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Effect of Training Clinical Positioning Guidelines on Physiological Parameters of Premature Infants undergoing Nasal Continuous Positive Airway Pressure

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Abstract: **Continuous Positive Airway Pressure (CPAP) is the most common form of non-invasive respiratory support applied to preterm infants and is a standard of care. Aim of the study was to evaluate the training clinical positioning guidelines on physiological parameters of premature infants undergoing Nasal Continuous Positive Airway Pressure. Design: A quasi - experimental research design. Setting: The study was carried out at Neonatal Intensive Care Units affiliated toBenha specialized hospital of children at Benha city. Sample: .A convenient sample of 50 nurses working at the study setting and a purposive sample of 50 neonates who undergoing CPAP. Tools: Three instruments were utilized to collect data; A structured interviewing questionnaire sheet, an observational assessment checklists. Results: this study revealed that, nursing intervention in the form of body positioning guidelines improved medical outcomes of preterm infants who placed on CPAP on post program phase compared with pre program phase. Conclusion: preterm infants who exposed to the intervention program in the form of body positioning had better mean scores in relation to their medical outcomes post program compared with preprogram intervention. . Recommendation, Program intervention in the form of body positioning should be integrated as a part of routine daily care of infants with nasal continuous positive airway pressure**

Keywords: **Training Clinical Positioning Guidelines, Physiological Parameters, Premature Infants& Nasal Continuous Positive Airway Pressure.**

1. INTRODUCTION

Provision of intensive care to high-risk infants is one of most significant challenges in nursing and nurses endeavor to increasingly improve the quality of care by incorporating evidence-based approaches into the science and art of nursing. Immaturity is the most common cause of neonatal mortality. According to statistics, 1.1million preterm infants die due to the complications of prematurity, and more than80% of premature infants are born at 32-37weeks of gestation. In addition, 75% of these newborns die within the first week of life due to these complications**(Murki et al., 2016).**

According to the latest report of the World Health Organization (WHO), the rate preterm is 23% in Iran. Numerous pulmonary issues threaten the life of preterm infants and respiratory distress syndrome (RDS) is considered to be the most common cause of admission to neonatal intensive care units(NICUs) and neonatal mortality and morbidity. However, the etiology and pathology of the syndrome remain controversial **(Thukral et al, 2016).**

For healthy, or even sick, premature infants the prone position can offer a number of benefits to respiratory function. It can promote increased oxygenation, a decrease in expired CO^2, an improvement in compliance and function of the diaphragm and a reduction in thorax-abdominal synchronicity**(Nahimana et al.,2015)**

Nurses can contribute to the improvement of feeding tolerance in preterm infants through specific interventions, such as the provision of proper conditions during and after feeding .Premature infants with increased nutritional disorders require mechanical ventilation via nasal prongs or masks. **(Valizadeh et al., 2015)**

NCPAP has proved beneficial in keeping the alveoli open and stabilizing the functional residual capacity (FRC) in the treatment of RDS within short periods. It has been recommended that continuous positive airway pressure (CPAP) be applied within the first few minutes after birth in order to prevent RDS or during treatment and after the removal of the tracheal tube to reduce the need for re-intubation **(Amatya et al.,2017)**

The effects of positioning on newborns have been investigated under a variety of neonatal circumstances, but there is one critical period, which is during weaning off from mechanical ventilation, during which the effects of position have not been evaluated. Therefore, this study was proposed into premature infants during the discontinuation of mechanical ventilation, with the objective of determining the effects of the prone position on oxygen saturation (SaO2) respiratory rate and cardiac rate, on the reduction of the ventilator parameters during the weaning process and on the frequency of success or complications during that process**(Zeitlin et al.,2016)**

Significance of the study

Premature infants with respiratory distress syndrome (RDS) are in dire need of respiratory support with a ventilator. However, the high tidal volume of mechanical ventilation may cause lung injury, and researchers have been concerned with the use of nasal continuous positive airway pressure (NCPAP). NCPAP has concomitant side effects, such as abdominal distention, which might disrupt the proper nutrition of neonates. Hence, the researcher found urgent to conduct nursing intervention in the form of body positioning guidelines to achieve positive medical outcomes of preterm infants who placed on NCPAP

Aim of the study:

The aim of this study was to evaluate the effect of training clinical positioning guidelines on physiological parameters of premature infants undergoing Nasal Continuous Positive Airway Pressure .Through the following objectives**:**

1-Assessing nurses' knowledge and practice regarding NCPAP in pre term infants

2-Designing training clinical positioning guidelines based on nurses' actual needs assessment about the best nursing practice in relieving abdominal distension and improving respiratory rate in preterm infants undergoing NCPAP .

