

# The Power of Mothers' Consoling Maneuvers on the Physiological and Behavioral Stability of the Premature Neonates: Mothers-Infant Bonding

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## Abstract

**Background :** A premature neonate is defined as any neonate born at less than 37 weeks of gestation. In Saudi Arabia in 2010, 35,700 preterm births occurred. Neonatal Intensive-Care Units (NICU), specialize in the care of premature neonates. However, this leads to early separation of babies from their mothers and negative effects on mother/ infant bonding. In addition, mothers' consoling maneuvers, have been found to be powerful in soothing premature neonates and improve mothers /infants bonding. **Aims:** The current study aims to examine the power of mothers' consoling maneuver on the physiological and behavioral stability of the premature neonates and, to explore the effect of mother involvement in caring for premature neonates on mothers-infants bonding. **Study design:** Quasi Experimental Research Design. **Settings:** The study was conducted at NICUs affiliated to Maternity and Children Hospital and Hera General Hospital at Makkah AlMukaramah. **Subjects:** A purposive sample composed of 120 premature neonates and their mothers. They were recruited according to specific inclusive and exclusive criteria. They were classified blindly into study and control groups. **Tools:** Two tools were utilized, First a structured Questionnaire Sheet: to assess mothers & premature neonates' demographic data, mothers-infant bonding and mothers' anxiety. Second, an observation checklist: to assess premature physiological and behavioral changes. **Results:** The majority of the mothers in the study group reported feeling close to their babies and enjoyed consoling their premature neonates. There were statistical significant differences between the study and control group regarding the mean of physiological and behavioral stability during and after mothers' consoling maneuvers. **Conclusion:** The current study concluded that, mothers' consoling maneuvers have positive effects on preterm physiological and behavioral changes. Mothers- infant bonding was emphasized in the intervention group. **Recommendations:** Establish a policy for promoting opportunities for mothers' consoling maneuvers and developing an educational program for nurses regarding developmental care and mothers' consoling maneuvers.

**Key words:** Premature neonates, Consoling Maneuvers, Physiological stability, Behavioral stability, Neonatal Intensive Care Units, and Mother-Infant bonding.

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## I. Introduction

Premature neonates are defined as babies born alive before 37 weeks' gestation. They are known as "preemies" or "preemies". According to World Health Organization (WHO), premature neonates are categorized according to gestational age. Babies born before 28 weeks of gestation are categorized as extremely premature. Very premature, are those born between 28 to less than 32 weeks, while, those delivered between 32 to less than 37 weeks of gestation are categorized as moderate to late preterm. <sup>(1)</sup> Prematurity are the second-leading cause of death in children less than 5 years and the most important cause of death in the first critical month of life. <sup>(2)</sup> An estimated 15 million babies are born too early every year. That is more than 1 in 10 babies. Almost 1 million children die each year due to complications of preterm birth. <sup>(3, 4)</sup>

Many premature survivors suffer a lifetime of disability, including learning disabilities, visual and hearing problems. The Global Action Report on Preterm Birth in 2010 reported premature births per 100 births in Australia was 7.6%, Brazil and Germany 9.2%, Jordan 14.4, Sudan 13.2. Rates in Egypt and Kingdom of Saudi Arabia were 7.3% and 6% respectively. <sup>(5)</sup> According to the WHO, at 2010 premature estimation in Saudi Arabia was 35,700. <sup>(5, 6)</sup> Of those, 2,900 preterm neonates died due to complications. A recent case-control study in Jazan "Saudi Arabia" concluded that the prevalence of spontaneous preterm birth was significantly high (8.24%). <sup>(5, 7, 8)</sup>

Neonatal Intensive-Care Unit (NICUs), specialize in the care of high risk or premature neonates. <sup>(5,9)</sup> Premature health is influenced by gestational age, weight at birth, congenital birth defects, maternal illness and maternal medical treatment during pregnancy. Most premature neonates who are born between 36 to 37 weeks'

gestation are mature enough to be discharged from the hospital. But many premature neonates experience respiratory distress, poor sucking, apnea or inability to regulate their temperature may need intensive care.<sup>(10)</sup>

Newborns vary in the ease or difficulty to console themselves or be soothed by others. Some infants who are crying or fussing can bring themselves or be brought by others to a lower state of restlessness. Consoling can help the neonates to progress from crying to being actively alert, quiet alert, drowsy, or sleep states. Some newborns make few or brief attempts to console themselves and some need outside intervention. Premature neonates can calm themselves at times, at least briefly. Most, however, need periodic help from others to be consoled. Different consoling maneuvers may be appropriate at different times. Premature are less likely to be able to console themselves and also require more rigorous efforts. Caregivers may need to use a greater variety of methods to console these premature neonates.<sup>(11)</sup>

Maneuvers used by neonates to console themselves include, sucking on fingers or fist moving the hands to the mouth, paying attention to voices or faces around them, and changing position. When newborns are crying and do not initiate self-consoling activities, they need attention from caregivers. Consoling maneuvers used by caregivers when an infant cries, include talking in a steady soft voice or holding both of the neonates' arms close to their bodies. Mothers can use maneuvers such as touch, swaddle, rock and pick up the neonates during feeding or changing soiled diaper.<sup>(12, 13)</sup>

The neonates' behaviors are grouped according to five subsystems of functioning. Autonomic or physiologic functioning of the neonates' body necessary for survival. The easily observable indicators of this subsystem are tremors/startles, skin color, heart rates and respiratory rates. Sleep/awake states is a way of categorizing the level of central nervous system sleepy/drowsy, awake/alert and fussing or crying. Attention/interaction including, alertness and the fitness of the interaction. Self-regulatory is the success of the neonates' efforts to maintain a balance of the other four subsystems.<sup>(14)</sup>

In the premature neonates these self-regulatory functions are not fully developed. Therefore, the premature neonates' behaviors are generally characterized by disorganized pattern of activity. The premature neonates are more dependent than full term neonates. They need to gain help, support and maintain a balanced equilibrium. As the newborn baby matures and approaches 40 weeks gestation, self-regulatory behaviors improve.<sup>(15)</sup>

Premature neonates experience a very different beginning to life, compared to full-term neonates. Indeed, when faced with a NICU admission, parents especially mothers struggle with the unfamiliar and potentially threatening environment of ICU. They also need to learn to trust the medical staff and to adapt their parental role to this environment. Mothers often encounter challenges to the development of their parental role and to establish mothers/infants bonding.<sup>(16)</sup>

