were selected through consecutive sampling for this study.

Preterm neonates having weight at birth not more than 2kg with mother's willingness to provide KMC were included in the study. The neonates who were hemodynamically unstable, on any type of respiratory support i.e. oxygen, CPAP, ventilator. Babies with or after major surgery or with severe gross congenital anomalies were excluded in the study.

The sample size of the study was calculated with the help of WHO calculator and based on statistical results of reference study using level of significance of 5%, power of test 99%, and population standard deviation (SD) 4.5gm per kg per day, mean weight gain per kg per day of neonates treated with KMC was 15.9gm and without KMC was 10.6gm.<sup>11</sup> The minimum required sample size on the basis of the statistics mentioned above was 27 in each group so we include total 60 neonates and divided them into two equal groups of 30 neonates each treated with KMC and conventional care. The cases were divided into two groups through computerized randomization process.

A self-designed questionnaire was used to collect the necessary variables for this study. A written consent was taken from each participant after explaining the objective of study. After inclusion, neonates were categorized into two groups, one group received kangaroo mother care, either continuous (KMC more than 20 hours/day) or intermittent KMC (less than 20 hour/day) and the second

group received conventional care. Kangaroo mother care consisted of placing the newborn upright in a skin to skin position against the mother's (or caregiver's) chest. The newborn was closely monitored for weight gain, feeding, and illness and was discharged when one of the following criteria was fulfilled:

- All medical illness has resolved,
- Mother has been trained to give KMC at home
- Infant is gaining weight (> 15gm/kg/day)
- Mother is trained to feed the baby (either Breast, Gavages/Nasogastric feed)

Infants were followed after discharge and growth parameters were monitored and entered in the self – design Performa.

Data was analyzed with SPSS version 23. The main outcomes of the study were neonatal age, weight, length, Occipito frontal circumference, and feed volume at birth, at the start of the study, at discharge from the hospital, at the first follow-up after one week, and at the second follow-up after two weeks. The total duration of stay in days in NICU was also compared between the two groups. Kolmogrov Smirnov test, Mann Whitney U test, Independent sample t test and chi-square test were used to compare the two study groups. P-value of <0.05 was considered significant.

## Results

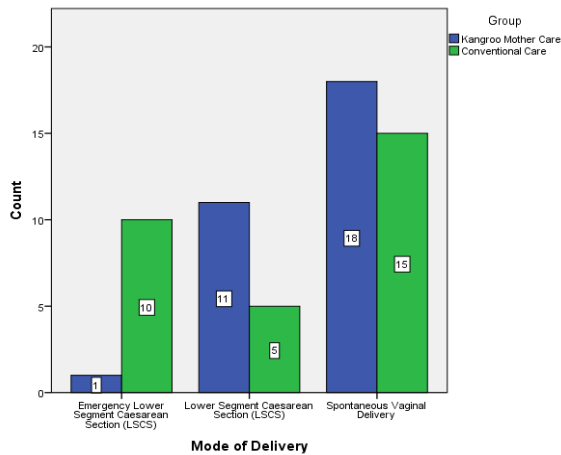
Sixty neonates, included in our study, were divided into two equal groups through randomization. In group A, neonates received KMC whereas in group B neonates received conventional care. The majority of the women came from Rawalpindi 29 (48.3%), whereas 21 (35%) were from Islamabad and only 10 (16.7%) were from other neighbouring cities. Out of 60 cases, the majority of them were spontaneous vaginal delivery (SVD) 33 (55%) from which 18 out of 30 (60%) in group A and 15 out of 30 (50%) from group B. (Figure 1)

The neonates were compared at baseline before starting the procedure. The non-significant difference of gestational age, birth weight, neonatal occipitofrontal circumference, neonatal length, neonatal age, and weight, showed that the subjects of two groups were identical.

Kolmogrov Smirnov test was used to test the normality of the quantitative variables of the data. The baseline characteristics of the two groups were not normally distributed at 5% level of significance having p value

0.039, 0.002, 0.001, 0.000, 0.001 and 0.013 respectively. (Table I) The Mann-Whitney U test was used to compare the mean rank of the baseline characteristics and the results showed that both groups were completely unbiased and had no difference with respect of baseline characteristics with p value 0.067, 0.646, 0.272, 0.253, 0.056 and 0.641 respectively.

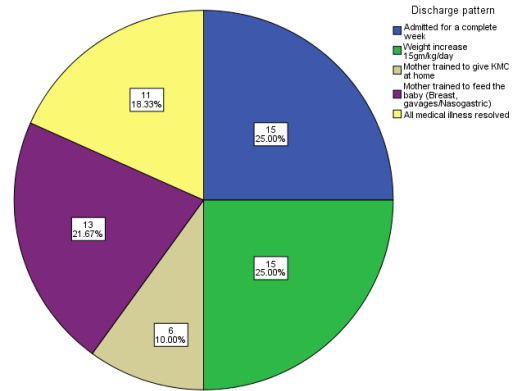
A total of 17 (28.3%) neonates were admitted for the whole week, while rests of the neonates were discharged earlier from the department. The reasons of early discharge are highlighted through pie chart in Figure 2.



**Figure 1. Cluster bar chart for comparison of mode of delivery between two groups.**

Base Characteristics	Group A	Group B
Gestational age	32.87±2.71	33.87±1.74
Birth weight	1441.67±277.19	1463.33±205.63
Occipitofrontal circumference	30.63±2.01	30.13±1.11
Neonatal Length	38.57±9.02	38.43±4.24
Neonatal age at the time of start the procedure	11.17±10.52	6.80±7.87
Neonatal weight at the time of start the procedure	1367±268.02	1447.33±213.19

The proportion of early discharge was 43 (71.7%) out of which 19 out of 30 (63.6%) from group A, and 24 out of 30 (80%) from group B. There is no association between early discharge and KMC with p value 0.152. The duration of hospital stay was not normally distributed having p value 0.045. The Mann Whitney U test showed that the mean ranks of the duration of hospital stay was not significantly different with p value 0.171.