3-Implementing an intervention program based on application of the training clinical positioning guidelines and for meeting nurses' needs

3-Evaluating the effect of the implemented intervention program on nurses' knowledge and practice towards care of preterm infants with NCPAP.

4-Evaluating the effect of implemented intervention program on physiological parameters of premature infantsundergoing NCPAP.

Hypotheses:

1- Nurses will adhere to the instructions related to training clinical positioning guidelines preterm infants on post program phase than on preprogram phase

2- Nurses will have higher level of knowledge about body positioning for premature infants on post program phase than on preprogram phase

3- Preterm infants will have less abdominal distension on post program phase than on preprogram phase.

4- The premature infants who will expose to the intervention program in the form of body positioning will have better physiological parameters than before applying the intervention program

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2. SUBJECTS AND METHOD

Research Design

Aquasi-experimental design was used to conduct this study

Setting

The study was carried out at neonatal intensive care units at Benha city they were: Benha Specialized Hospital for Children (affiliated to Ministry of Health) . It included two units. These units are for neonates having different diagnosis. One of them contained 14 incubators and the other unit contained 26 incubators.

Sampling: Consisted of two groups of subjects were included in the study as the following:

Group (1): A purposive sample of 50 prematureinfants from the previously mentioned setting.The neonates fulfilled the following

Inclusion criteria:

– Gestational age less than<37weeks.

– The need for CPAP during the first month of life.

-Birth weight of1,500-2,490 grams

-One- and five-minute Apgar scores of >7

- Infants with RDS requiring respiratory aid measures

The exclusion criteria were:

– Clinical or surgical inter current conditions which make the randomized position at the start of the study impossible to maintain or which interrupt CPAP

– Undergoing mechanical ventilation through an endotracheal tube, detachment from the CPAP device, and need for re-feeding in lessthan 120 minutes

– The inadvertent violation of the research protocol or the newborn remaining in a position other than that prescribed by the study for more than an hour per day

Group (2): A convenient sample of 50 bedside male and female nurses who were working at the previously mentioned setting regardless their characteristics**.**

Body positioning intervention: Prone versus supine positions

Tools of data collection

Tool (I): It involved a structured Interviewing questionnaire. It was developed by the researchers based on the scientific literatures. It was prepared in Arabic language to suite the study subject nature. To assess the nurses' knowledge regarding CPAP. Each nurse was interviewed individually for answering the knowledge questionnaire sheet. It comprised three main parts which are:

Part 1:Personal characteristics of the studied nurses as; age, gender, qualifications, years of experience and attendance of training courses regarding neonatal care.

Part 2: Nurses' knowledge about CPAP, which consisted of multiple choice questions and close ended questions covering the questions related to definition, indications, fundamental for uses devices, contraindication, proper position post prandial and nursing management. The scoring system consisted of giving score (1) for the correct answer and (0) for the wrong answer.

The scoring system for total knowledge classified as follows:

- Satisfactory knowledge level: Equal to or more than 70%
- Unsatisfactory knowledge level: Less than 70%

Part 3: Neonates' characteristic sheet: It was designed by the researchers to collect data about characteristics of neonates after a review of related literatures. It included infant baseline information such as; gestational age, current age at the study time, weight on admission, current weight at study time. gender, birth weight, date of admission

- **Tool III:** Physiological parameter and measurement of the abdominal circumference checklist: It was performed at stable state to record the health status, the abdominal girth by using apaper measuring tape at one centimeter above the navel. The measurements were obtained at 15, 30, 60, 90, and 120 minutes after each event recording and the abdominal distension scores were compared in the prone and supine positions

Content Validity: Content validity was done through five experts from Faculty Members of Pediatric Nursing Department.