Mother-infant bonding is the formation of a relationship between a mother and her infant through physical and emotional interactions. It begins during the prenatal period, before child's birth. At this period, acceptance and nurturing of the fetus growing inside the mother's body takes place. For mothers, being unable to take the first steps in bonding has been reported as the most difficult experience when they have a neonate in NICU. Mothers may also feel excluded when their neonates are cared for by experts, with the consequent reduced physical contact. They may feel loss of identity as a mother, and loss of a sense of belonging, which can lead to feelings of inadequacy.<sup>(17)</sup>

Separation can negatively affect the premature neonates earliest development as well as the initial mother-infant bonding. It can be influenced by both medical and environmental factors. Separation has been described as the worst and most painful experience. However, it can be lessened by increasing the mothers' involvement in premature neonates' care to encourage the establishment of mother-infant bonding.<sup>(16)</sup>

Mothers' consoling maneuvers promotes improvement in body temperature, increased peripheral oxygen saturation, and decreased respiratory rate.<sup>(16)</sup> It may also reduce crying time and improve achievement of periods of sleep. When premature neonates experience painful procedures, crying is a common response and is considered to be the most sensitive and effective measure of pain. Crying has many adverse physiological effects such as increased heart rates, blood pressure, arterio-venous spasms causing cerebral blood flow changes and shunting of un-oxygenated blood. The management of premature neonates' pain is a high priority in caring for premature neonates. Interventions to reduce pain and its adverse response may necessitate the use of consoling maneuvers and soothing behaviors.<sup>(18)</sup>

During premature neonates' hospitalization, mothers need to establish a bond with their premature neonates and initiate their caregiving role. This implies a shift in their level of involvement from passive participants to active primary caregivers.<sup>(16)</sup> Neonatal nurses play a crucial role in assisting mother-infant bonding by promoting and encouraging early mother-infant interaction. The most important way in which the nurse can support mothers is to allow them to interact directly with their premature neonates through touching, consoling, and caring for them.<sup>(17)</sup> Mothers should help in feeding, holding, bathing, and changing their premature when the premature is medically stable. Both mothers and their premature neonates will benefit when mothers undertake interactions over the course of their stay in NICU. As an added benefit, the premature

neonates' is more likely experience an easetransition from the NICU to the home and consequently greater continuity of care. <sup>(19)</sup>

### **Significance of the Study**

Consoling maneuvers can be used by mothers to sooth the neonates. Consoling includes many consecutive maneuvers as touching the premature's face, move the hands on belly, followed by retraining the arms, then picking up, holding, and rocking, to be consoled. This help to stimulates tactile nerve endings in the skin, and a release of oxytocin, endorphins and serotonin, also known as "love hormones". Consoling maneuvers produce pleasant sensations and soothing or relaxation behaviors for the premature neonates, and establish mothers' infants bonding. Evidence has shown that, consoling helps premature neonates to cope with many painful procedures they receive as part of their routine care in NICUs. Fewstudieshaveexamined the power of mothers' consoling maneuvers on the physiological and behavioral stability of their premature neonates or the effectofactive involvement of mothers, through consoling maneuvers, on mother –infant bonding.

### **Aims of the study:**

The current study aims to:

1. Examine the power of mothers' consoling maneuvers on the physiological and behavioral stability of the premature neonates at NICUs.
2. Explore the effect of mother involvement in caring of premature neonates on mothers–Infants bonding.

### **Hypotheses**

Based on scientific researches, literature review as well as on clinical observations, the current study expected that:

- Mothers' consoling maneuvers has an impact on both physiological and behavioral stability of the preterm infants.
- Mothers' involvement in caring for premature neonates through consoling maneuvers has a positive effect on mother - infant bonding.

## **II. Subjects and Methods**

### **Research design**

Quasi experimental research design was utilized in the current study.

### **Research settings:**

The study was conducted at Neonatal Intensive Care Units (NICUs) affiliated to Maternity and Children Hospital and Hera' a General Hospital at Makkah Al-Mukarmah.

### **Sampling:**

A purposive sample composed of 120 premature neonates and their mothers. They were classified blindly into two groups intervention group and control "usual care" group, 60 premature neonates in each group. Premaure neonates were included according to the following inclusive and exclusive criteria.

### **Inclusion criteria:**

- Gestational age between 31-<37 weeks.
- Premature neonates who can be handled safely.
- Aged from 1-15 days.

### **Exclusion criteria:**

- Critical Premature neonates ( e.g. Premature on ventilator.....etc.,)
- Premature with congenital malformation (e.g. Congenital heart disease ...etc.).

### **Tools of data collection:**

#### **Data was collected using the following two tools:**

**I . Structured Questionnaire Sheets (SQSs):**This tool was adapted from F. Brockington et al. (2001). <sup>(20)</sup> It was consisted of two parts; Mother-Infant Bonding Questionnaire (MIBQ) and Mothers' Anxiety Questionnaire (MAQ). The original tool consisted of a 6 points Likert scale; in the current study the researcher modified this to a 3 points scale for ease of applicaion. Therresponse options ranged from, Always "3", often "2", rarely"1". The tools were translated into Arabic and tested for validity and reliability. Cronbach's alpha was used to test the internal consistency of the scale.

**A. Part (1):Mother-Infant Bonding Questionnaire (MIBQ):** This tool was used to assess MIB. Andconsisted of 16 statements. The statements included mothers feeling towards their premature neonates, enjoyment, touching, and cuddling and so on.

**Scoring system:**

Total score was 48 points:

- Poor mother-infant bonding ranged from 0- 16 points.
- Moderate mother-infant bonding ranged from 17 - 32 points.
- Good mother-infant bonding ranged from 33 – 48 points.

**B. Part (2):Mothers' Anxiety Questionnaire (MAQ):** This was used to collect data about mothers, anxiety levels regarding their premature neonates. This part was composed of (7) items.

**Scoring system:**

The total score was 21 points:

- Mild anxiety ranged from 1-7points.
- Moderate anxiety ranged from 8-14points.
- Severe anxiety ranged from 15-21 points.

Socio-demographic Questionnaire was developed by the researcher to collect mothers' socio-demographic data including age, education, occupation etc., and obstetric history including number of pregnancies, abortion and type of delivery etc.,.In addition, a premature neonates demographic questionnaire was developed to collect data regarding gestational age, current age, gender, etc., this part of the questionnaire was attached to the first tool (SQSs).

**II . Observation checklist:**This was developed by the researcher to collect physiological and behavioral functions of the premature neonates. It consisted of two parts:

**A. Part (1):**The purpose was for collection of data about the physiological functions of the premature neonates using monitor and pulse oximeter, and included :

- Vital signs : Temperature, Heart beats and Respiration
- Oxygen saturation.

