

## Effect of Kangaroo Mother Care on Premature Infants' Physiological, Behavioral and Psychosocial Outcomes in Ain Shams Maternity and Gynecological Hospital, Cairo, Egypt

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**Abstract: Background:** Kangaroo Mother Care (KMC) is a method of skin-to-skin contact that has physiological, behavioral and psychosocial gains for premature infants. **The aim** of this study was to evaluate the effect of KMC on premature infants' physiological, behavioral and psychosocial outcomes. **Study design:** It was a quasi-experimental study. **Subjects and Methods:** A purposive sample composed of fifty premature infants and their mothers were chosen from the Neonatal Intensive Care Unit (NICU) at Ain Shams Maternity and Gynecological Hospital according to inclusive and exclusive criteria and recruited into two identical groups: group one was the study group (25) received KMC and group two was the control group (25) received conventional care. The data were collected through using the kangaroo Mother Care Assessment Flow Sheet (KMCAFS) and Mother Bonding Behavioral Scale (pre/post). The researcher was available three days per week, five hours per day from 10 am to 3pm. The average number of cases that was taken per week ranged from 2 to 4 premature infants and their mothers. **Results:** Approximately, fifty percent of premature infants' gestational age was 34 - ≤ 36 weeks and < 32 weeks in both study and control groups respectively. Meanwhile, the birth weight in three fourths of study group was 2000 - < 2500 grams and more than half of premature infants' diagnosis was prematurity. Regarding, the premature infants' physiological outcomes, it was found that there was statistical significant differences pre and post KMC application ( $X^2 = 17.64, 17.64, 7.76$  and  $0.36$  and  $P$ -value  $\leq 0.05$ ) concerning heart rate, respiratory rate, temperature and occurrence of apneic episodes respectively. **Conclusion:** KMC was effectively and positively promoted premature infants' physiological stability, behavioral organization and enhanced psychosocial outcomes than those cared by the conventional care. **Recommendations:** Educational training program for all neonatal nurses in skills necessary to implement the KMC and further studies should be conducted to assess the neonatal nurses' knowledge, attitudes and practices regarding KMC.

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**Key words:** Kangaroo Mother Care (KMC), Premature Infants, Conventional Care.

### 1. Introduction

A premature birth is a birth that takes place more than three weeks before the neonate is due. In other words, after less than 37 weeks of pregnancy, which usually lasts about 40 weeks. Premature birth gives the neonate less time to develop in the womb. Although, premature infants especially those born earliest, often have complicated medical problems<sup>(1,2,3)</sup>, meanwhile not all premature experiences complications, these depending on how early a neonate is born, where's extremely preterm born at less than 25 weeks of pregnancy meanwhile very preterm born at less than 32 weeks of pregnancy and late preterm born between 34 and 36 weeks of pregnancy. However, most premature births occur in the late preterm stage. Generally, the earlier a neonate is born, the higher the risk of complications physiological and psychological<sup>(2,4)</sup>.

In Egypt, despite increased efforts to prevent prematurity, the prevalence of premature birth has significant rate. It may reach approximately to 41,728 each year. These statistic may indicates in some way the highly rate of Neonatal Intensive Care Units (NICUs) admission in hospitals every year<sup>(5)</sup>. Consequently, because premature infants are born too early and weigh much less than full-term neonates. They may have health problems because their organs did not have enough time to develop. So, they need special medical care in a NICU and stay there until their organ systems can work on their own<sup>(6)</sup>.

Approximately 6% of live births are preterm each year in the UK, while in the USA the incidence is as high as 12%<sup>1</sup>. Demand for neonatal care has risen year on year, and currently premature infants account for more than 70% of Neonatal NICUs admissions<sup>(7)</sup>.

In 2007 in England alone, around 60,000 babies (one in ten births) were admitted to NICUs<sup>(8)</sup>.

Mothers of premature infants experience multiple stressors and negative emotions, such as anxiety, guilt, helplessness and depression<sup>(8,9)</sup>. The highly technical environment, as well as the appearance and behaviors of the premature infant frequently lead to disruptions in assuming the maternal role and a diminished quality of mother-infant attachment<sup>(9)</sup>. These early problems may contribute to prolonged difficulties with mothers and place premature infants at risk for further cognitive, emotional, behavioral, and developmental problem<sup>(10)</sup>.

Kangaroo Mother Care (KMC) is defined as a method of holding a small nappy neonate in skin-to-skin contact (SSC), prone and upright on the maternal chest. The neonate is enclosed in maternal clothing in order to maintain temperature stability. SSC contact should ideally start at birth, but is helpful at any time. It should ideally be continuous day and night, but even shorter periods are still helpful<sup>(11,12,13)</sup>. So, it is recommended that SSC with the mother should be employed regularly and consistently with medically stable premature infant, including those requiring respiratory support due to its beneficial effects. Thus, it is important that parents are informed about the benefits and process of KMC<sup>(6,7,13)</sup>.

In many countries, KMC was practiced in Neonatal Intensive Care Units (NICUs) for premature and low-birth weight infants and their families, allowing them to play a significant role in the care and survival of their neonate within the NICU setting. KMC provides a physical environment as safe as the incubator. Previous research has proven that KMC has been proved to be effective for maintaining body temperature, breastfeeding, stimulation and bonding irrespective of setting, weight, gestational age, and clinical conditions<sup>(14,15)</sup>.

Kangaroo care was first suggested in 1978 by Dr Edgar Rey in Bogotá, Colombia as an alternative to conventional care in order to compensate for overcrowding and scarcity of resources. Currently, kangaroo care is an adjunct to standard care for stable low birth weight and premature infants. The core feature is early positioning of the infant, clad only in a nappy, prone and upright on the mother or father's chest to maximize skin-to-skin proximity. Associated features are kangaroo nutrition (exclusive breast feeding whenever possible) and early home discharge in the kangaroo position. Since kangaroo care was first introduced more than 260 studies have been published relating to its safety, efficacy, and feasibility<sup>(16,17,18)</sup>.

