

The Effect of Training Program on Nurses Performance Regarding Massage and Positive Body Touch of Preterm and Low Birth Weight Infants at NICU

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Abstract: Background: Training programs focusing on massage and positive body touch can enhance nurses' knowledge and skills in providing appropriate and safe touch to preterm and low birth weight infants. Aim of the study: This study was conducted to evaluate the effect of training program on nurses' performance regarding massage and positive body touch of preterm and low birth weight infants at NICU. Research design: A quasi-experimental research design was used in this study. Setting: The study was conducted at Neonatal Intensive Care Unit in Pediatrics Departments Children's Hospital affiliated to Ain Shams University Hospitals. Subjects: 30 nurse working at the previous mentioned setting. Data Collection Tools: Tools of the study consist of two tools, tool (1) A Structured Questionnaire sheet to nurses assess knowledge regarding massage and positive body (2) Observational check list to assess studied nurse's level of practices regarding massage and positive body touch of preterm and low birth weight infants at NICU Results: More than three quarters of the studied nurses had satisfactory level of total knowledge regarding infant massage post educational program. Approximately three quarters of the studied nurses had satisfactory level of total knowledge regarding positive touch post educational program. Furthermore, more than half of the studied nurses had competent level of practice regarding infant massage post educational program and two thirds of them had competent level of practice regarding positive touch post program. Finally there is statically significant relation between nurses' performance regarding massage and positive body touch pre and post educational program. Conclusion: It can concluded that the educational nursing program had a positive effect on the improvement of nurses' knowledge, attitude and practices related to massage and positive touch. Recommendation: Periodical educational programs for the nurses to enhance their knowledge and practice of positive touch and massage of low birth weight and preterm in order to improve their performance level.

Key words: Massage, Neonatal Intensive Care Unit, Positive Body Touch.

1. INTRODUCTION

Low birth weight (LBW) refers to infants weighing less than 2500g at birth regardless of gestational age. LBW can be caused by preterm birth, intrauterine growth restriction (IUGR), or a combination of both factors (Tamirat et al., 2021). Low birth weight can be categorized into more specific subgroups such as very Low Birth Weight (VLBW) for infants weighing less than 1500 grams and Extremely Low Birth Weight (ELBW) for those weighing less than 1000 grams (WHO, 2018).

A significant risk factor for low birth weight (LBW) in Egypt is poverty, along with maternal smoking and limited educational achievement (Algameel et al, 2020). During this time, the emphasis was directed towards low birth weight as a critical factor in determining a newborn's probability of survival and the potential for healthy growth and development (Kargbo et al., 2020).

Preterm infants can be classified into different groups based on their gestational age. Extremely preterm infants are born with a gestational age of less than 28 weeks, very preterm infants are born between 28 and 32 weeks of gestational age, while moderate to late preterm infants are born between 32 and 37 weeks of gestational age (Unicef, 2018).

Preterm infants' complications were the primary cause of mortality among children below five years of age, resulting in about one million death (Zhu et al, 2021). Several factors have been identified as associated with preterm birth, which include demographic and socioeconomic status. These factors encompass maternal age, parity, previous preterm birth, carrying multiple fetuses, pregnancy-induced hypertension, antepartum hemorrhage, prolonged pre-

labor rupture of membranes, and urinary tract infections (Griffin et al, 2019).

Premature and/or underweight newborns are at a considerably higher risk of experiencing two well-known conditions known as respiratory distress syndrome and neonatal sepsis. Additionally, immediate complications that may arise after birth include asphyxia, jaundice, hypoglycemia, intra-cranial hemorrhage, and congenital malformations. Furthermore, post-neonatal physical, neurological and mental impairments are considerably more prevalent in preterm infants (Karnati et al., 2020).

Massage therapy is a safe and effective intervention that can help to improve the health and well-being of these infants. Massage therapy is a non-invasive intervention that has been shown to have a number of benefits for preterm infants. Massage can help to reduce stress, improve sleep, and promote weight gain. It can also help to improve the infant's immune system, cardiovascular function and neurological development (Unicef, 2018).

Massage is characterized as a physical treatment of bodily tissues by using repetitive pressure and gentle stroking to enhance overall physical and mental health. It is an important developmental requirement for every newborn, and is particularly advised for preterm and low birth weight infants (Afand et al., 2017). According to research, insufficient massage and positive body touch that is experienced by many preterm infants in intensive care units can potentially slow down their recovery (Campbell et al., 2021).

Massage has been shown to have several beneficial effects, such as improving circulation, enhancing immunity, promoting hormone growth, and stimulating neurological development. It also appears to promote vagal tone, gastric motility, digestion, and relief of gas and colic, as well as improve circulation of blood and lymph fluids. However, more research is needed to confirm these mechanisms (Singh et al., 2017).

Premature and low birth weight infants (LBW) are at increased risk for health problems, including respiratory distress syndrome, jaundice and infections. They are also more likely to experience stress and pain due to the medical interventions and procedures they receive in the NICU. Positive touch can be a way to provide comfort and support to these infants (Mathewson et al., 2017).

Benefits of positive touch can help to reduce stress and anxiety, improve sleep, promote weight gain, increase oxygen levels, regulate heart rate and breathing, improve digestion, promote muscle development, enhance brain development and promote bonding between the infant and caregivers (Mathewson et al., 2017).

Positive touch is a safe and effective intervention that can help to improve the health and well-being of these infants. The exact mechanisms by which positive touch works are not fully understood. However, it is thought that touch releases oxytocin, a hormone that has calming and stress-reducing effects. Touch can also stimulate the production of endorphins, which are natural pain relievers. Additionally, touch can help to regulate the infant's nervous system and improve their overall well-being (WHO, 2022).

Nurses must take steps to maintain a safe environment for preterm and LBW infants. This includes keeping the incubator warm, free of drafts, and free of infection. Nurses also need to be careful when handling these infants, as they are more fragile than full-term infants (WHO, 2022).

Nurses are also advocates for preterm and LBW infants. They work to ensure that these infants receive the best possible care and that their needs are met. Nurses also advocate for policies and practices that support the care of these infants (Galea et al., 2022).