**B. Part (2):**This section concerned with collecting data about behavioral functions of the premature neonate including :

- Sleep behaviors : starting time, lasting time, sleep states (deep sleep, light sleep or drowsy)
- Awake state: Alert, Active alert, or crying.

Collecting data using the second tool was done before, during and after diaper care as follow: **for the intervention group**, mothers were allowed to perform consoling maneuvers including touching, holding, grasping neonates' hands together, 15 minutes beforediaper care, during, and 15 minutes after diaper care. **For the control group** data was collected during routine diaper care performed by NIC nurses. It was collected 15 minutes before, during and 15 minutes after diaper care.

**Ethical Considerations:**

The ethical considerations in the current study included the following: approval was obtained from the responsible authorities before research implementation;the research maintained anonymity and confidentiality of the subject,the aims of the study were clarified to the participants;Subjectswere allowed to participate or not and they have the right to withdraw from the study any time without penalty.

**Validity and Reliability:**

The tools for data collection were tested for validity and reliability. The validity testing of the tools was done by sending the tools to five experts in the field of Pediatric Nursing and special consideration for their opinion was collected. Reliability using Cronbach's Alpha method was used to test the internal consistency of the tools. Reliability of the MIBQ was (0.708), and it was (0.821) for MAQ, this waswasconsideredto be a good level.

**Data collection**

**1. Preparatory phase:**

A review of the past, current related literature covering all aspects of the subject using available text books, journals articles magazines, and web sites was done.

**2. Exploratory phase:**

A pilot study was conducted on 10% from the sample size to test the clarity, feasibility, applicability and content validity of the tools, and time required to fill in the study tools. Based on the results obtained from the pilot study all the necessary modifications were done. The pilot sample was excluded from the study sample.

**Field work:**

Data collection was carried out from the beginning of October 2015 to the end of December 2015 (three months). The researcher was available at the visiting time of the NICUs affiliated to the predetermined hospitals. The researcher recruited 1-2 preterm neonates/day. The nature and the purpose of the study were explained to the mothers in the initial interview. Data were collected using the previously described tools.

### **Procedure / Technique:**

The study was conducted throughout four sessions, two days between each session. **In the first session** the researcher informed the mothers about the aims of the study and collecting socio- demographic data and obstetric history of the mothers. Premature demographic data were also assessed using the questionnaire sheets. Data about Mother-infant bonding was assessed using MIBQ. Also, mothers' anxiety regarding newborn was assessed at the same session using MAQ.

The researcher classified the study sample into study "intervention" and control groups, being "blinded" to the allocation groups. All mothers were informed about the routine infection control measures including gowning, gloving, and wearing the mask. Also, routine instructions about hand hygiene were done before the entrance to the NICUs. A simple explanation about consoling maneuvers was done to the study mothers.

**Second and third sessions:** During these sessions, the study group was informed about consoling maneuvers used to sooth their preterm neonates. Consoling includes several maneuvers begin with touching the face alone, move on to placing their hand on premature belly. This is followed by retraining both arms, then picking up, holding, and rocking, to be consoled. Allow the premature neonates enough time to succeed in response to that particular consoling intervention. Consolability maneuvers is cumulative i.e. picking up and holding the neonates includes restraining arm movements and using one's face and voice. These consoling maneuvers were carried out during diaper care. Simple explanation, direction, and observation were done during implementation of the maneuvers.

**Fourth session: For the study group,** data about physiological functions of the premature neonate including, Vital signs "Temperature, Heart beats, Respiration", and Oxygen saturation were collected using monitor and pulse oximeter. The behavioral functions of the premature neonate including: Sleep behaviors, sleep states and awake state were also assessed. Data were collected through direct observation 15 minutes before consoling maneuvers, during and 15 minutes after maneuvers.

**For control group:** Data about physiological functions of the premature neonate including, Vital signs, and Oxygen Saturation were collected using monitor and pulse oximeter. The behavioral functions of the premature were also collected through direct observation 15 minutes before, during, and 15 minutes after routine diaper care performed by the NIC Nurses.

### **Administrative design:**

An official permission for data collection was obtained from the hospitals' managers in the previously mentioned settings through submission of official letters issued by the responsible authorities of the Faculty of Nursing at Umm Al-Qura University.

### **Ethical Considerations:**

Ethical approval from the ethical committee in the Faculty of Nursing Umm Al-Qura University was given. Anonymity and confidentiality of the study subject were maintained. The aims of the study were clarified to the participants. The participants were informed that they have the right to withdraw from the study any time without penalty.

### **Statistical analysis:**

Collected data were coded and analyzed. The statistical analysis software (SPSS V.21) was used for data entry and analysis of the results. Appropriate statistical were used to achieve the objectives of the study, including: Frequencies, Percentages, Mean, Standard Deviation, Cronbach's Alpha, Two-way ANOVA and Mann-Whitney Test.

## **III. Results**

Figure (1) shows that the majority of mothers (40%) in the study and 33.3% of the control group were aged between 16-25 years. Mothers who were aged more than 45 years ranged between 6.6 % of the study group and 3.4% of the control group.

Table (1) shows the obstetric history of the mothers. It was evident that, 66.7% and 76.7% of the study and control groups respectively had 1-3 children. Equal percentage of 16.7% of the study and control group had 7-9 previous pregnancy. Previous premature babies were reported by 20% of the study group and 26.7% of the control group. More than half of the of the study mothers(56.7%) visited their babies once daily and 40% of them had irregular visits, compared to 46.7% and 43.3% of the control group who visited their babies once or at irregular time respectively.

In figure (2) the gestational age of the premature neonates is presented. It was clear that, 50% of the study group and 43.3% of the control group had a gestational age between 35<37 weeks of gestation. Thirty

percent of the premature neonates in the study group had gestational age between 33 - < 35 weeks compared to 16.7% of the control group.

Figure (3& 4) show the current age of the premature neonates, with 53.4% of the study group aged between 1-5 days compared to 43.4 % of the control group. Thirteen point three percent and 33.3% of the study and control group respectively had a premature age of between 6-10 days..

As regards, figure (5) presents the premature neonates' gender. It was evident that, 53.3% of the study group was boys compared to 63.3% of the control group. Girls in the current study were 36.7% and 46.7% of the study and control groups respectively.