Ethical consideration and human rights: All relevant ethical aspects were considered for ensuring the confidentiality of the collected data through; gaining oral consent form parent after explaining the purpose of the study, right to refuse to continue participation at any time without giving any reasons.

Pilot study: It was carried out on 10 %(5 nurses) of total sample to assess the tool clarity, applicability, and time needed to fill each sheet.

4.4. Field work

The field work was performed from the beginning of from October 2018 to end of December 2018.to collect data. The researchers were available six days per week except Friday by rotation two days per week for each researcher in the morning and afternoon shifts.

Procedure

-After the pilot carried out, it was clear for all nurses that neonates who placed on prone position had improved outcome.

-The studied infants were assessed by using the study tools during NICU hospitalization.

-Ongoing education occurred as needed throughout the study. At each participant's bedside, signage was posted with positioning instructions, and a contact number was provided to call when there were challenges.

-Upon notification, the researchers would go to the bedside and demonstrate proper positioning to nursing staff.

-The numbers of nurses who were assessed and taking educational sessions per week were ranged from 4-5 nurses. The structured interviewing questionnaire sheet was filled out by the nurse and observational checklists were collected by the researchers and the average times required for completion of each tool was around 10-15 minutes. The same researcher was observing the nurses' practice regarding care of preterm infant with CPAP for the same specified nurse during their actual practices.

- Infant medical assessment was assessed by using tool I based on review of literature.

- Measurement of the abdominal circumference was performed at stable state to recording the conditions; the girth was measured using a paper measuring tape at one centimeter above the navel. The measurements were performed at 15, 30, 60, 90, and 120 minutes after each event recording, and the abdominal distension scores were compared in the prone and supine positions

- **Preparation phase:**

It was concerned with designing and testing different data collection tools, in addition, the administrative arrangements to carry out the study as well as to conduct the pilot study. In the beginning, the researchers introduce themselves to the nurses. prior to study initiation and over a period of one week, nursing staff who were responsible for day-to-day care of the infants were gave an oral consent to participate in the study and educated by researchers through presentations and bedside demonstrations on how to correctly position preterm infants on prone position to decrease abdominal distension. Nurses who accepted to participate in the study individually interviewed by the researchers to explain the nature, purposes, and the desired outcomes of the study and an oral consent was obtained from these nurses

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- **Implementing phase:**

Data were collected from the beginning of October 2018 to the end of December 2018. The researchers attended the selected study setting six days per week except Friday by rotation two days per week for each researcher in the morning and afternoon shifts.

Each nurse was interviewed individually for 10 – 15 minutes to fill out the structured interviewing questionnaire sheet (**Tool 1**). The researchers clarified and answered any related questions. Then, each nurse was observed during their practice on morning and afternoon shifts using nurses observational check lists by the same researcher **(Tool 2) Assessment of physiological parameter and abdominal circumference for premature infant.** The time needed for each observation for each nurse was 20-25 minutes **for four times during** provision of care for preterm infants with CPAP. The same researcher was observing the nurses' actual practice regarding care preterm infants with CPAP for the same specified nurse during their practices. The mean of the three observations was calculated after that, and the mean score was taken.

- **Program Construction, Implementation, and Evaluation:**

The intervention program was designed based on the actual needs assessment of nurses then implemented and evaluated. The aim of this program was to upgrade nurses' knowledge and improve their practice regarding care preterm infants placed on CPAP. In addition, improving the medical outcomes of the preterm infants placed on CPAP. The implementation of the intervention program was carried out in the previously mentioned study settings. The guiding booklet was distributed and implemented with the studied nurses whereas, the researchers explained the contents of the guiding booklet and how to use as a personal reference later on. Training of nurses was conducted using a laptop with MS Power Point presentations 2010 made from contents of the guiding booklet. The program was implemented for a group of nurses that entail (4-5) according to working circumstances, there mental and physical readiness.

The intervention program was implemented over four weeks period in addition to one week for pre and post-test. A time schedule suitable for nurses was developed to conduct the program that included; date, place, topic, time and duration of each session. The total number of sessions was 6 sessions for theory and practice (2 for theory and 4 for practice) in each setting, each session took about 30 to 35 minutes include periods of discussion during their training. In addition, 2 sessions for pre-test and post-test.