1.1. Significance Of the Study

According to the global report, about 2.9 million preterm die in the first month of life, of which preterm births, complications during pregnancy, and sepsis are the leading causes of death (Blencowe et al., 2019). Particularly, 2498

adverse birth outcomes contributed to more than 75% of these deaths occurred in the first weeks of life (Tamirat et al., 2021). The adverse birth outcomes are defined by the World Health Organization as events of low birth weight, preterm birth, stillbirth, or perinatal deaths (Amhara, 2018).

According to the joint UNICEF and WHO study of global, regional, and country estimates the incidence of LBW in the Middle East and the Gulf countries was reported as Oman 9%, Lebanon 6%, Syria 6%, Algeria 7%, Kuwait 7%, Libya 7%, Tunisia 7%, Bahrain 8%, Jordan 10%, Qatar 10%, Morocco 11%, Saudi Arabia 11%, Egypt 12% and Yemen 32% (El-Gilany et al., 2016).

Egypt is not far from the above adverse birth outcomes. The prevalence of preterm birth rate 13%. The following year El-Gilany and colleagues in their study on incidence and occupational risk factors of preterm delivery among working mothers, a single center study in Egypt, showed that, the prevalence of preterm was 24.3% (El-Gilany et al., 2016).

While the joint UNICEF and WHO study of global, regional, and country estimates of LBW, the incidence of LBW in the Egypt 12% (Taha et al., 2020). But in 2019, infant mortality rate for Egypt was 17.3 deaths per 1,000 live births (Moshi et al., 2020). This is unacceptable and more realistic effort is required in this area so as to lower the mortality resulting from preterm and low birth weight, this demands evidence-based, cost-effective care during this period of life (Jebessa et al., 2021).

Since weight gain is the most consistent parameter associated with touch and massage therapy in infants, its effects has been documented in a study which found that, apart from weight gain, other benefits of touch and massage is improvement of sleep-wake pattern, since infants who receive massage therapy appear more alert and spend less time in sleep, improved scores on mature habituation, orientation, motor, and range of state behavior, reduced level of energy expenditure, and decrease in infant mortality (Chen et al., 2021).

From the researcher point of view, it is important to investigate this study to evaluate the Effect of Training Program on Nurses Performance Regarding Massage and positive body touch of preterm and low birth weight infants at NICU. This study will help impart knowledge on nurses working at NICU with the aim of reducing morbidity and mortality among infants born prematurely and those who are low birth weight infants.

1.2. Aim Of the Study

This study aims to evaluate the effect of training program on nurses' performance regarding massage and positive body touch of preterm and low birth weight infants at NICU

The aim was achieved through the following objectives:

I- Assess nurses' level of performance regarding massage and positive body touch of preterm and low birth weight infants at NICU.

II- Planning and implementation of training program on massage and positive body touch of preterm and low birth weight infants at NICU

III- Evaluation of nurse's level of performance on massage and positive body touch of preterm and low birth weight infants at NICU.

1.3. Research Hypothesis

Training program regarding massage and positive body touch on preterm and low birth weight infants will have a positive effect on nurses' performance at NICU.

1.4. Operational definition

Nurses' performance means to assess nurses' knowledge and practice regarding massage and positive body touch of preterm and low birth weight infants at NICU.

2. SUBJECT AND METHOD

The subjects and methods for this study were portrayed under the four main designs as following:

- I. **Technical design.**
- II. **Operational design.**
- III. **Administrative design.**
- IV. **Statistical design.**

1- Technical design:

The technical design for this study were included research design, setting, subjects and tools of data collection.

- **Research design:**

A quasi-experimental research design (pre-post test) was utilized to achieve the aim of this study.

- **Research setting:**

This study was conducted at Neonatal Intensive Care Unit in Pediatrics Children's Hospital affiliated to Ain Shams University Hospitals.

- **Subject:**

A purposive sample consisted of 30 nurses who were working at the above mentioned setting under the following inclusion criteria:

- Both gender
- Regardless their ages
- At least one year of experience at NICU.

2.1. Tools for Data Collection

The tools of data collection were designed by the researcher in the light of the relevant review of literature and written in simple Arabic language. All tools designed for the nurses were used in the form of pre/post tests. The data was collected using the following two tools.

(pre/post tests).

Tool (I): - A Structured interview Questionnaire sheet:

It was developed by the researcher and it consists of 3 parts:

Part I- it concerned with characteristics of the studied nurses such as (age, educational level, gender, marital status, occupation, years of experience and number of training courses regarding massage and positive body touch of preterm and low birth weight infants).

Part II- it concerned with characteristics of studied infants which include (gender, diagnosis, weight at birth, date of birth and admission, gestational age, length and birth order).

Part III- To assess studied nurses' knowledge regarding massage and positive body touch (pre and post program) that consisted of twenty questions in the form of open and closed ended questions distributed in two parts as the following:

Part A: it included 10 open ended question to assess studied nurses' knowledge regarding massage of preterm and low birth weight infants which includes: definition, importance, indications, how often, benefits, precautions, steps, time, obstacles and complications.

Part B: it contains 10 open ended questions to assess studied nurses' knowledge regarding positive touch of preterm and low birth weight infants which included: definition, importance, indications, how often, benefits, precautions, steps, time, obstacles and complications.

Scoring System

The total score of knowledge was 40 grades (2 grades for complete answer, 1 grade for incomplete correct and zero for incorrect or unknown answer) and then categorized into:

- $\geq 75\%$ of satisfactory when the total grades were ≥ 30 grades.
- $< 75\%$ of unsatisfactory when the total grades were < 30 grades.

Tool (2): - Observational check list

Tool(II):- Observational check list that was adopted from.^[10,16] It was used by the researcher to assess studied nurse's level of practices regarding massage and positive body touch of preterm and low birth weight infants at NICU. It was used pre and post program, it included 2 parts:

Part I: Observational check list to assess studied nurses' level of practice about massage at NICU. It was designed by the researcher to assess nurse's practice toward massage in care of preterm and low birth weight infants. It contained 15 steps.