Mother-Infant bonding domains and responses are presented in table (2). It was clear that, most of the study mothers (93.3%) always feel close to their babies compared to 73.3% of the control group and there was statistical significant difference (  $P = .039$ ). All the study mothers (100%) "always feel peace when their babies is close to them" and "enjoy touching them", while the percentage was 86.7% and 82.8% respectively in the control group, a difference was statistical significant, (  $P = .040$  and  $.018$  respectively). Most of the mothers in the study group (90% and 93.1%) "always feel confident caring for their babies" and "want to touch or hold them" respectively compared to 60% of the control group and there were statistical significant differences (  $P = .008$  and  $.003$  respectively).

Table (3) shows mothers' anxiety toward their premature neonates. It was evident that, 86.7% of the mothers in the study group "rarely scares when touching their babies", compared to 73.3% of the mothers in the control group and there was statistical significant difference (  $P = .030$ ). Sixty two point one percent and 43.3% of the mothers in the study and control group respectively "feel there is something more they should be doing for their babies" and there was statistical significant difference (  $P = .004$ ).

With regard to, table (4) there were no statistically differences between the premature neonates in the study and control groups regarding sleep and awake behaviors, 15 minutes before and 15 minutes after mothers' consoling maneuvers or routine care. Slightly more than half (56.7%) of the premature neonates in the study group and 37.3% of the control group exhibit light sleep. Crying was observed in 10% and 26.7% of the study and control groups respectively. Statistical significant differences were found regarding light sleep (  $P = .005$ ) and crying (  $P = .021$ ).

The results presented in table (5), no statistically significant differences in premature babies' self-regulatory, attention and motor behaviors in both study and control group before and after mothers' consoling maneuvers and routine care at 15 minutes. During mothers consoling maneuvers 43.3% of the premature neonates exhibit sucking as the self-regulatory behavior compared to 23.3% of the premature in the control group, a statistically significant difference (  $P = .030$ ). Nearly one third (33.3%) of the study premature neonates and 6.7% of the premature in the control group use hand clasping as a self-regulatory behavior, the difference being statistical significant (  $P = .023$ ). Finger splaying, which is one of the motor behaviors was observed in 50% and 20% of the study and control groups respectively and this difference was statistical significant (  $P = .002$ ).

Autonomic and visceral responses' behaviors are presented in table (6). It was concluded that, no statistically significant differences was found between study and control group regarding premature neonates' behavior before and after mothers' touch and routine care by 15 minutes. Statistical significant difference regarding premature' behavior has been observed in the autonomic / color changes (Flashing) during mothers touch (  $P = .021$ ).

Table (7) shows a comparison between the study and control group regarding O<sub>2</sub> saturation. It was evident that, there were no statistical significant differences between the study and control groups of premature neonates regarding the mean of O<sub>2</sub> saturation before consoling maneuvers or routine care. Oxygen saturation was better in the study premature neonates with a mean of 99.03 during consoling maneuvers while it was 97.57 in the control group and there was statistical significant difference (  $P = .012$ ). After consoling maneuvers or routine care at 15 minutes the mean O<sub>2</sub> saturation was 98.5 and 97.33 for the study and control groups respectively, this difference being 0 statistical significant (  $P = .02$ ). The results indicate that consoling maneuvers improve O<sub>2</sub> saturation in the studied premature neonates.

In figure (6), it was observed that, despite the lack of difference between the study and control group in the mean of all vital signs before mothers' consoling maneuvers and routine care, there were differences observed during and after mothers' consoling maneuvers and routine care, in the mean temperature, pulse and respiration. It was clear that vital signs decrease during and after consoling maneuvers in the study group. The mean temperature was 36.81 C<sup>0</sup> and 36.87 C<sup>0</sup> in the study group during and after consoling maneuvers respectively, while it was 37.19 C<sup>0</sup> and 36.96 C<sup>0</sup> respectively in control group. Pulse rate was 143.17 b.m and 143.3 b.m during and after consoling maneuvers respectively in the study group compared to 148.37 b.m and 146.6 b.m respectively in the control group. Respiratory rate was also decreased during and after consoling maneuvers in the study group it was 48.27 b.m and 48.57 b.m respectively while was 49.43 b.m and 49.1b.m in the control group.

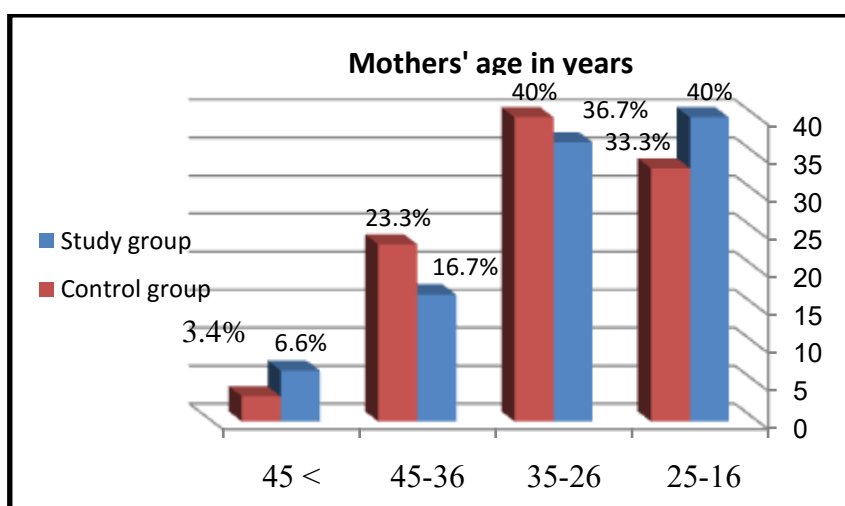


Figure (1): Distribution of Premature Neonates' Mothers According to their Age. (no. = 60)

Table (1): Percent Distribution of Mothers According to their Obstetric History (no. = 60).