Although, KMC maintain neurobehavioral organization and physiologic stability (oxygenation, heart rate, thermoregulation) during transfers and

holding, remain free from any adverse effects associated with transfer or skin-to-skin holding of infant, such as extubation and thermal instability, begin a bonding process, improve breastfeeding outcomes, and promote sleep and brain development<sup>(11,16,19)</sup>.

Furthermore, KMC helps to regulate the premature infant's heart rate and fewer apnea and bradycardia, best oxygen saturation level, better maintenance of temperature, analgesic effect, increases time spent in quiet sleep, enhances maternal-neonate attachment, improved breastfeeding success and longer breastfeeding duration, least caloric expenditure, faster growth rates and earlier discharge from hospital, recovery from birth-related fatigue, and longer alert states and less crying<sup>(20,21)</sup>.

Previous studies about KMC reported some high level of mothers' satisfaction with KMC because it allowed them to be closer to their babies. Hence giving them the opportunity to observe their growth and become fully involved in the care<sup>(21,22)</sup>. Premature infants come out of incubators and into cribs sooner, also premature infants feed earlier and more successfully and earlier discharge from the hospital<sup>(6,8,23)</sup>.

Advantages of KMC are not limited to the neonates, the mothers too derive benefits out of it. The bond between mother and neonates is strengthened by practicing the technique in neonatal care. KMC, also helps the mother to overcome trauma of the birth that did not go as desired. In this manner, mothers feel more confident to nurture their neonate relieve their stress. Improves neonate / maternal bonding. Mothers become more confident in caring for their neonate in addition to, mothers feel more involved in their neonates' care<sup>(19,20,24)</sup>.

Nursing care measures for successful KMC can guide efforts to promote no separation of mothers and premature infants through skin to-skin contact<sup>(19,25)</sup>. The steps to successful kangaroo care have been developed using the format of written KMC policies that are routinely communicated to all healthcare staff, in addition to train all healthcare staff in skills necessary to implement the policy pertaining to their area of care and inform all pregnant women about the benefits and management of KMC<sup>(25,26)</sup>.

Furthermore, help mothers of cesarean neonates and premature or sick neonates initiate KMC as soon as possible (able to tolerate transfer and skin contact without physiologic or behavioral compromise), and monitor premature neonate to ensure tolerance without physiologic and behavioral compromise and show the mothers how to position the neonate for both safe transfer and safe KMC<sup>(25,26)</sup>.

Additionally, practice KMC, allowing mothers and neonates to remain in skin-to-skin contact

24 hours a day, 7 days a week until discharge and give neonates at least 1 hour of KMC per session, if not continuous KMC, encourage KMC for all warming and comforting needs of neonates, give adequate thermal insulation (head cap, warm blankets, insulating cover as needed) to the neonate throughout KMC, lastly, foster the establishment of KMC support for mothers through posters, patient scrap books, patient record of KMC, and support groups that may assist even after discharge<sup>(26)</sup>.

Assessment of the mothers begins with determining their willingness to hold their premature infants skin-to-skin. criteria need to be met to establish mother willingness for KMC. The mothers need to have been given adequate information about KMC. So, that an informed decision is being made. If the mothers then agree, KMC is allowed. However, mothers' emotional readiness should be considered too. If the mother seems emotionally inappropriate (unavailable to neonate, withdrawn, uninterested, weepy/crying, not touching the neonate, not questioning about the neonate, not holding the neonate, not bonding or attaching well, uninvolved, uncommunicative, having only short/infrequent visits) and/or expresses helplessness, hopelessness, or guilt<sup>(24-26)</sup>.

So, it is important to encourage the mothers to do KMC because it helps maternal overcome feelings of guilt, empowers maternal, facilitates maternal emotional resolution of preterm birth, and promotes bonding, involvement, and better maternal-neonate interaction<sup>(25,26)</sup>.

Assessing mothers' feeding intentions is wise for securing maternal agreement to do KMC. If the mother intends to provide breast milk, encourage KMC as soon as possible and as often as possible. At least 20 minutes of KMC each day promotes breastfeeding, and suckling at the breast during KMC facilitates the hormonal stimulation that supports breast milk production. If the mother is receptive to having the infant go to the breast, encourage KMC because most neonates, including premature, can spontaneously move toward a nipple and try to suckle during KMC. Having the neonate in KMC often enhances maternal commitment to breast feeding<sup>(22,25,26)</sup>.

The neonatal nurse educate the mothers about KMC by giving an information verbally about benefits and needs to provide. Determine the mothers' readiness for KMC and obtain their agreement to provide KMC to their neonate. Secure all tubes and lines. Perform any needed procedures that may later interrupt premature infant holding, if possible. Set up rocker/recliner and privacy screen beside incubator. Check heart rate, respiratory rate, oxygen saturation,

and temperature and assess pain score before and 15 minutes after transfer<sup>(25,26,27)</sup>.

The neonatal nurse document premature infants' vital signs, oxygen saturation, and temperature before, during, and after KMC. Also, the premature state as sleep, awake, or crying before, during, and after KMC session. Indicate KMC session start and stop times on nursing flow sheet. Write brief note indicating how the premature infant tolerated KMC including mother's comments and positive reflections. Include amount of time spent in KMC and teaching given<sup>(27)</sup>.

#### **Significance of the Problem:**

Premature infants have significantly more developmental impairment than their term counterparts. The brain of premature infants is still immature and rapidly developing in the neonatal period. However, the premature infants in the intensive care environment are exposed to an abnormal environment, repeated invasive procedures and prolonged illness. This intense sensory impact adversely affects maturation and organization of vision, hearing, sleeping pattern, growth and consequently neuro-development and long-term outcomes of the premature infants<sup>(27)</sup>.