Scoring system:

Each practice item done correctly was scored one and not done or done incorrectly was scored zero. The total numbers of steps in the Observational check list were (15). Total score was (15) and then converted into percentage and categorized as the following:

Complement $\geq 85\%$ (≥ 13 grades).

Incompetent $< 85\%$ (< 13 grades).

Part II: Observational check list to assess studied nurses' level of practice about infant positive touch at NICU. It was designed by the researcher to assess nurse's practice toward positive body touch in care of preterm and low birth weight infants. It contained 12 steps.

Scoring system:

Each practice item done correctly was scored one and not done or done incorrectly was scored zero. The total numbers of steps in the Observational check list were (12). Total score was (12) and then converted into percentage and categorized as the following:

- Complement $\geq 85\%$ (≥ 10 grades).
- Incompetent $< 85\%$ (< 10 grades).

2-Operational design:

The operational design included preparatory phase, validity and reliability, pilot study, field work and limitation of the study.

- The preparatory phase:

Prepared the study tool based on review of literature and theoretical knowledge of various aspects of the study

using books, articles, internet, periodicals, magazines in order to assess the nurses needs and develop data collection tools.

- **Tools Validity and Reliability:**

The Content validity: of the tools by inspecting the items to determine whether the tools measure what supposed to measure. The stage developed by a jury of 7 experts from different academic categories (4assistant professors and 3 Lecturers) of Pediatric Nursing at the Faculty of Nursing, Helwan University. The expertise reviewed the tools for the format, simplicity, consistency, clarity, accuracy and relevance and minor modification was done.

Testing reliability :The reliability of the data collection tool scales was assessed using internal consistency method. The two scales showed good reliability as shown by their Cronbach's alpha coefficient below.

	No of Items	Cronbach's Alpha
Massage and Positive touch knowledge scale	20	0.824
Massage and Positive touch practice scale	37	0.864

Ethical Considerations:

The ethical research consideration in this study was included the following: The research approval was obtained from the Ethical Committee of the Faculty of Nursing, Helwan University and Ethical Committee of the Faculty of Medicine, Ain Shams University before starting the study. The researcher will clarify the aim of the study to nurses and parents who agreed to be included in the study. The researcher will assure maintaining anonymity and confidentiality of the subjects' data. The researcher obtained informed consent from the participants included in the study prior to data collection. Participants were informed about their rights to participate or withdraw from the study at any time without any reason.

- **Pilot study:**

Before performing the actual study, a pilot study is carried out for 5 nurses (10%) of studied nurses at NICU to test clarity, applicability of tools used in this study. Some modifications on tools were done based on pilot study. Infants who included in the pilot study were excluded from the main study group.

- **Field work:**

• **Designing phase:**

This phase aims at planning for the educational nursing program through setting educational objects, preparing the educational program, designing the methodology, media, determine the total number of sessions and duration of each session.

• **Development of the educational program**

The educational nursing program was developed by the researcher. Based on the results obtained from the assessment tools and review of the literature, the program content was developed by the researcher in the form of a booklet. The educational program aimed to increase the nurse knowledge and practice regarding massage and positive body touch of preterm and low birth weight infants at NICU. This educational program has a set of specific objectives for each session and the number of program's sessions was about 12 sessions and it was implemented for 3 days\ week and each session take about 30-45 minutes a day. The final booklet is given for nurses in the first session.

Objectives of the training program are as the following:

General objectives of program:

At the end of the program implementation the nurses should be able to:

- Gain information and knowledge about preterm and low birth weight infant
- Gain information, knowledge about the positive body touch and massage.
- Gain skills and practices about the positive body touch and massage.

Specific objectives:

At the end of the program implementation the NICU nurses should be able to:

- List causes of pre-term \low birth weight infants.
- List common problems among preterm and low birth weight infants.
- Define of positive body touch and massage.
- Indications of positive body touch and massage.
- List the advantages of positive body and massage.
- Discuss how to prepare the surrounding environment for massage and touch.
- List steps of positive body touch and massage.
- Apply the steps of positive body touch and massage.

Methods of teaching

- Group discussion & Role model

Media used:

- Power point
- Demonstration and Re-demonstration

Methods of evaluation:

- Feedback through oral questions
- Group discussion

- **Implementation phase:**

The implementation of the study passed into four phase (pre assessment phase, planning, implementation, and post assessment phase.

- **Assessment phase (pre- test):**

The data collected from previously mentioned setting until reaching the sample size. First the researcher introduced herself to the parents and nurses. The purpose of study explained to nurses who agree to participate in the study prior to any data collection. Before starting the interview a written consent was obtained from each nurse after the explanation of the study purpose, nurses were interviewed using tools as pre-test, each interview last 30-45 minutes depending to nurses' capacity to response. This process (pre-test) took two months.

- **Planning phase:-**

- The nursing educational program was developed by the researcher based data from the assessment phase and review related literature. Priorities goals and expected outcome criteria was formulated.
- The constructed program was submitted to a panel of experts to be evaluated. The researcher taken all comments of experts into consideration and modify the program accordingly.

- An educational booklet (self- help manual) developed to be distributed to every nurse for enforcement and as a reference.

Implementation phase:-

The purpose of the program to enable NICU nurses to gain information, knowledge and practice about the positive body touch and massage. The program was developed and given through (12) session\ three days\ week. Each session lasted from 30-45 minutes. Nurses were classified into 3 groups: each group consisted of 10 nurse. Each group attended 12 sessions. Schedules as 3 session per week for duration of about 4 weeks. The session of educational intervention program were carried out from the beginning of October 2022 to the ending of March 2023. The program has general objectives and every session has its specific contents and objectives, this was achieved through several teaching methods as, brain storming, lecture discussions and emotional expression, role playing and intervention booklet using the following media as computer, video, and pictures. At end of each session summery and conclusion was done, let a time for asking question, feedback and give homework assignment for the next session.