Obstetric history	Study group		Control group	
	no.	%	no.	%
<b>No. of children</b>				
1-3	40	66.7	46	76.7
4-6	14	23.3	10	16.7
7-9	6	10	4	6.6
<b>No. of pregnancies</b>				
1-3	30	50	20	33.3
4-6	20	33.3	30	50
7-9	10	16.7	10	16.7
<b>No. of abortions</b>				
1-3	58	96.7	56	93.3
4-6	2	3.3	4	6.7
<b>Previous premature babies</b>				
Yes	12	20.0	16	26.7
No	48	80.0	44	73.3
<b>Visiting time</b>				
Once daily	34	56.7	28	46.7
Two times / daily	2	3.3	6	10
Irregular	24	40	26	43.3
<b>Feeding practice</b>				
Not involved	20	33.3	18	30
Breast feeding	22	36.7	30	50
Bottle feeding	18	30	12	20

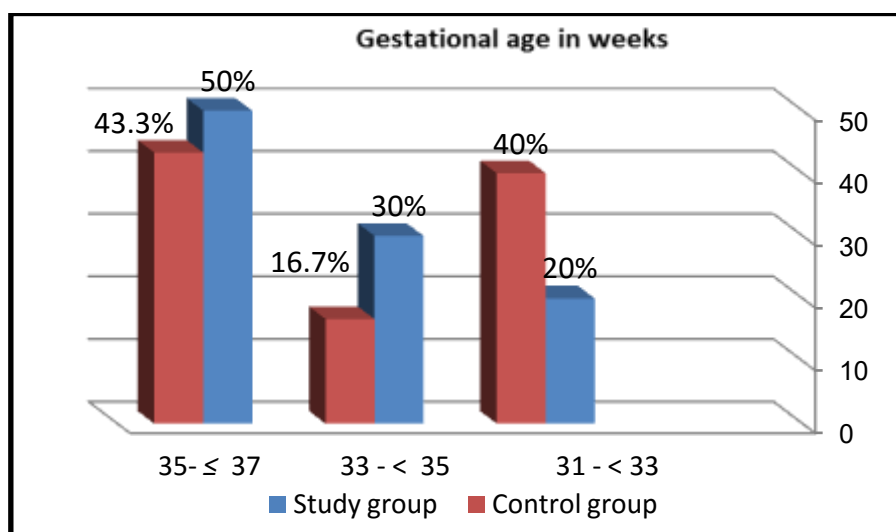


Figure (2): Distribution of Premature Neonates' According to their Gestational Age in Weeks. (no. = 60)

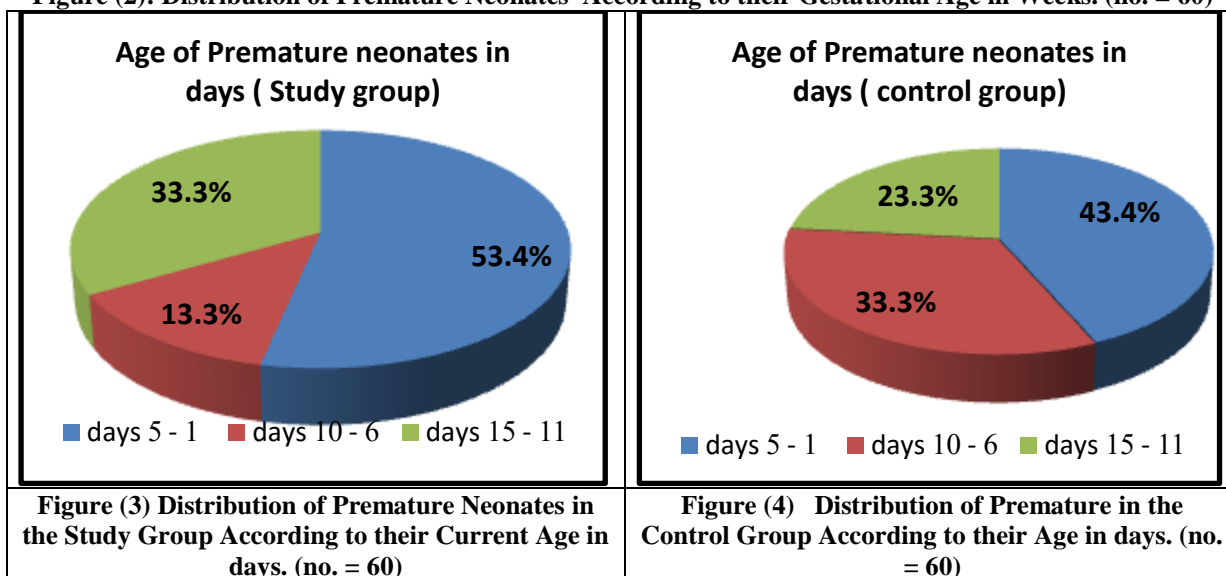


Figure (3) Distribution of Premature Neonates in the Study Group According to their Current Age in days. (no. = 60)

Figure (4) Distribution of Premature in the Control Group According to their Age in days. (no. = 60)

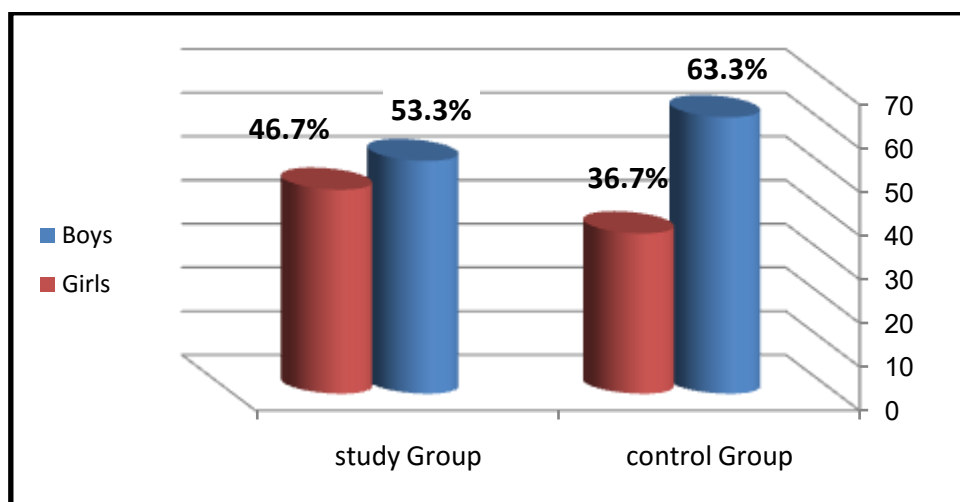


Figure (5): Distribution of Premature Neonates According to Gender (no. = 60)

Table (2): Percent Distribution of the Mothers According to Mothers-Infant Bonding (no. = 60).