Developmental care provides a framework in which the neonatal environment and care processes are modified and structured to support the individual medical, psychosocial and developmental needs of the premature infant and family. Developmentally supportive care has been proposed as a means of optimizing the premature infants' development and diminishing the deleterious effects of prematurity<sup>(13)</sup>. It relates to a broad category of interventions which include clustering of nursery care activities as well as integration of parents and specific supportive behavioral techniques such as non-nutritive sucking and kangaroo care<sup>(13,16,27)</sup>.

#### **Aim of the Study**

The aim of this study was to evaluate the effect of Kangaroo Mother Care (KMC) on physiological, behavioral and psychosocial outcomes of premature infants.

#### **Research Hypothesis:**

There is a positive relation between application of Kangaroo Mother Care and premature infants' physiological, behavioral and psychosocial outcomes.

## **2.Subjects and Methods:**

### **A. Research Design:**

The study design was a quasi-experimental study.

### **B. Research Setting:**

This study was conducted in the Neonatal Intensive Care Unit (NICU) at Ain Shams Maternity and

Gynecological Hospital, where the setting being of highest capacity of premature infants.

### C. Research Subjects:

#### Sample Size and Characteristics:

A purposive subjects composed of fifty premature infants and their mothers were chosen from the previously mentioned setting and recruited into two identical groups: group one was the study group (25) received kangaroo mother care (KMC) and group two was the control group (25) received conventional care (routine incubator care by hospital staff nurses). The subjects were selected according to the following criteria **inclusive and exclusive criteria:**

#### -Inclusive criteria:

- All Stable premature infants as medically classified and both gender.

#### -Exclusive criteria:

- High risk premature infants with; infections, severe respiratory distress, ventilated premature infants or on oxygen therapy, and premature with congenital anomalies.

#### Tools of data collection:

Data were collected through the following tools

#### 1. Kangaroo Mother Care Assessment Flow Sheet (KMCAFS):

It was adopted from <sup>(15)</sup>, it was used to evaluate the effect of Kangaroo mother Care (KMC) on physiological, behavioral and psychosocial of premature infants outcomes. The necessary modifications were done by the researcher to suit the nature of the current study. It covered the following:

**a. Characteristics of premature infants**, as regards their birth weight, gestational age, chronological age, diagnosis, length of hospital stay and weight gain at discharge. These data were obtained from the premature infants' medical record during hospitalization.

**b. Characteristics of mothers, it includes:** Age, level of education and employment, obstetrical history such as; type of delivery, number of gravida, and parity.

**c. Effect of Kangaroo Mother Care on premature infants' physiological, behavioral and psychosocial outcomes;** it includes observation of:

- Premature infants' heart rate, respiratory rate, body temperature, occurrence of apneic episode, and weight gain at discharge (**physiological outcomes**).
- Premature infants' feeding type, crying and sleeping condition (**behavioral outcomes**).
- Maternal- premature infants' attachment (**Psychosocial outcomes**).

**d. Mothers' satisfaction, perception and suggestions** regarding Kangaroo Mother Care.

Questions were in the form of open and closed ended questions.

- The time consumed with each mother for application of kangaroo care and to fill the Flow Sheet by the researchers for each mother with her premature infant in study and control groups was 2-3 hours. Each **KMCAFS** was filled by the researchers' observation on spot individually and the average number of premature infants and their mothers who interviewed and observed per week was 2-4 for both study and control.

- Each premature infant was assessed pre & post KMC, for physiological, behavioral and psychosocial outcomes and the mothers' perceptions regarding KMC.

#### 2. Pre/Post Mother's Bonding Behavioral Scale :

It was adopted from <sup>(28)</sup>, it aimed to assess the mother's emotional, psychosocial, attachment and behavioral interactions for their premature infants during breast feeding through observation of each mother and premature infant by the researchers.

Some modifications were done to suit the nature of the current study. It consists of six statements, mother's responses were classified into two categories (positive attachment and negative attachment). All statements were scored on a scale from (0-1), whereas positive attachment (scored 1) and negative attachment (scored 0).

**Regarding the total score was 6 divided into two categories as the following:**

- Score from (3-6) referred to positive attachment.
- Score from (0 - <3) referred to negative attachment.

#### Validity and Reliability

The researchers reviewed the past, current regional and international related literature covering all aspects of the study using textbooks, articles in journal and scientific magazines. This helped the researchers to be acquainted with the research problem and guided them in preparation and developing the study tools. To measure content validity of the study tools, the researchers assure that items of the instruments were adequately represent what are supposed to measure by presented it to experts for review and validation.

To measure the stability of the responses from the same premature infant and mother and is form of test retest reliability. The researchers performed two separate assessments at two different times; these two data sets from the same researchers and then compared with each other.

#### Pilot study

A pilot study was carried out on 10 % of the study sampling (5 premature infants and their mothers ) at the previously mentioned setting to test the study tools for its clarity; validity and time require to fill it. The necessary modifications were done through



adding or omission of unneeded or repeated criteria prior to data collection according to the pilot study results. The premature infants and their mothers in the pilot study were excluded from the study sample.

#### **B. Field work:**

The actual field work was carried out from 15-6-2012 to 22-8-2012 for data collection. The researchers were available three days per week in Saturday, Monday and Wednesday, five hours per day from 10am to 3pm at the allowed time of mothers' visit for their premature infants. The number of cases that taking per week were ranged from 2 to 4 premature infants and their mothers in both study and control groups.

#### **Procedures :**

##### **A. Procedures for both groups (study and control groups):**

- Assessing the premature infants' vital signs (Temp., H.R., and R.R.) occurrence of apneic episodes, feeding, crying and sleeping condition of premature infants'.
- Assessing the mother- premature infants attachment.
- Assessing the mothers' satisfaction with their premature infants.