To ensure that the nurses understand the program content, each session was begun by a summery about what was given through previous session and at the end of each session the nurses were oriented about content of the next session by using simple language to suit all nurses. Its content including:

Session 1: (Introductory session):

Time required for session: 30-45 minutes

Setting: Neonatal Intensive Care Unit.

Aims of the first session:

- Orient the participant with the aim, objectives, and rules of the program.
- Help participant feel known and appreciated.
- Provide an opportunity to connect with the participants before the meeting.
- Create a worm atmosphere and pleasurable physical experiences
- Describe schedule of the program.

Contents:

- Introduction
- Content of the program
- Expected outcomes
- Setting& time followed for each session.

Sessions (2, 3, 4, 5): theoretical part

Setting: Neonatal Intensive Care Unit

Aims of these sessions:

At the end of the above sessions, the participants will be able to:

- Define pre term and low birth weight infants
- List causes of pre-term \low birth weight infants
- List common problems among preterm and low birth weight infants.
- Define of positive body touch and massage.
- Indications of positive body touch and massage
- List the advantages of positive body touch and massage.

- prepare the surrounding environment for massage and touch
- List steps of positive body touch and massage.

Contents:

Definition, causes, advantages, importance, types, signs and symptoms of preterm and low birth weight and steps of positive body touch and massage

Methods of teaching

- Group discussion
- Brain storming
- Lecture
- Real life situation

Media used:

- Written cards
- Pictures
- Videos
- PowerPoint

Methods of evaluation:

- Feedback through oral questions
- Group discussion

Sessions 6, 7,8,9,10, 11&12 : practical session

Time require for each session: 30-45 minutes

Setting: Neonatal Intensive Care Unit

Aim of the above sessions:

At the end of the sessions, the participants will be able to:

- Prepare the environment for positive body touch and massage
- Apply the self-preparation before applying body touch and massage
- Apply the steps of massage
- Apply the steps of positive body touch
- Demonstrate different forms of positive body touch

Before performing a massage or engaging in positive body touch with infants, nurses take several steps to prepare the environment such as:

- Cleanliness and hygiene: Nurses ensure that the environment is clean and sanitized to minimize the risk of infection. They wash their hands thoroughly before interacting with the infant and use appropriate protective measures such as gloves, if necessary.
- Privacy and comfort: Nurses create a private and comfortable space where the infant and caregiver can feel relaxed and at ease. They may draw curtains, dim the lights, or use soft music to create a soothing atmosphere.
- Temperature regulation: Infants are sensitive to temperature, so nurses ensure that the room is appropriately warm and comfortable. They may use warm blankets or heating pads to maintain warm environment, especially during

skin-to-skin contact.

- Removing potential hazards: Nurses eliminate any potential hazards or distractions that could interfere with the positive body touch session. They ensure that the area is free from sharp objects, loose wires, or other items that could cause harm to the infant.
- Gentle touch and stroke techniques: Nurses familiarize themselves with appropriate touch and stroke techniques that are safe and beneficial for infants. They receive training in specific massage techniques suitable for different age groups and developmental stages.
- Communication with caregivers: Nurses engage in open and clear communication with the caregiver before initiating positive body touch. They explain the purpose of the touch, its benefits, and any precautions or contraindications that may apply. They also obtain consent from the caregiver before proceeding.
- Individualized approach: Each infant has unique needs and preferences, so nurses tailor their approach accordingly. They consider the infant's medical condition, gestational age, temperament, and any specific instructions or restrictions given by the healthcare team or the caregiver.
- Observation and assessment: Before and during the positive body touch session, nurses observe the infant's behavior, cues, and responses. They assess the baby's comfort level, signs of relaxation, and any signs of distress. This helps them modify their techniques or adjust the environment as needed to ensure the infant's well-being.

In this sessions the researcher helped the nurses to demonstrate how to practice massage in about (30-45) minute. The duration of each massage session 10 minutes for 3 times per day until 14 days and the distance between each massage had at least 4 hours apart.

Each premature infant was conducted massage in first day for 15 minutes, the massage started from the top of the head to the neck and back to the top of the head, and back to the neck, from the neck across the shoulders; from the upper back to the waist and back to the upper back; from the thigh to the foot to the thigh on both legs and from the shoulder to the hand to the shoulder on both arms. Followed by passive movements of the limbs for 5 minutes. The newborn is placed in a supine position and each arm, then each leg, and finally both legs together are flexed and extended as in a bicycling motion. Each flexion/extension motion lasting for 10 seconds.

Also the researcher helped the nurses in providing positive body touch for infants, which is essential for their overall well-being and development. Positive body touch refers to nurturing, gentle, and respectful physical contact that promotes bonding, comfort, and emotional regulation in infants. The researcher informed them about their roles in facilitating positive body touch.

- Skin-to-skin contact: Nurses often initiate and facilitate skin-to-skin contact between newborns and their parents or caregivers. This practice involves placing the baby on the bare chest of the parent, promoting warmth, comfort, and emotional connection. Skin-to-skin contact has numerous benefits, such as stabilizing the baby's heart rate, regulating body temperature, and fostering breastfeeding.
- Comfort and soothing: Nurses use touch as a means of providing comfort and soothing to infants. Gentle strokes, cuddling, and rocking can help calm a distressed baby and alleviate their anxiety. Nurses understand the importance of responsive touch and create a nurturing environment where infants feel safe and secure.
- Feeding support: Nursing staff often assist mothers with breastfeeding, and touch plays a crucial role in this process. Nurses may guide mothers in positioning the baby correctly for latching, providing gentle touches and cues to facilitate effective feeding. Through their touch, nurses can help establish a positive breastfeeding experience for both the mother and the infant.