**Figure 2: Discharge pattern of the selected neonates of the study**

Komogrov Smirnov test showed that neonatal weight at the time of discharge from hospital, neonatal weight at first follow-up after 1 week and neonatal weight at second follow-up after 2 weeks of discharge were followed by normal distribution, having p value 0.2, 0.2 and 0.08 respectively, whereas OFC and length at the time of discharge, at first follow-up and on second follow-up, were not normally distributed having p value 0.009, 0.000, 0.000, 0.000, 0.000, and 0.000 respectively. The result of the independent sample t test is mentioned in table II.

**Table II: Mean comparison of quantitative variable between two groups.**

Neonatal weight	Group A	Group B	P value
At the time of discharge	1582.6±204.97	1589±197.65	0.902
At first follow-up after 1 week	1699.5±208.90	1653.9±202.32	0.394
At second follow-up after 2 weeks	1839.87±233.48	1717.67±207.83	0.036

The Mann Whitney U test used to compare OFC and length at the time of discharge, at first follow-up and on second follow-up between two groups. The result showed that there was no significant difference between mean ranks of OFC at the time of discharge, at first follow-up and on second follow-up between two groups at 5% level of significance having p value 0.201, 0.230 and 0.221 respectively, whereas length at the time of discharge, at first follow-up and on second follow-up between two groups was significantly different at 5% level of significance with p value 0.03, 0.026 and 0.023 respectively.

## Discussion

Neonate birth weight is seen as an indicator of maternal and fetal health. Neonates having low birth weight are at a higher risk of facing death because of underdeveloped organs, life sustaining systems, and also because of their inability to physically react against the external environment in which they are placed.<sup>12</sup> Problems linked with LBW i.e. mortality in infants are of serious nature. Some of these issues include feeding difficulties, hypoglycemia and hypothermia, pulmonary immaturity, increased susceptibility to infection, and fluid and electrolyte imbalances.<sup>13</sup>

In a Nigerian study, the researcher observed that the survival rate of the KMC group was 73% as compared to 20% in Non-KMC group, weight gain  $15.9 \pm 4.5$ g/day in KMC group while  $10.6 \pm 4.5$ g/day in Non-KMC group, and hospital discharge after  $27.2 \pm 7$  days in KMC group and  $34.6 \pm 7$  days in non-KMC group.<sup>11</sup>

In a similar study, the neonate weight gain in both KMC and Non-KMC groups are comparatively low but have a significant difference. The mean weight gain per kg per day in KMC group was  $9.85 \pm 4.24$  gm while in Non-KMC group the mean weight gain per kg per day was  $7.70 \pm 3.26$  gm which was significantly different with p value 0.000.<sup>18</sup> The same results was found in a study conducted in Egypt where the mean daily weight gain in KMC group was  $22.1 \pm 2.5$  gm which was significantly higher as compare to the control group  $10.4 \pm 2.5$  gm with p value 0.001.<sup>19</sup>

In a recent meta-analysis, based on 13 randomized control trials, the researchers concluded that the neonates care with KMC at least 6 hours per day got significant weight gain as compared to the Non-KMC group with a mean difference 8.99 gm per day. They also concluded that the infants received KMC for less or equal to 02 hours per day not showed a significant difference in weight gain as compared to controls.<sup>16</sup>

In our study, gradually patients were educated with KMC and the majority, 22 out of 30 patients, were admitted and learnt about KMC equal to or more than 5 days in hospital. Similarly, in first two days of the KMC procedure only 23% (7 out of 30) neonates got KMC equal to or more than 20 hours per day, and after two days this pattern was turned over and the percentage of neonates who got KMC more than 20 hours per day was increased up to 56% on day 3 and 70% on day 4.

Many studies have concluded that a complete implementation of KMC technique is not possible as observed in most cases. The difficulties in the implementation are mainly related to insufficient infrastructure development, smaller number of experienced workers, and a supportive environment, which is needed all the times. Proper follow-up after the discharge of mother from the health facility remained a major concern. Hence, leadership have a vital role to manage the above hurdles to implement KMC practice in the neonatal but these components are not constantly available in the department.<sup>14</sup> The effectiveness and outcomes of the strategy are found to be affected by the external influences which result in the quality of implementation of KMC to decrease.<sup>15</sup>

In another study, the researchers identified that the level of motivation among the health care providers may deteriorate the implementation procedure and objectives of KMC technique.<sup>16</sup> In a short communication Tahir & Fatmi highlighted the benefits of KMC specifically in respect of rural area of Pakistan and concluded that it reduce the cost of hospital care and reduces patient burden on hospital by reducing postnatal hospital stay duration.<sup>17</sup>

## Conclusion

KMC is very useful technique for weight gain in low birth weight neonates. Furthermore, it is an effective intervention in reducing the hospital stay of preterm and low birth weight neonates.

Limitations: Because bed facilities in public care hospitals are very limited due to increasing patient workload, we did not pressurise the selected mothers to stay in the department for a longer period of time for this study, as many other patients were waiting to be transferred to KMC ward. Hence, we couldn't completely monitor the case till the neonate gain weight up to 2.5 kg leading to inability to note down the exact duration required to attain weight of 2.5 kg.

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