##### **B. Procedures for KMC (Study group):**

- Kangaroo Mother Care was performed only after the mothers were fully informed about the nature and purpose of KMC and when the mothers' verbal agreement was obtained.
- The nature, aim, benefits and effect of the study were explained by the researchers to all mothers included in the study.
- Giving the mother KMC booklet that was prepared by the researchers.
- **The researchers then prepared both the mother and the premature infant through:**
- Wrapping the premature infant in a blanket and giving for the mother.
- The premature infant was transferred from the incubator into KMC after routine incubator care was completed.
- KMC was carried out with the mother through holding the premature infant prone, clothed only in a diaper, skin-to-skin, between the mother's breast.
- All premature infants were held upright at a 30 – 40 degree angle. The premature infant's back was covered with a receiving blanket folded in fourths and placed beneath the mother's cover gown to insure premature infants' temperatures were sustained within a neutral thermal zone.
- Mother and the premature infant were sited on a chair in the feeding room.

- Mother was encouraged to rest during KMC, and breast feed the premature neonate.
- Assessing the premature infants' feeding during KMC for type of feeding.
- Assessing the mother-premature infants' interaction.
- Mother and premature infant had 60 minutes of undisturbed KMC.
- Returning the premature infant to the incubator.
- Assessing the premature infant's vital signs (Temp., H.R., and R.R.,).
- Assessing the premature infant's crying and sleeping condition.
- At the end, assessing the mothers' perceptions and suggestions regarding KMC.

##### **C. Procedures for Conventional or routine incubator Care (control group):**

- Helping the mother to sit on a chair in the feeding room.
- Wrapping the premature infant in a blanket and giving for the mother.
- Helping the mother to feed the premature infant.
- Assessing the premature infants' type of feeding.
- Assessing the mother-premature infants' interaction.
- Returning the premature infant to the incubator.
- Assessing the premature infant's vital signs (Temp., H.R., and R.R.,).
- Assessing the premature infant's crying and sleeping condition.
- At the end, the researchers thanked the mother and gave the KMC booklet as a reward from the researchers for the mother's sharing and encouraged them to practice KMC.

#### **Administrative design :**

An official approval to conduct the study was obtained from the Ain Shams Maternity and Gynecological Hospital manager to collect the study sample.

#### **Statistical design:**

The collected data were organized, revised, tabulated and analyzed by using the SPSS Version (15). Descriptive statistics was calculate percentages, and frequencies for the study and control groups. Appropriate statistical tests as Chi- square ( $\chi^2$ ) were used to estimate the statistical significant differences between the groups. Statistical significance consider at  $p \leq 0.05$ , mean while statistical insignificance consider at  $p > 0.05$ .

#### **Ethical Considerations :**

- Needed permission was obtained through the appropriate channels.
- The aim of the study was explained to all mothers.
- Mother's participation was voluntary.

- Code number for each mother and premature infant was applied to protect their confidentiality right of their personal data.

### 3.Results:

Table (1) shows that approximately half (52% and 48%) of premature infants' gestational age is 34 -< 36 weeks and < 32 weeks in both study and control groups respectively. Meanwhile, the birth weight in 76 % of study group is 2000 - < 2500 grams compared with 36% for control group. As regards the length of premature infants' hospital stay is 3- < 6 days in 40 % of study group and 20% in control group. Regarding the premature infants' weight gain at discharge, approximately half of them (56% and 44%) are increasing more than 100 grams in both study and control groups respectively.

Figure (1) shows that 60% of the premature infants' gender in both groups are males and the rest of them (40 %) are females.

Figure (2) shows that more than half (60%) of premature infants' diagnosis are prematurity compared with 44% of them are low birth weight and few of them (8% & 14%) their diagnosis are neonatal jaundice and infant of diabetic mothers respectively.

Table (2) clarifies that more than three fourths (76%) of mothers' age in study group is 20- <30 years compared with 84% in control group. Concerning mother's level of education, more than half (52%) of them are moderately and highly educated in study group compared with 76% of them in control group. Also, this table demonstrates that nearly two thirds( 68% &60 %) of mothers not work in study and control groups respectively.

Figure (3) founds that 62% of mothers in both study and control groups their delivery is normal vaginal delivery and the rest of them (38%) are delivered through cesarean section.

As regards the premature infants' physiological outcomes, table (3) clarifies that there is statistical significant differences between pre and post KMC application ( $X^2 = 17.64, 17.64, 7.76$  and  $0.36$  at  $P$ -

value  $\leq 0.05$ ) concerning heart rate, respiratory rate, temperature and occurrence of apneic episodes respectively.

As regards the premature infants' behavioral outcomes,table (4) clarifies that there is statistical significant differences between per and post KMC application ( $X^2 = 21.16, 9.0$  and  $1.96$  at  $P$ -value  $\leq 0.05$ ) concerning crying, sleeping pattern and type of feeding respectively. Whereas, the majority (84%) of premature infants are breast feed post KMC.

As regards the premature infants' psychosocial outcomes, table (5) shows that there is statistical significant differences between per and post KMC application ( $X^2 = 12.4$  and  $1.0$  at  $P$ -value  $\leq 0.00$ ) regarding mother -infant attachment and mothers' satisfaction respectively.

Regarding mothers' perceptions for KMC, table (6) shows that most of mothers (88%) doesn't have information about KMC and 8 % feel distance from their premature infants pre KMC application, compared with 92% of mothers having adequate knowledge about KMC and nearly half of them (52%) request to apply KMC and they are confident when caring and touching their premature infants post KMC application.

As regards the mothers' suggestions regarding the application of KMC.Table (7) illustrates that approximately half of mothers(48%) are suggesting that it is important for educating and training the mothers to apply KMC, and only 16 % states that mothers should continue to apply KMC in their homes.

Table (8) clarifies that there are statistical significant differences ( $X^2 = 2.43$  and  $2.49$ , at  $P$ -value  $\leq 0.05$ ) regarding mothers' age and the type of delivery in maternal-neonate attachment respectively.

Table (9) clarifies that there are statistical significant differences ( $X^2 = 3.72$  and  $3.70$ ,at  $P$ -value  $\leq 0.05$ ) regarding mothers' age and the type of delivery in relation to their satisfaction with their premature neonates respectively.