- **Developmental care:** Nurses incorporate positive body touch as part of developmental care practices in neonatal intensive care units (NICUs). Premature or sick infants in the NICU require specialized touch and handling techniques to minimize stress and support their growth and development. Nurses are trained in techniques such as "developmental care," which involves light and slow touch, containment, and supportive positioning to optimize the infant's sensory experiences.
- **Emotional bonding:** Touch is a powerful means of establishing emotional bonds between caregivers and infants. Nurses encourage parents and family members to engage in loving touch and physical contact with their babies, fostering a sense of security and attachment. They educate parents about the importance of positive touch and help them overcome any fears or anxieties they may have about handling their newborns.
- **Observing cues:** Skilled nurses are attentive to the cues and responses exhibited by infants during touch interactions. They carefully observe the baby's body language, facial expressions, and physiological signals to ensure that the touch is well-received and appropriate. This helps nurses tailor their touch and respond to the individual needs of each infant.

Methods of teaching

- Brain storming
- Group discussion
- Real situation
- Demonstration and re- demonstration

Media used:

- Written cards
- Pictures
- Videos
- PowerPoint
- Role play

Method of evaluation:

Feedback through oral questions and positive interaction

- **Evaluation phase (post test):**

This phase aims at evaluation the effect of training program on nurses performance regarding massage and positive body touch of preterm and low birth weight infants at NICU. After the conduction of educational program sessions, a post test was done by using pretest tools.

3-Administrative design:

Approvals to carry out this study was obtained from Dean of Faculty of Nursing –Helwan University. An official permission was taken from the hospital administrators at which the study was conducted, explaining the purpose of the study and requesting the permission for data collection from the study nurses.

4-Statistical design:

Data entry and statistical analysis were done using SPSS 25.0 statistical software package. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations and medians for quantitative variables. Cronbach's alpha coefficient was calculated to assess the reliability of the tools through their internal consistency. Qualitative categorical variables were compared using

chi-square test. Whenever the expected values in one or more of the cells in a 2x2 tables. Spearman rank correlation was used for assessment of the inter-relationships among quantitative variables and ranked ones. In order to identify the independent predictors of occupational hazards and side effects scores, multiple linear regression analysis was used and analysis of variance for the full regression models done. Statistical significance was considered at p-value < 0.05.

3. RESULTS

Part I: Characteristics of studied nurses

Table (1): Distribution of studied nurses regarding their personal characteristics (n=30)

characteristics of nurses	No	%
Age		
20<30	13	43.3%
30<40	10	33.3%
40≤50	7	23.3%
Mean ±SD= 35.25±14.25		
Marital status		
Single	13	43.3%
Married	17	56.7%
Gender		
Male	0	0.0%%
Female	30	100.0%
Education level		
Bachelor	5	16.7%
Technical	16	53.3%
Diploma	9	30.0%
years of experience		
<1	10	33.3%
1<5	4	13.3%
5<10	4	13.3%
>=10	12	40.1%
Mean ±SD= 9.52±21.15		
Position		
Staff nurse	29	96.7%
Head nurse	1	3.3%
Number of children		
No children	14	46.7
1:2	10	33.3
≥ 2	6	20.0
Previous training about massage and positive touch of preterm and low birth weight infants:		
Yes	4	13.3
No	26	86.7

As regard studied nurses age table (1) cleared that more than more than one third of them in age group 20<30 years , more than half of them (56.7%) were married and all of them were females. While more than half of them (56.7%) were in technical degree and the majority of them (86.7) not attended any previous training about massage and positive touch of preterm and low birth weight infants, 40.1%,, 96.7% and 46.7 of them had > 10 year of experience, staff nurses respectively and not had children.

Part II: Characteristics of studied infants:**Table (2): Distribution of studied infants regarding their characteristics (n=30)**

characteristics of infants	No	%
Gender		
Male	10	33.3
Female	20	66.7
Diagnosis		
Atrial Septal Defect	1	3.3
Dyspnea	4	13.3
Hernia	3	10.0
intestinal obstruction	4	13.3
Pneumonia	5	16.7
Respiratory Distress Syndrome (RDS)	3	10.0
Tetralogy of Fallot (TOF)	8	26.7
Ventricular Septal Defect	2	6.7
Age per day		
0-10 day	18	60.3
10-20 day	2	6.7
20-28	10	33.3
Weight \ gm		
1000-1250	6	20.0
1260-1500	3	10.0
1510-1750	2	6.7
1760-2000	5	16.7
2010-2250	4	13.3
2260-2499	10	33.3
Length \ cm		
46	11	36.7
42	17	56.7
36.5	2	6.7
Order	12	40.1
1 st	7	23.3
2 nd	13	43.3
3 rd	8	26.7
4 th	2	6.7

As regard studied infants table (2) cleared that, more than two thirds of infants (66.7%) were females and more than quarter (26.7 %) of them was suffered from Tetralogy of Fallot and more than one third of them birth weight (33.3%) were between 2260: 2499. Also more than half of them (56.7%) were 42 cm in length. Regarding infants order in family, more than one third of them (43.3%) was 2nd.

Part III: Studied nurses' knowledge about infant massage and positive touch:

Table (3): Distribution of studied nurses' knowledge regarding massage pre and post-program (n=30)

Items	Pretest						Posttest						X2	p-value
	Complete answer		In- Complete answer		In Correct answer or unkown		Complete answer		In- Complete answer		In Correct answer or unkown			
	No	%	No	%	No	%	No	%	No	%	No	%		
Definition of massage	0	0	1	3.3	29	96.7	20	66.7	7	23.3	3	10.0	45.3	0.000**
Importance of massage	0	0	1	3.3	29	96.7	22	73.4	4	13.3	4	13.3	42.1	0.000**
Reasons for massage	0	0	1	3.3	29	96.7	17	56.6	8	26.7	5	16.7	39.1	0.000**
Appropriate number of massage times	1	3.3	1	3.3	28	93.3	15	50	10	33.4	5	16.7	35.6	0.000**
Massage for premature babies Benefits	1	3.3	0	0	29	96.7	21	70	3	10	6	20.0	36.3	0.000**
Precautions to be taken when doing massage	1	3.3	0	0	29	96.7	9	30	15	50	6	20.0	36.3	0.000**
Types of massage	0	0.0	0	0	30	100	20	66.7	3	10	7	23.3	37.3	0.000**
Appropriate pattern of massage	0	0	3	10	27	90.0	12	40	9	22.5	9	30.0	22.5	0.000**
Obstacles of massage	0	0	1	3.3	29	96.7	15	50	5	16.7	10	33.3	26.4	0.000**
Complications of massage	0	0	1	3.3	29	96.7	10	73.3	12	40	8	26.7	31.1	0.000**

*: Significant at P ≤ 0.05

Table (3) Shows nurses level of knowledge about massage; the results reveal that 73.4 %, 73.3% and 70% of studied nurses had complete answer post educational program about importance, complication and benefits for massage compared with 3.3 % , 3.3 % and 3.3 % of them pre educational program. Finally there was statistically significant improvement of nurses' knowledge score at post-program phase than pre-program of all knowledge items (p-value =0.000).