Core maternal attachment	Study group			Control group			Z	P-value
	Always	Often	Rarely	Always	Often	Rarely		
	%	%	%	%	%	%		
I feel close to my baby.	93.3	6.7	0.0	73.3	26.7	0.0	2.061	.039*
I wish I had no baby.	0.0	0.0	100	10.0	3.3	86.7	2.052	.040*
I feel distant from my baby	6.9	13.8	79.3	33.3	23.3	43.4	2.952	.003*
I love to cuddle my baby	90	6.7	3.3	66.7	23.3	10	2.151	.031*
I regret having this baby.	6.7	3.3	90	3.3	0.0	96.7	1.009	.313
I feel happy if my baby smile.	96.7	0.0	3.3	86.6	6.7	6.7	1.357	.175
I feel peace if my baby close	100	0.0	0.0	86.7	13.3	0.0	2.053	.040*
I enjoy touching my baby	100	0.0	0.0	82.8	13.8	3.4	2.356	.018*
My baby cries too much.	3.4	27.6	69.0	16.7	30	53.3	1.464	.143
I feel trapped as a mother	16.7	16.7	66.6	24.1	34.5	41.4	1.721	.085



I feel angry with my baby	0.0	0.0	100	0.0	14.8	85.2	2.167	.030*
I resent my baby.	6.9	6.9	86.2	10.7	14.3	75.0	1.033	.302
I feel confident when caring for my baby.	90.0	10.0	0.0	60.0	40.0	0.0	2.661	.008*
I want to touch my baby.	93.1	6.9	0.0	60.0	40.0	0.0	2.963	.003*
I feel like hurting my baby.	0.0	10.3	89.7	3.3	3.3	93.4	.455	.649
My baby is easily comforted.	70.0	23.3	6.7	36.6	46.7	16.7	2.531	.011*

\*Significant at the 0.05 level

Table (3): Percent Distribution of the mothers according to Anxiety regarding their premature neonates (no. = 60).

Maternal anxiety	Study group			Control group			Z	P-value
	Always	Often	Rarely	Always	Often	Rarely		
	%	%	%	%	%	%		
The future of my baby makes me anxious.	46.7	36.6	16.7	43.3	26.7	30.0	.708	.479
It scares me to touch baby.	0.0	13.3	86.7	6.7	20.0	73.3	2.167	.030*
I don't know how to interact with my baby.	0.0	10.3	89.7	6.7	73.3	20	2.963	.003*
I have trouble feeling the baby is mine.	3.3	0.0	96.7	6.7	0.0	93.3	.587	.557
I feel there is something more I should be doing for my baby.	62.1	24.1	13.8	43.3	23.3	33.4	4.828	.004*
Holding my baby break him.	3.3	20.0	76.7	13.3	26.7	60.0	3.502	.033*
I don't know what to do for my baby.	6.6	26.7	66.7	13.3	26.7	60.0	.659	.510

\*Significant at the 0.05 level

Table (4): Comparison of the study and control groups regarding sleep and awake behaviors before, during and after mothers' consoling maneuvers / routine care.

Variables	Study group before touch	Control group before care	Z	P-Value	Study group During touch	Control group During care	Z	P-Value	Study group After touch	Control group after care	Z	P-Value
	%	%			%	%			%	%		
<b>Sleep states:</b>												
Deep sleep	50.0	50.0	0.00	1.00	10.6	20	.753	.451	46.7	46.7	.779	.436
Light sleep	16.7	6.7	1.19	.232	56.7	37.3	2.79	.005*	16	16.7	0.00	1.00
Active sleep	33.3	43.3	1.00	.317	32.7	42.7	0.00	1.00	37.3	36.6	0.00	1.00
<b>Awake state</b>												
Alert	40.0	33.3	1.15	.247	46.7	43.3	1.34	.180	26.7	33.3	.559	.576
Active alert	13.4	23.6	.853	.393	10.0	26.7	1.65	.098	13.3	6.7	0.00	1.00
Crying	26.6	23.6	0.00	1.00	10	26.7	2.31	.021*	43.3	39.3	1.39	.165
Drowsy	20	19.5	0.00	1.00	16.6	20.0	2.42	.015	16.7	20.7	.331	.741

\*Significant at the 0.05 level

Table (5): Comparison between study and control groups regarding to self-regulatory, attention and motor behaviors before, during and after mothers' consoling maneuvers / routine care.

Variables	Study group before touch	Control group before care	Z	P-Value	Study group During touch	Control group During care	Z	P-Value	Study group After touch	Control group after care	Z	P-Value
	%	%			%	%			%	%		
<b>Self-regulatory behaviors:</b>												
position	20.0	16.7	.331	.741	56.7	46.7	.769	.442	36.7	36.7	0.00	1.00
Hand to mouth	20.0	20.0	0.00	1.00	30.0	23.3	.579	.563	13.3	23.3	.993	.321
Grasping	23.3	20.0	.311	.756	50.0	60.0	.772	.440	33.3	33.3	0.00	1.00
Sucking	13.3	10.0	.399	.690	43.3	23.3	5.62	.030*	10.0	23.3	1.37	.169
Visual locking	6.7	16.7	1.19	.232	36.7	30.0	.543	.587	13.3	10.0	.399	.690
Hand clasping	0.0	3.3	1.00	.317	33.3	6.7	8.53	.023*	6.7	6.7	0.00	1.00
<b>Attention / Interaction</b>												
Listen & suck bottle	3.3	3.3	0.00	1.00	23.3	16.7	.359	.720	0.0	3.3	1.00	.317
Look around	26.7	36.7	.826	.409	43.3	53.3	.769	.442	36.7	46.7	.779	.436
<b>Motor</b>												
Finger splaying	43.3	33.3	.790	.430	50.0	20.0	9.21	.002*	36.7	30.0	.543	.587
Hyperextension of extremities	13.3	10.0	.399	.690	10.0	20.0	1.07	.282	6.7	3.3	.387	.557
change in posture	13.3	10.0	.399	.690	33.3	33.3	0.00	1.000	20.0	6.7	1.50	.132

\*Significant at the 0.05 level

N.B. Premature exhibits some behaviors not all.

Table (6): Comparison between study and control groups regarding to autonomic and visceral responses before, during and after mothers' consoling maneuvers / routine care.

Variables	Study group	Control group	Z	P-Value	Study group	Control group	Z	P-Value	Study group	Control group	Z	P-Value
	before touch	before care			During touch	During care			After touch	after care		
	%	%			%	%			%	%		
<b>Autonomic / Color changes</b>												
Pallor	6.7	3.3	.587	.557	3.3	0.0	1.00	.317	0.0	0.0	0.000	1.00
Flushing	3.3	13.3	1.39	.165	13.3	40.0	2.31	.021*	16.7	6.7	1.196	.232
Cyanosis	0.0	0.0	0.00	1.000	0.0	0.0	0.00	1.000	0.0	0.0	0.000	1.00
<b>Visceral responses</b>												
Vomiting	3.3	0.0	1.00	.317	0.0	3.3	1.00	.317	0.0	0.0	0.000	1.00
Gagging	10.0	0.0	1.76	.078	3.3	6.7	.587	.557	6.7	6.7	0.000	1.00

\*Significant at the 0.05 level.