**Table (1): Percentage Distribution of Premature Infants in Both Groups According to their Characteristics.**

Premature Neonates' Characteristics	Study Group No.= 25 (100%)		Control Group No. = 25(100%)	
	No.	%	No.	%
<b>1.Gestational Age (Weeks):</b>				
• <32	2	8	12	48
• 32-<34	10	40	6	24
• 34-<36	13	52	7	28
<b>2. Birth Weight (Grams):</b>				
• <1500	3	12	5	20
• 1500-<2000	3	12	11	44
• 2000 - <2500	19	76	9	36
<b>3. Chronological Age (Days):</b>				

• 1-<10	10	40	6	24
• 10-<20	8	32	12	48
• 20-<30	5	20	6	24
• ≥30	2	8	1	4
<b>4.Length of Hospital Stay (Days):</b>				
• <3	4	16	4	16
• 3-<6	10	40	5	20
• 6-<9	7	28	6	24
• ≥10	4	16	10	40
<b>5.Weight Gain (Grams) :</b>				
• <50	1	4	4	16
• 50-<100	10	40	9	36
• ≥100	14	56	11	44

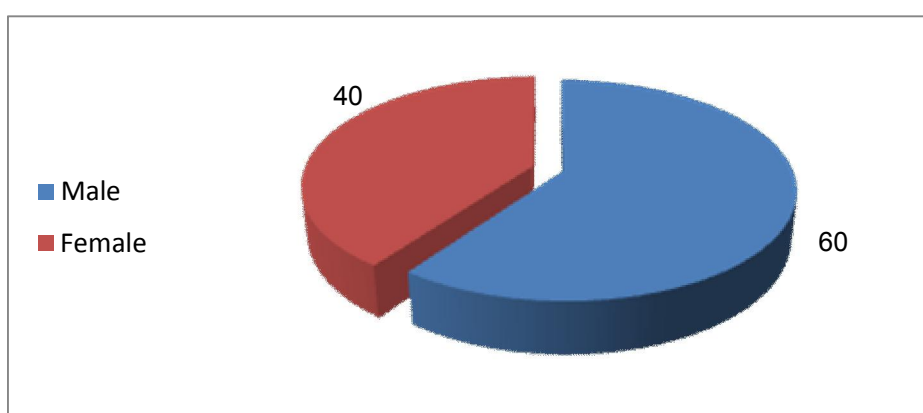


Figure (1): Percentage Distribution of the Premature Infants' in Both Groups According to their Gender

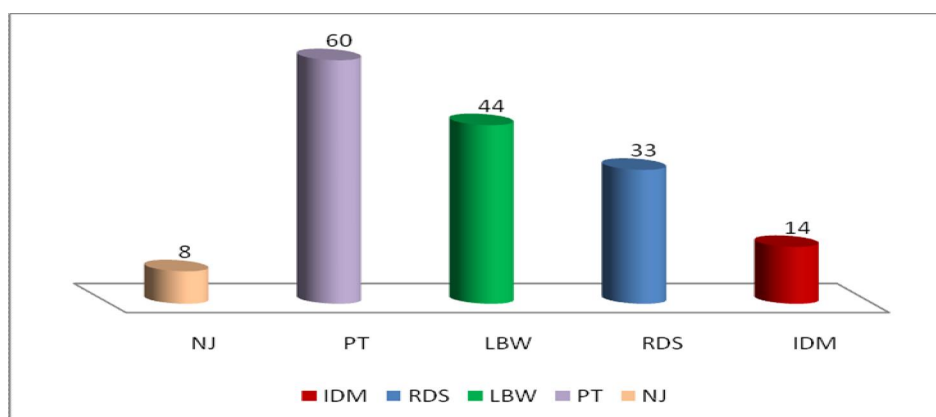


Figure (2): Percentage Distribution of Premature Infants in Both Groups According to their Diagnosis  
\*Total number is not mutual exclusive.

Table (2): Percentage Distribution of Mothers in Both Study and Control Groups According to their Characteristics

Mothers' Characteristics	Study group (Kangaroo Care) No.=25(100%)		Control group (Conventional Care) No.=25(100%)	
	No.	%	No.	%
<b>1. Age in Years:</b>				
• <20	2	8	0	00

• 20-<30	19	76	21	84
• 30- ≥ 40	4	16	4	16
<b>2. Level of Education:</b>				
• Illiterate	8	32	6	24
• Read and Write	4	16	0	00
• Moderately educated	8	32	10	40
• Highly Educated	5	20	9	36
<b>3. Employment</b>				
• Worked	8	32	10	40
• Not worked	17	68	15	60
<b>4. Parity:</b>				
• <3	16	64	22	88
• 3-<4	9	36	2	8
• ≥4	0	0	1	4
<b>5. Type of delivery:</b>				
• Normal Vaginal Delivery (NVD)	17	68	14	56
• Cesarean section(CS)	8	32	11	44

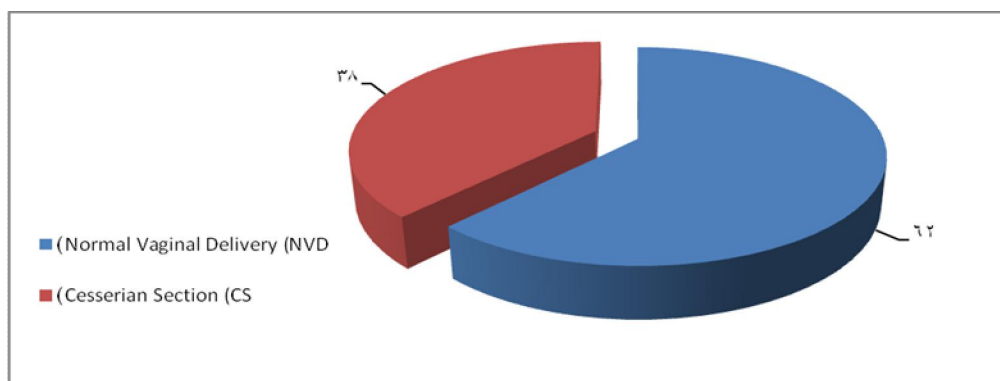


Figure (3): Percentage Distribution of Mothers in Both Study and Control Groups According to their Type of Delivery

Table (3): Distribution of Premature Infants' Physiological Outcomes in Both Study and Control Groups.