Table 4: Distribution of studied nurses knowledge regarding positive touch pre and post-program (n=30).

Items	Pre-program						Post-program						X2, P-value
	Complete answer		In- Complete answer		In Correct answer or unkown		Complete answer		In- Complete answer		In Correct answer or unkown		
	No	%	No	%	No	%	No	No	No	%	No	%	
Definition of positive touch	0	0.0	0	0.0	30	100	20	66.7	7	23.4	3	10.0	49.1, 0.000**
Importance of positive touch	0	0.0	0	0.0	30	100	21	70	5	16.7	4	13.3	45.9, 0.000**
Reasons for positive touch	0	0.0	1	3.3	29	96.7	22	73.4	3	10	5	16.7	39.1, 0.000**
Appropriate number of positive touching times	0	0.0	0	0.0	30	100	15	50	10	33.3	5	16.7	42.9, 0.000**
Positive touch for premature babies Benefits	0	0.0	1	3.3	29	96.7	20	66.7	4	13.3	6	20.0	36.3, 0.000**
Precautions to be taken when doing positive touch	0	0.0	0	0.0	30	100	14	46.7	10	33.3	6	20.0	40.0, 0.000**

Types of positive touch	0	0.0	0	0.0	30	100	19	63.4	4	13.3	7	23.3	37.3, 0.000**
Appropriate pattern of positive touch	0	0.0	3	10.0	27	90.0	17	56.7	4	13.3	9	30.0	22.5, 0.000**
Obstacles of positive touch	0	0.0	0	0.0	30	100	10	33.3	10	33.4	10	33.3	30.0, 0.000**
Complications of positive touch	0	0.0	0	0.0	30	100	12	40	10	33.3	8	26.7	34.7, 0.000**

*: Significant at P ≤ 0.05

Table (4) shows nurses level of knowledge about positive touch ,the results reveal that 73.4%, 66.7% and 66.7% of studied nurses had complete correct answer post educational program about reasons, definition and benefits about positive touch compared with 0.0 %, 0.0 and 0.0 % of them pre educational program. Finally there was statistically significant improvement of nurses’ knowledge score at post-program phase than pre program of all knowledge items (p-value =0.000).

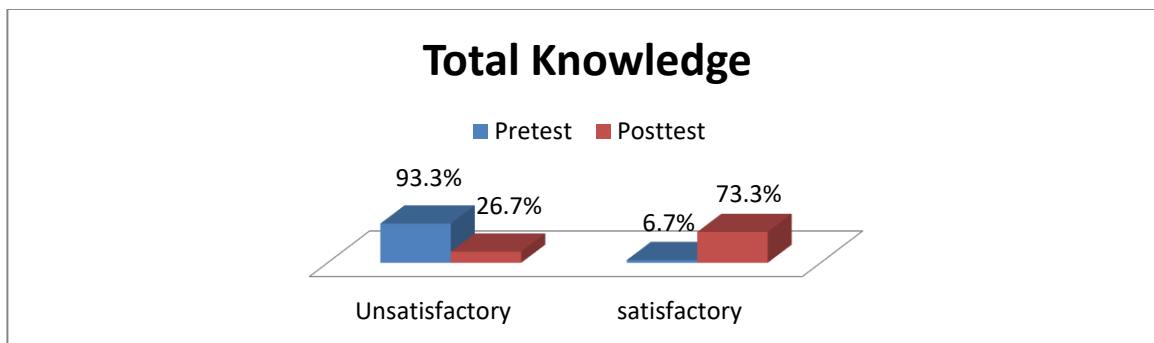


Figure (1): percentage distribution of the studied nurse total level of knowledge (n=30).

Figure 1 illustrates that, less than quarter of studied nurses (6.7%) had satisfactory total level of knowledge at preprogram phase while it increased to approximately three quarters (73.3%) at post program phase.

Part IV: Studied nurses’ practices about infant massage and positive touch:

Table (5): Distribution of studied nurses practice regarding massage practice pre and post program (n=30).

Massage skills items	Pre-program				Post-program				X2	p-value
	Done		Not- Done		Done		Not- Done			
	No	%	No	%	No	%	No	%		
Check if the infant is calm or restless	5	16.7	25	83.3	27	90.0	3	10.0	32.4	0.000**
cleaning hands	6	20.0	24	80.0	26	86.7	4	13.3	26.8	0.000**
Hand warming	7	23.3	23	76.7	25	83.3	5	16.7	21.7	0.000**
Lay the child asleep on his stomach	7	23.3	23	76.7	25	83.3	5	16.7	21.7	0.000**
6Smears from the beginning of the head to the end, then vice versa	8	26.7	22	73.3	24	80.0	6	20.0	17.1	0.000**
6Swabs , starting from the neck to the shoulder, then vice versa	11	36.7	19	63.3	24	80.0	6	20.0	11.6	0.001**
6Swabs from the shoulder to the wrists ,then vice versa, passing through the back of the arms	13	43.3	17	56.7	23	76.7	7	23.3	6.9	0.008*
6Swabs from the pelvis to the ankles ,then vice versa, passing on the back of the two legs	10	33.3	20	66.7	21	70.0	9	30.0	8.1	0.004*
6Swabs from the pelvis to the ankles ,then vice versa, passing on the back of the two legs	11	36.7	19	63.3	20	66.7	10	33.3	5.4	0.02*