N.B. Premature exhibits some responses not all.

Table (7): Comparison between the study and control group regarding to mean of Oxygen saturation before during and after mothers' consoling maneuvers and routine care.

O2 saturation	Study group		Control group		T-test	P-value
	Mean	SD	Mean	SD		
Before consoling maneuvers / routine care	97.20	2.483	96.90	2.044	97.33	2.952
During consoling maneuvers / routine care	99.03	1.351	97.57	2.763	2.612	.012*
After consoling maneuvers / routine care	98.50	2.446	97.33	2.952	2.384	.020*

\*Significant at the 0.05 level.

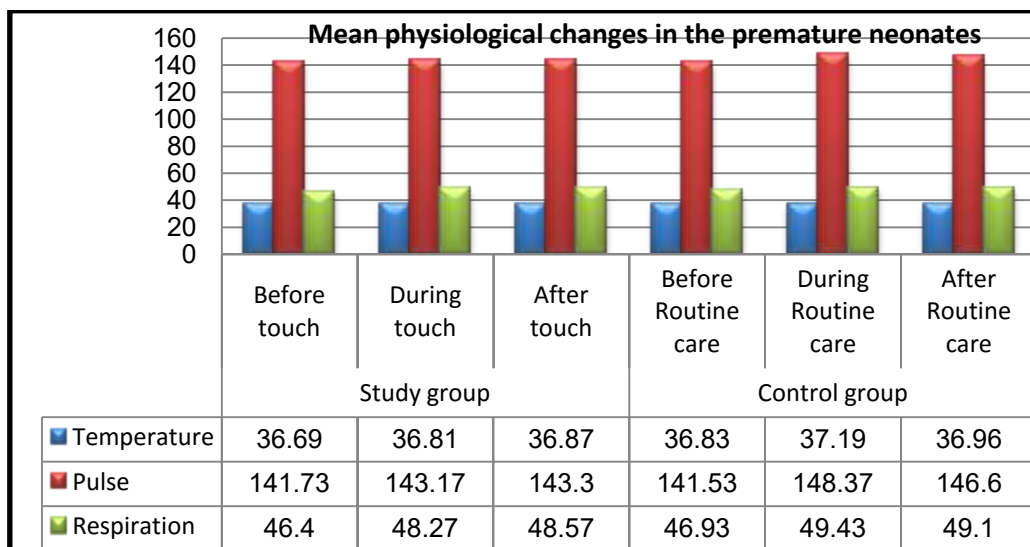


Figure (6): Comparison between the study and control groups regarding to the Mean of physiological changes before, during and after mothers' consoling maneuvers / routine care

#### IV. Discussion

The preterm neonate is defined as any neonate delivered before 37 weeks of gestation. An estimated 15 million premature neonates are born early every year. (1) Preterm neonates are considered as a high-risk group who need to be hospitalized at NICUs. Establishing mothers / infants bonding is essential for the premature neonates to grow and thrive in the mothers' care. It is difficult for the premature neonates to console themselves, they often need external assistance. Mothers' consoling maneuvers have a positive impact on mother-infant bonding, infant development and self regulation as well as the mother's mood and anxiety. (21) Evidence shows that, mothers have a profound role in caring for their premature neonates. The aims of the current study were to examine the power of mother's consoling maneuvers on the physiological and behavioral stability of the preterm neonates in NICUs, and to explore the effect of mothers' involvement in caring for premature neonates on mother-Infant bonding.

The findings of the present study revealed that, two fifth and nearly one third of the mothers in the study and control groups respectively were aged between 16-25 years, while the minority of mothers in both

groups were aged more than 45 years. These results are in line with the study of Badiee et al., (2014) <sup>(22)</sup> who reported that, the mean age of mothers in their experimental group was 28.46 years and in the control group was 25.84 years, with the maximum age of 39-41 years.

The gestational age of the premature neonates in the present study revealed that, half of the study premature neonates and slightly more than two-fifths of the control group had gestational age between 35- $\leq$  37 weeks. Nearly one third of the premature neonates in the study group had gestational age between 33 - < 35 weeks compared to less than one-fifth of the control group.

These results are in agreement with the study of Chiu S et al (2009) <sup>(23)</sup> who reported that, slightly more than one third of the premature neonates in the study group had gestational age between 32 < 33 weeks compared to one quarters of the control group. The results of the current study also, are congruent with the study of El-nagger et al., (2013) <sup>(24)</sup> who reported that approximately half of premature infants' gestational age is 34 - $\leq$  36 weeks and < 32 weeks in both study and control groups respectively.

In the current study, nearly half of the study group and two thirds of the control group was boys (Figure5). These results are in agreement with the study of El-nagger et al., (2013) <sup>(24)</sup> who reported that, two thirds of the premature infants' gender in their study were boys. Another study by Alabbasi K.H. et.al (2015) <sup>(5)</sup> who studied maternal variables risk indicators of preterm labor also reported that, nearly two thirds of the preterm births were males.

Concerning Mothers-Infant bonding, the current study showed that most of the study group "always feels close to their babies", "always feel peace when their babies are close to them" and "enjoy touching them" compared to approximately three-quarters of the control group and there was the statistical significant difference. These results may be due to mothers who were involved in caring for their premature neonates feeling more confident, experiencing less anxiety, resulting in more closeness and happiness in caring for their premature neonates. Similar findings were reported by Flacking R. et al (2012) <sup>(25)</sup> who studied the attributes of closeness and separation between mothers and babies in neonatal intensive care and showed that, physical closeness may facilitate mothers' emotional closeness. Another study by Brigitte L., et al., (2008) <sup>(18)</sup> support the findings of the current study. They studied experiences of having a prematurely born infant from the perspective of mothers and found that, all mothers need to be with their infant as much as possible. Spending time with and being close to the infant made "feelings of motherhood" grow.

In the current study, most of the mothers in the study group always feel confident caring for their babies and want to touch or hold them respectively compared to two-quarters of the control group and there were statistical significant differences. These results are in accordance with the results of Chiu et al (2009) <sup>(23)</sup> who reported that, after skin to skin contact, between mothers and neonates expressed their feelings as heart-warming, being needed, and having confidence in knowing how to care for their infant. Another study done by Korja et al., (2011) <sup>(19)</sup> who studied the effects of preterm birth on mother-infants interaction and attachment reported results in agreement with the current study demonstrated that the mothers of preterm infants exhibited more positive maternal interaction, including more responsiveness, care taking and affectionate holding.