Physiological Outcomes	Study Group (Kangaroo Care) No. =25(100%)				Control Group (Conventional Care) No.25=(100%)			
	Pre		Post		Pre		Post	
	No.	%	No.	%	No.	%	No.	%
<b>1. Heart Rate (b/min):</b>								
Bradycardia (<120)	0	00	2	8	0	00	0	00
Normal (120 - 150)	23	92	23	92	22	88	22	88
Tachycardia(> 150)	2	8	0	00	3	12	3	12
$X^2$ (P- value )	17.64 0.00				- (not applicable)			
<b>2. Respiratory Rate (b/min):</b>								
Bradypnea (< 35)	1	4	2	8	1	4	1	4
Normal (35 - 50)	24	96	23	92	22	88	22	88
Tachypnea(> 50)	0	00	0	00	2	8	2	8
$X^2$ (P- value )	17.64 0.00				-(not applicable)			
<b>3. Temperature(°C):</b>								
Hypothermia (<36.5)	10	40	1	4	2	8	2	8
Normal (36.5 - 37.2)	13	52	24	96	23	92	23	92



Hyperthermia (> 37.2)	2	8	0	00	0	00	0	00
$X^2$ ( <i>P</i> - value )	7.76 0.02				- (not applicable)			
<b>4. Apnea:</b>								
Yes	14	56	1	4	0	00	0	0
No	11	44	24	96	25	100	25	100
$X^2$ ( <i>P</i> - value )	0.36 0.00				- (not applicable)			

\* Statistical Significant differences(*P*-value  $\leq 0.05$ ).

**Table (4): Distribution of Premature Neonates' Behavioral Outcomes in Both Study and Control Groups**

Behavioral Outcomes	Study Group(Kangaroo Care) No. = 25(100%)				Control Group (Conventional Care)No. = 25 (100% )			
	Pre Care		Post Care		Pre Care		Post Care	
	No.	%	No.	%	No.	%	No.	%
<b>1. Crying:</b>								
Yes	24	96	1	4	6	24	8	32
No	1	4	24	96	19	76	17	68
$X^2$ ( <i>P</i> - value )	21.16 0.00				-(not applicable)			
<b>2. Sleep pattern:</b>								
Quite Sleep	5	20	16	64	1	4	3	12
Interrupted Sleep	20	80	9	36	24	96	22	88
$X^2$ ( <i>P</i> - value )	9.00 0.00				-(not applicable)			
<b>3- Feeding: Type of feeding:</b>								
Breast Feeding	16	64	21	84	2	8	2	8
Bottle Feeding	9	36	4	16	23	92	23	92
$X^2$ ( <i>P</i> - value )	1.96 0.05				-(not applicable)			

\*Statistical Significant differences(*P*-value  $\leq 0.05$ )

**Table (5): Distribution of Premature Infants' Psychosocial Outcomes Regarding their Mothers' Attachment and Satisfaction in Both Groups**

Psychosocial Outcomes	Study Group (Kangaroo Care) No.=25(100%)				Control Group (Conventional Care) No.=25(100%)			
	Pre Care		Post Care		Pre Care		Post Care	
	No.	%	No.	%	No.	%	No.	%
<b>1. Mother-Infant Attachment (bonding):</b>								
Positive Attachment	13	52	24	96	7	28	7	28
Negative Attachment	12	48	1	4	18	72	18	72
$X^2$ ( <i>P</i> - value )	12.4 0.00				-(not applicable)			
<b>2. Mothers' Satisfaction</b>								
Satisfied	15	60	25	100	6	24	6	24
Dissatisfied	10	40	0	0	19	76	19	76
$X^2$ ( <i>P</i> - value )	1.0 0.00				-(not applicable)			

\* Statistical Significant differences(*P* -value  $\leq 0.05$ )

**Table (6) : Mothers' Perceptions Regarding Kangaroo Mother Care Pre and Post KMC Application in Study Group**

Items	Study Group (Kangaroo Care No. =25(100%))	
	No.	%

<b>Mothers' Perceptions Pre. KMC:</b>		
• My baby cries too much.	5	20
• My baby irritate me & feel anxious.	20	80
• Feel distance from my baby.	2	8
• KMC is important and I need help to apply.	2	8
• Don't have information.	22	88
• Afraid expected harm to baby.	10	40
<b>Mothers' Perceptions Post KMC:</b>		
• Having adequate knowledge about KMC.	23	92
• Requesting to apply KMC.	13	52
• I feel close to my baby.	20	80
• Enjoying and happing to playing with baby.	4	16
• Confident when caring and touching baby.	13	52
• My baby is easily comforted.	10	40

\*Total number is not mutual exclusive.

**Table (7) : Mothers' Suggestions in The Study Group Regarding the Application of Kangaroo Mother Care.**

<b>Mothers' suggestions</b>	<b>No.</b>	<b>%</b>
• The nurse should encourage the mothers to apply KMC.	10	40
• Educating the mothers to apply KMC.	12	48
• Training the mothers to apply KMC.	12	48
• Applying KMC immediately after delivery.	8	32
• Mothers should continue to apply KMC at home.	4	16

\*Total number is not mutual exclusive.