Turn the child over so that he is in a supine position	9	30.0	21	70.0	22	73.3	8	26.7	11.3	0.001**
6Times bending and straightening both arms separately while fixing them along the collarbone	7	23.3	23	76.7	24	80.0	6	20.0	19.3	0.000**
6Times bending and straightening the legs separately, while fixing them along the pelvic bones	8	26.7	22	73.3	23	76.7	7	23.3	15.0	0.000**
6Times bending and straightening the legs together at the same time while holding the ankle joint	7	23.3	23	76.7	21	70.0	9	30.0	13.1	0.000**
Then turn the baby over to sleep on the tummy again	8	26.7	22	73.3	20	66.7	10	33.3	9.6	0.002*
Repeat steps 1-5	5	16.7	25	83.3	22	73.3	8	26.7	19.5	0.000**

*: Significant at P ≤ 0.05

Table (5) shows nurses level of skills about massage, the results reveal that 90.0 %, 86.7 and 83.3 % of studied nurses had satisfactory knowledge post educational program about check if the infant is calm or restless, cleaning, handhand warming and lay the child asleep on his stomach compared with 16.7 %, 20.0% and 23.3% of them pre educational program. Finally there was improvement in nurses' infant massage skills in post phase of program implementation.

Figure (6): Distribution of studied nurses practice regarding positive touch practice pre and post program (n=30).

Steps	Pre-program				Post-program				X ²	p-value
	Done		Not- Done		Done		Not- Done			
	No	%	No	%	No	%	No	%		
Ensure that the environment is quiet.	8	26.7	22	73.3	27	90.0	3	10.0	24.8	0.000**
check the infant is calm	9	30.0	21	70.0	26	86.7	4	13.3	19.8	0.000**
cleaning hands	10	33.3	20	66.7	25	83.3	5	16.7	15.4	0.000**
Warm the hands by rubbing them together when you are near the infant	9	30.0	21	70.0	25	83.3	5	16.7	17.4	0.000**
contain the child	11	36.7	19	63.3	26	86.7	4	13.3	15.9	0.000**
Putting the hand on the child in the sleep position	12	40.0	18	60.0	25	83.3	5	16.7	11.9	0.001**
Plump quietly	16	53.3	14	46.7	23	76.7	7	23.3	3.6	0.058
Start by offering your finger in the ,baby's palm for him to hold.	12	40.0	18	60.0	23	76.7	7	23.3	8.3	0.004*
Hold the child's head with both hands	12	40.0	18	60.0	22	73.3	8	26.7	6.8	0.009*
Give the child periods of rest during the application procedure	11	36.7	19	63.3	22	73.3	8	26.7	8.1	0.004*
Non food suckling	9	30.0	21	70.0	24	80.0	6	20.0	15.2	0.000**
Check that too much stimulation can lead to stress	10	33.3	20	66.7	23	76.7	7	23.3	11.4	0.001**

*: Significant at P ≤ 0.05

Table (6) shows nurses level of skills about positive touch, the results reveal that 90.0 %, 86.7 and 83.3 % of studied nurses had satisfactory knowledge post educational program about the environment is quiet, cleaning and warm hands, contain the child and compared with 26.7%, 30.0%and 33.3 % of them pre educational program. Finally there was improvement in nurses' positive massage skills in general post phase of program implementation.

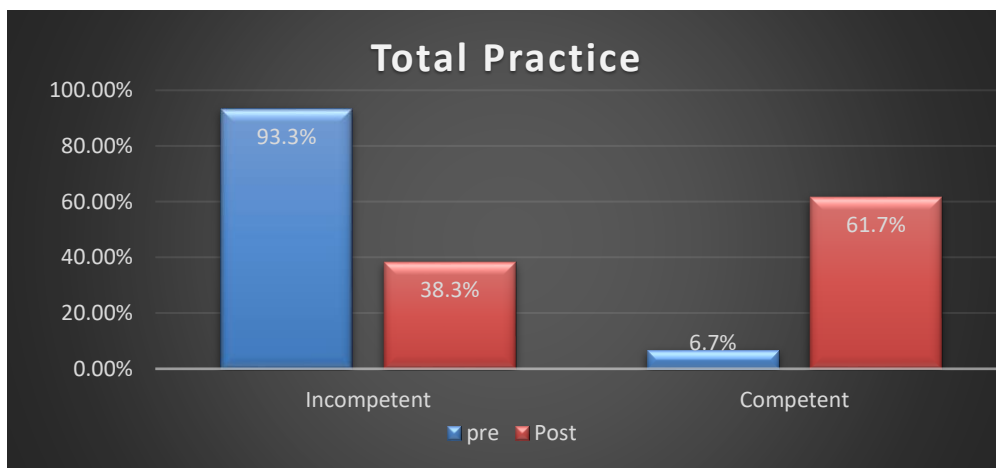


Figure (2): Percentage distribution of the studied nurse total level of practices (n=30).

Figure (2) shows that, about tenth of studied nurses (6.7%) had competent level of practice at preprogram phase while it increased to more than half (61.7%) at post program phase.

Table (7): Correlation between the studied nurses ‘total level of knowledge and total level practice regarding massage and positive touch.

Items	Mean± SD	Total knowledge	
		Correlation Coefficient (r)	P-value
Practice	0.133	0.764	0.000*

*: Significant at P ≤ 0.05

Table (7) reveals that, there was a highly statistically significant correlation between the studied nurses’ knowledge and practice with p- value = 0.000.

4. DISCUSSION

Massage therapy has gained recognition as a valuable intervention for promoting the well-being of low birth weight infants. These infants often face a range of challenges due to their underdeveloped systems and susceptibility to health complications. Gentle and structured massage can provide various benefits. The massage therapy can aid in weight gain, improve digestion, enhance sleep patterns and reduce stress in premature and low birth weight infants (Rad et al., 2016).