Regarding mother's anxiety toward their premature neonates, the current study found that, most of the mothers in the intervention group reported being "rarely scare when touching their babies", compared to a lower percent of the mothers in the control group and there was a statistical significant difference. The majority of the mothers in the study group "rarely didn't know how to interact with their babies" compared to one-fifth of the mothers in the control group and there was a statistical significant difference. This may be explained as, when mothers involved in caring for their premature neonates, they feel more worth, became more responsible, confident, and familiar with their premature neonates so, their anxiety decrease.

These results were supported by Flacking R. et al (2012) <sup>(25)</sup> who further postulated that close physical contact may be important and powerful for the formation of secure and healthy attachment relationships. Another similar study by Hala et al (2009) <sup>(26)</sup> also reported, mothers explained their need to have closeness and belonging to their infant. Tallandini et al. (2006) <sup>(27)</sup> in their study about kangaroo mothers care reported similar results that to the current study. They revealed that, a better mother-infant interactive style was associated with, a significant decrease in maternal emotional stress, anxiety, and better infant ability to respond to parental interactive style in the Kangaroo mother care group.

Preterm birth and admission to the NICUs results in separation of mother and baby, interrupting the process of mother- infant bonding. Mothers who have had the opportunity to touch and care for their premature neonates describe feelings of being needed, increased confidence and a sense of their role as a mother. In the current study, slightly less than two-thirds of the mothers in the study group and half of the mothers in the control group reported feeling that, "there was something more they should do for their babies" and the difference was statistically significant. The belief that, "holding babies could break them" is rarely experienced by three quarters and two third of the mothers in the study and control group respectively and there were a statistical significant differences.

Again in the study performed by Flacking R. et al (2012)<sup>(25)</sup> correspondant findings were reported. They showed that long periods of mother–infant skin-to-skin contact were regarded as an effective way to empower mothers to become familiar with their infants, strengthen their mothering at their own pace and increase feelings of parental competence. Similary study by Feldman et al., (2002)<sup>(28)</sup> reported that, near the time of discharge home, mothers who touched their infant more frequently show positive affect and were more adaptive to their infant's need than mothers who had not provided "kangaroo care". When mothers were followed after discharge, they were found to provide a better home environment and were more sensitive to their infant.

Ahn and colleagues (2010)<sup>(29)</sup> performed a study to investigate the effects of kangaroo mother care (KMC) on newborns and their mothers. Overall, their study showed the positive effects of KMC on the growth of premature infants, maternal attachment, and rates of postpartum depression and in line with the current study.

With regard to sleep and awake behaviors, the current study showed statistical significant differences between the study and control group in the premature neonates' behavior sleep states (Light sleep/drowsy), as well as the awake state during mother's consoling maneuvers. These results are in agreement with the study of Baley J., (2015)<sup>(30)</sup> who found that "skin to skin contact" associated with better sleep organization, and a longer duration of quiet sleep. Furthermore, studies by Ludington-et al., (2006)<sup>(31)</sup> who studied Neurophysiological assessment of neonatal sleep organization in preterm infants showed that they exhibit decreased arousal and sleep during skin-to-skin care, suggesting more mature sleep organization.

Holding, and skin contact through mother's consoling maneuvers in the present study increases premature neonates' sleep time. These results are in agreement with the study of Feldman R (2002)<sup>(28, 32)</sup>. They reported that premature neonates receiving kangaroo care during their stay in the NICU demonstrate longer periods of quiet sleep and alert wakefulness, and more organized sleep-wake cyclicality when compared with infants without kangaroo care. Ohgi S, et al., (2002)<sup>(33)</sup> reported that infants who received kangaroo care are more alert, responsive, less irritable and fussy than those who receive standardized care and this results are congruent with the findings of the current study.

The present study founded statistical significant differences between the study and control group regarding self-regulatory behavior (sucking and hand clasping) and in motor behavior (finger splaying) during mother's consoling maneuvers. These results are in agreement with Feldmen R., et al (2002)<sup>(28)</sup> who found that "skin to skin contact" contributed to the development of self-regulation behaviors in premature infants. Another study performed by Goldestein S., et al (2004)<sup>(34)</sup> revealed that, skin to skin touch improve motor maturity in preterm infants.

Autonomic and visceral responses' behaviors in the current study revealed that, there were statistical significant differences in the premature neonates' behavior regarding the autonomic / color changes (Flashing) during mother's consoling maneuvers in the study group. The current results are supported by Goldestein S., et al (2004)<sup>(34)</sup>, who reported improve state regulation, neurobehavioral status, and autonomic maturation in the preterm infants after mothers' touch.

In present study there were statistical significant differences between the study and control group regarding the mean O2 saturation changes during and after mother's consoling maneuvers. The mean of heart beats, and respiratory rate changes of the study group were lower than the control group. These results are in accordance with the results of Saparst L., et al (2015)<sup>(35)</sup> who revealed that skin-to-skin contact between mothers and premature reduced pulse and respiratory rate and increased oxygen saturation. A meta-analysis of 326 preterm infants, Mori R., (2010)<sup>(36)</sup> contradict with the results of the currents study. They reported an increase in body temperature of 0.22°C, no change in heart rate, and a statistically but not clinically significant decrease in oxygen saturation of 0.60% during periods of skin-to-skin contact. This contradiction may explained by the fact that meta-nalysis includes small studies analyze individual therefore, meta-analysis is weak.

## V. Conclusion

The current study concludes that mothers' consoling maneuvers have positive effects on preterm physiological changes including vital signs and O2saturation. There were Statistical significant differences between the study and control group regarding premature neonates' behaviors during mothers' consoling maneuvers. Mothers-Infant bonding was emphasized in the study group. Most of the mothers in study group feel close to their babies, always feel confident caring for their babies and want to touch or hold them and the entire mother's feel peace when their babies are close to them and enjoy touching them compared to the control group and there were statistically significant differences between the study and control groups.

## VI. Recommendations

**Based on results of the current study, the following recommendations are suggested:**

1. Establish a policy for mothers' consoling maneuvers in the NICUs.
2. Educating mothers about the importance of skin to skin contact and active care involvement to enhance mother- infant bonding.

3. Developing an educational program for nurses regarding developmental care including mothers' consoling maneuvers and promoting maternal caring skills.
4. Further research investigating new strategies to enhance premature neonates' developmental care and active involvement of mothers in the NICUs are needed.

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