**Table (8): Correlation between Mothers' Characteristics and their premature Infants' Attachment in the Study Group.**

<b>Mothers' demographic Characteristics</b>	<b>Maternal-Infant Attachment</b>				<b>X2 (P - value )</b>
	<b>Positive Attachment</b>		<b>Negative Attachment</b>		
	<b>No.</b>	<b>%</b>	<b>No.</b>	<b>%</b>	
<b>1. Age by Years:</b>					
• <20	0	00	2	8	<b>2.43 0.29</b>
• 20-<30	11	44	8	32	
• 30- 40	2	8	2	8	
<b>2. Level of Education:</b>					
• Illiterate	4	16	4	16	<b>2.29 0.68</b>
• Read and Write	2	8	2	8	
• Moderately Educated	5	20	3	12	
• Highly Educated	2	8	3	12	
<b>3. Employment</b>					
• Worked	4	16	4	16	<b>0.19 0.89</b>
• Not worked	9	36	8	32	
<b>4. Parity:</b>					
• <3	9	36	7	28	<b>0.32 0.57</b>
• 3-<4	4	16	5	20	
• ≥4	0	00	0	00	
<b>5. Type of delivery:</b>					
• Normal Vaginal Delivery(NVD)	7	28	10	40	<b>2.49 0.11</b>
• Caesarian section (CS)	6	24	2	8	

\* Statistical Significant differences( $P$ -value  $\leq 0.05$ ).  
0.05).

\* No statistical significant Differences( $P$ -value  $> 0.05$ ).

**Table (9) : Correlation Between Mothers' Characteristics and their Satisfaction in the Study Group.**

Mothers' Characteristics	Maternal satisfaction				X <sup>2</sup> (P - value )
	Satisfied		Dissatisfied		
	No.	%	No.	%	
<b>1. Age by Years:</b>					
• <20	0	00	2	4	<b>3.72</b> <b>0.15</b>
• 20-<30	13	52	6	24	
• 30+	2	8	2	8	
<b>2. Level of Education:</b>					
• Illiterate	4	16	4	16	<b>1.38</b> <b>0.84</b>
• Read and Write	2	8	2	8	
• Moderately Educated	6	24	2	8	
• Highly Educated	3	12	2	8	
<b>3. Employment</b>					
• Worked	5	20	3	12	<b>0.31</b> <b>0.84</b>
• Not worked	10	40	7	28	
<b>Maternal obstetric data</b>					
<b>4. Parity:</b>					
• <3	10	40	6	24	<b>0.11</b> <b>0.73</b>
• 3-<4	5	20	4	16	
• ≥4	0	00	0	00	
<b>5. Type of delivery:</b>					
• Normal Vaginal Delivery(NVD)	8	32	9	36	<b>3.70</b> <b>0.05</b>
• Caesarian section (CS)	7	28	1	4	

\* statistical significant Differences( $P$  -value  $\leq 0.05$ )

\*No Statistical Significant differences( $P$  -value  $> 0.05$ ).

#### 4. Discussion

Premature infants are highly vulnerable group of the population. Premature births accounts for the highest mortality rate among infants in the first year of life<sup>(18,20,24)</sup>. This is probably the reason for increasing numbers of prematurity related researches done during the last twenty five years. The birth of a premature infant is an unexpected and stressful event for which families are emotionally unprepared. Although, the health of premature infant is first and foremost the parental responsibility, mothers are considered the most plentiful primary health care workers around the world<sup>(25,26)</sup>.

Kangaroo mother care is becoming an integral part of the care of premature and low birth weight infants worldwide. It provides economic savings to families and health care facilities and many physiologic and psycho behavioral benefits to mothers and infants, whereas the most important of which is the promotion of successful breastfeeding<sup>(20,21,24)</sup>. Therefore, the main concern of this study was to evaluate the effect of Kangaroo mother Care (KMC) on physiological, behavioral and psychosocial outcomes of premature infants

According to the characteristics of premature infants, the present study revealed that approximately half of premature infants' gestational age was  $34 \leq$

36 weeks in study group and  $< 32$  weeks in control group. Meanwhile, the birth weight in three fourths of study group was 2000 -  $< 2500$  grams compared with nearly one third in control group. These results supported by<sup>(24,26)</sup>, who pointed out that the birth weight is an indicator of the neonate's health status.<sup>(19,27)</sup> stated that the relation between the neonate's gestational age and birth weight reflects the adequacy of his intrauterine growth, whereas the organ systems maturity depends largely on gestational age. Thus the greater gestational age neonate's the more full developed the organ systems. Additionally, premature deliveries are associated with higher rates of low birth weight (50.5%) compared to full term deliveries, and the risk increased 13 times with premature delivery<sup>(24)</sup>.

However, the evidence backs the effectiveness and safety of KMC in stable preterm neonates. In low birth weight infants weighing 2000 grams or less, who are unable to regulate their temperature, KMC is at least as safe and effective as traditional care with incubators<sup>(4,12,23)</sup>.

Regarding the length of premature infants' hospital stay, it was 3-  $< 6$  days in more than one third of study group and less than one quarter in control group. Regarding the premature infants' weight gain at discharge, approximately half of them increasing more

than 100 grams in both study and control groups. This may be attributed to the specific selection criteria for study subjects that they were uncomplicated and free from severe degree of respiratory distress. However, they didn't need for respiratory ventilator or prolonged hospitalization in addition to the effect of KMC application that promoting calming and decreasing the premature infants' crying and energy loss so, maintain weight gain.

According to the mothers' characteristics, the result of the present study revealed that more than three fourths of mothers' age in study group was 20-30 years compared with the majority of them in control group and few of them in study group were under twenty years of age<sup>(16,18)</sup>. stated that a longer proportion of premature births have been found among infants born to younger than to older mothers. They added that the lowest incidence of premature is in the age period 26-35 years. Premature and low birth weight cases were most frequent among young mothers who were under twenty<sup>(20,25,27)</sup>. Also, if the mother is less than 18 years of age or over 35 there is a higher risk of delivering prematurely<sup>(27)</sup>.

As regards mother's level of education, it was found that nearly half of mothers in study group were illiterate and only able to read and write compared to one fourth of them in control group, and more than half of mothers were moderately and highly educated in the study group compared to approximately, three fourths of them in control group. This result was in agreement with<sup>(6,8,26)</sup>, who found that the incidence of premature infants was 16% among mothers of no or low education and 10.4% among highly educated mothers. However, many studies revealed that decrease health awareness of the mother was one of the predisposing factors which lead to premature birth and that education and cultural level have an effect on infant's condition both before and after birth<sup>(8,10,14)</sup>.