Positive body touch, characterized by gentle and nurturing tactile interactions, holds profound importance for the development and well-being of low birth weight infants. Positive touch, such as skin-to-skin contact, has been shown to offer a range of benefits. Positive body touch plays a significant role in establishing the crucial bond between caregivers and infants. This emotional connection not only aids in reducing stress and promoting relaxation but also contributes to the infant’s cognitive and emotional development (Khasawneh et al., 2020).

The study was carried out aiming to assess effect of training program on nurses’ performance regarding massage and positive body touch of preterm and low birth weight infants at NICU through:

I- Assess nurses’ level of performance regarding massage and positive body touch of preterm and low birth weight infants at NICU.

II- Planning and implementation of training program on massage and positive body touch of preterm and low birth weight infants at NICU

III- Evaluation of nurse’s level of performance on massage and positive body touch of preterm and low birth weight infants at NICU.

Part I: Personal characteristics of studied nurses

In relation to nurses' characteristics, the present study revealed that more than half of the nurses had a technical degree. The data also highlights a substantial percentage of nurses with extensive experience, with fewer than half of them having more than 10 years of experience and majority work as staff nurses in NICU. This result is in accordance with **Needleman, (2016)** revealed that there is a significant correlation between the years of experience of nurses and improved infants outcomes including reduced mortality rates, decreased length of hospital stay and lower rates of complications and the nurses with higher levels of knowledge and experience were more likely to adhere to evidence-based practices, leading to better patient outcomes.^[29] Also **Sermeus et al., (2011)** revealed that, lower qualifications are also associated with higher rates of side effects and longer length of stay.

Also majority of nurses had not attended any previous training. This result is in accordance with **Li-Ying et al., (2016)** who revealed a positive association between nurses who actively pursued knowledge enrichment and improved patient care metrics. Nurses who participated in regular workshops, attended conferences and pursued additional certifications demonstrated greater competence in handling complex medical situations, leading to reduced medical errors and enhanced patient safety. Possibly indicating the need for further emphasis on continuous professional development and in need for more knowledge and new skills.

Part II: Personal characteristics of studied infants:

The current study also revealed that more than quarter of them was suffered from Tetralogy of Fallot, this is in congruent with **Jelly et al. (2018)**, who stated that congenital heart disease including Tetralogy of Fallot (TOF) is the most prevalent form of primary congenital disability in newborns and is the leading cause of death in children with congenital malformations. It occurs in approximately 0.8% of live births.^[19]

Also more than third birth weights were between 2260: 2499. This result is supported by **Mrljak et al., (2018)**, who stated that, low birth weight is a critical indicator of a newborn's health and development and it plays a significant role in determining the need for NICU admission.

Part III: Nurses' knowledge about infant massage and positive touch:

As regards the effect of the educational program about massage and positive body touch on nurses' level of knowledge; the current study revealed that there was statistically significant improvement of nurses' knowledge post-program than pre-program of all knowledge items. These findings is similar of that Lerthamteve et al., (2011), who revealed that nurses who participated in an educational program about infant massage showed significant improvement in their knowledge of infant massage. Because the educational program provided nurses with the opportunity to learn about the benefits of infant massage and how to perform it safely and effectively.

Tool II: observation check list during nurses' performance for infant massage and positive touch

Concerning nurses' main reason for non-compliance with massage and positive touch skills, the current study revealed that the most frequently mentioned mean reason for non-compliance was "not known" by around three quadrants of nurses followed by one quadrant of nurses stated that they are un-familiarity with the procedure. This is in accordance with **Sun et al. (2021)** who surveyed NICU nurses to explore their attitudes and practices related to massage and touch-based interventions and revealed that a substantial proportion of nurses cited lack of knowledge or inadequate training as the primary reason for not using these techniques. Many nurses expressed a desire for more education and training in this area to gain confidence and competence in implementing massage and positive touch effectively.

Moreover **Li-Ying et al., (2016)**, who investigated factors influencing nurses' adherence to developmental care practices in the NICU including massage and positive touch. Among the barriers identified, the most commonly reported reason for non-compliance was a lack of knowledge and understanding of the potential benefits and techniques of these interventions.

Investigating nurses' level of skills about massage, the current study results revealed that, a satisfactory knowledge post educational program and there was improvement in nurses' infant massage skills in post program implementation. This result is consistent with **McCourt et al., (2000)**, who concluded that nurses who have expertise and have demonstrated new skills related to neonatal care should be given enough time and are more likely to achieve high levels of productivity.

Also this finding supported **Pados et al., (2019)**, who stated that, NICU nurses who participated in an educational program about infant massage showed significant improvement in their skills in performing infant massage. Because the educational program provided nurses with the opportunity to practice their skills under the supervision of an experienced instructor.

The current study also revealed that, there was improvement in nurses' positive touch skills in post program implementation. This result is in accordance with **Zhang et al., (2020)**, revealed that NICU nurses who participated in an educational program about positive body touch showed significant improvement in their skills in providing positive body touch to infants. Because the educational program provided nurses with the opportunity to learn about the different types of positive body touch, how to perform them safely and effectively and the benefits of positive body touch for infants.

CONCLUSION:

The educational nursing program had a positive effect on the improvement of nurses' knowledge, attitude and practices related to positive body touch and massage and positive touch.

RECOMMENDATIONS:

Based upon the results and the forgoing conclusion of the current study, the following recommendations are suggested:

- Periodical educational programs should be developed for the nurses working at the high-risk neonate units according to their needs or positive touch and massage aiming at refreshing their knowledge and adding
- New interventions in order to improve their performance level.
- Positive touch approach; including massage and support during invasive procedures should be applied as a routine care at the high-risk neonates units.
- Long-term follow-up to the preterm/low birth weight infants of the experimental group should be done to compare their physical growth, behavioral development and educational achievements with their peers at different growth and developmental stages.
- Further studies should be conducted to study the effect of positive touch and body massage on:
 - Ventilated neonates and those on CPAP.
 - Extremely low birth weight infants.
 - Neonates receiving oxygen support and during resuscitating the preterm/low birth weight infants.
 - Full term infants.
- Replication of the study on larger samples of different gestational ages and in different high-risk units of other settings.

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