The results of the present study showed that nearly two thirds of mothers were not work in study and control groups. This result was contradict to<sup>(8,19,11)</sup>, who reported that prematurity is higher in infants delivered for women employed outside home, particularly when employment has been continued longer during their pregnancy. Also it was reported by<sup>(19,20)</sup>, that mothers working for cash had a higher rate of premature birth 12.4% compared to 9.6% for housewives. Maternal work, however, could have an effect on pregnancy independently of its nutritional effect. In particular physical exertion or upright posture might diminish uterine blood flow and thus hinder the supply of oxygen and nutrients to the fetus.

Regarding the mothers' parity, the result of the current study reported that nearly two thirds of

them their parity was < 3 in KMC group compared with the majority of mothers in conventional care group, additionally, there was no statistical significant differences between per and post KMC application ( $X^2 = 0.32$  at 0.11,  $P$ -Value 0.57 and 0.73) between mothers' parity and their attachment and satisfaction with the premature infants after KMC respectively. This result was supported by Goldenberg et al.<sup>(20)</sup>, who reported that prematurity was more common in first births than among later births. Also<sup>(21,26)</sup>, stated that abnormally high rates of premature births have been found in primigravida (12.4%), and lower rates were observed for the other parity categories. This contradicted with Nathalie et al.<sup>(22)</sup>; Alberman<sup>(23)</sup>, who stated that admission of a newborn infant to a NICU commonly implies separation of the new mother from her infant. KMC is a model of neonatal care which supports the parental role as primary care-giver and contributes for minimizing the separation between the premature infant and parents.

On studying the effect of KMC on the premature neonates' physiological outcomes, the results of the present study revealed that there was statistical significant differences between per and post application of KMC ( $X^2 = 17.64, 17.64, 7.76$  at 0.36,  $P$ -Value 0.00, 0.00, 0.02, and 0.00) between premature neonates' heart rate, respiratory rate, temperature and occurrence of apnea in pre and post KMC respectively compared with control group. However, direct skin-to-skin contact between the infant and mother may stabilize the infant's temperature in the thermal neutral range, stabilize the infant's vital signs, respiratory pattern, and oxygenation, resulting in decreased apneic events, encourage more homogenous sleep patterns and potentially result in better weight gain<sup>(7,13,20,23)</sup>. A number of studies have investigated the physiological effects of KMC when used with premature infants and reported that with KMC, the premature infants typically snuggles into the breast and is deeply sleep within just a few minutes. Thus, these premature infants gain weight faster than their non-kangarooed counterparts, and it is interesting to note that they usually do not lose any of their birth weight<sup>(21,22)</sup>. Maternal breast milk supply becomes streamlined, making it easier for the mother to breastfeed the offspring for a longer duration that increased breast milk supply<sup>(19,21)</sup>.

On investigating the effect of KMC on the premature infants' psychosocial outcomes. The results of the present study revealed that there was statistical significant differences between per and post KMC application ( $X^2 = 12.4$  and 1.0 at,  $P$ -Value 0.00) as regards mother-infant attachment (bonding) and their satisfaction pre and post KMC group respectively compared with mothers in conventional care group. This result was in agreement with Alberman<sup>(23)</sup>;

Bracht et al<sup>(24)</sup>, who stated that KMC appears to have physiologic as well as psychosocial benefits. KMC has been shown to improve the mother's psychological state, strengthen mother-infant bonding and stimulate maternal lactation<sup>(4,7,14)</sup>.

On investigating the mothers' perceptions regarding KMC. The result of the present study found that the majority of mothers didn't had information about KMC and few of them felled distance from the baby pre KMC, compared with post KMC, most of them had adequate knowledge about KMC and nearly half of them requested to apply KMC and they are confident when caring and touching their babies. This findings was supported by many authors<sup>(21,22,25,27)</sup> who reported that the mothers of moderately preterm and ill newborn infants showed good acceptance of the idea of providing their infants with continuous KMC during their stay at the NICU. The mothers' evaluations of this method were predominantly positive. Negative comments concerned lack of information about practical application of the method, and some mothers perceived their infants' care KMC is also beneficial for parents of premature infants.

One of the biggest obstacles to adopting KMC is the mistaken belief that KMC is second-rate care that is more time-consuming than regular care for small babies<sup>(29)</sup>. These misconceptions must be dispelled through advocacy, training, education and behavior change communication to support KMC implementation. This type of strategy would target providers and pregnant mothers/families, sensitizing them to the benefits of KMC.

Also, it was reported that skin-to-skin holding provided mothers with a greater sense of wellbeing, personal fulfillment and confidence in taking care of their infant during the night as exhausting. No mother would have preferred not to perform continuous KMC or to terminate KMC earlier than they did. This could be due to lack of application and researches about KMC application<sup>(29)</sup>.

#### Conclusion:

The current study concluded that Kangaroo Mother Care (KMC) was effectively and positively promoted premature infants' physiological stability, behavioral organization and enhanced psychosocial outcomes than those cared by the conventional care.

#### Recommendations:

Based on the findings of the present study, the following recommendations are suggested:

1. Educational training program for all neonatal nurses in skills necessary to implement the KMC.
2. Inform all pregnant women about the benefits and management of KMC through booklets, posters,

kangaroo care practical guide and support groups that may assist them even after delivery.

3. Hospital support for the mothers is needed to facilitate and continues early initiation of KMC through allowing the mother to visit her premature infants' all of the time without restrictions.
4. Help the mothers who are delivered through cesarean section neonates and premature or sick neonates initiate KMC as soon as possible (able to tolerate transfer and skin contact without physiologic or behavioral compromise).
5. Prepare a well-equipped room with warming and comforting needs for premature neonates and their mothers.
6. Application of KMC as the standard of care in all NICUs.

#### For further research

Further studies should be conducted to assess the neonatal nurses' knowledge, attitudes and practices regarding KMC.

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