At the beginning of the first session an orientation to the program and its importance and outcomes were explained. In addition, a feedback about the previous session was done and the objectives of the new topic were explained. Simple words and Arabic language were used to suite the nurses' level of understanding. At the end of each session, nurses' questions were discussed to correct any misunderstanding. In addition to re-demonstration for practical procedures.

Different teaching strategies were used for implementation of the program such as; lectures, small group discussion, brain storming, role play, demonstration and re-demonstration using real objects. Suitable teaching aids as booklet, colored posters, doll and real objects were prepared especially for practice. Nurses were motivated to cooperate and participate actively in different stages of the study

Evaluation:

Upon the completion of the intervention program the post test (evaluation) was done for the studied sample to evaluate the outcomes of the implemented program using the same tools for data collection.

Administrative design

An official permission for data collection was obtained from the hospitals' manager of Benha Specialized Hospital for children through submission of official letters issued from the dean of Benha faculty of nursing. The title, objectives, and outcomes of the study were illustrated as well as the main data items to be covered, and the study was carried out after gaining the necessary permission.

Statistical design

To answer the research questions for this study, the collected data revised, organized, tabulated and analyzed by using SPSS (Statistical Package for the Social Science Software) statistical package version 16 on IBM compatible computer. Numerical data (Quantitative data) was presented in tables by using Mean, Standard deviation (X ± SD) and analyzed by applying t-test for normally distributed variables, while qualitative data were expressed as frequency and percentage and chi-square was used.

P-value at .05 was used to determine significance regarding:

- P-value > .05 to be statistically insignificant.
- P-value ≤ 05 to be statistically significant.
- P-value ≤ 001 to be high statistically significant

3. RESULTS

Table (1) reveals the distribution of the studied nurses regarding their personal data. As more than half of them (52.0%) have age of 20 - < 35. While more than half of them (62.0%) were females. Moreover, more than one third of them (38.0%) had Technical Institute of Nursing. In addition, their mean years of experience, it was found to be 3.14 ±0.98. Rather more than half (54.0%) of them had attended previous training courses related to CPAP for neonatal care.

Table (2) demonstrates distribution of the studied nurses regarding their knowledge about CPAP in preterm neonates. It was found that the majority of the studied nurses (84.0. %,) gave correct answers on post intervention test compared with pre-intervention test in relation to; definition, while more than two thirds (70.0,68.0,70.0,68.0%) gave correct answers on post intervention related to start to use device, contraindication, fundamentals (CPAP) for newborn and use a one-size nose catheter, while more than half of them (60.0%) gave correct answers on post intervention related to indication for uses CPAP, while near to two thirds (62.0,64.0%) gave correct answers on post intervention related to changing the child's position help improve neonates breathing and abdominal distension

Figure (1) demonstrates distribution of the studied nurses regarding their total knowledge scores pre and post intervention. It was revealed that, the majority (80%) of the studied nurses have satisfactory knowledge post intervention compared (40%)with pre-intervention

Table (3) clarifies distribution of the studied neonates according to their characteristics. Whereas, the mean gestational age of them was 34.02-2.86 years with a mean current age at the study time was 4.58-3.28days. Moreover, more than two thirds (68.0%) of them were males. Regarding their weight on admission it was found that, the mean weight was 2.28-0.85. While their mean weight at the time of the study was2.27-0.87.

Table (4): describes that the mean score The mean changes in the abdominal circumference of the neonates was measured at stable, 30, 60, 90, and120 minutes in the supine and prone positions.

Tables (5-6): describes that the mean score The mean changes in the physiological characteristics of the neonates was measured at stable, 30, 60, 90, and120 minutes in the supine and prone positions.

Table (7): The mean changes in the abdominal circumference of the neonates was measured at stable state, 30, 60, 90, and120 minutes in the supine and prone positions, indicating a statistically significant difference between the supine and prone positions according to the analysis of variance with repeated measurements in at least one of the timings

Table (8): The mean changes in the physiological characteristics of the neonates was measured at stable state, 30, 60, 90, and120 minutes in the supine and prone positions, indicating a statistically significant difference between the supine and prone positions according to the analysis of variance with repeated measurements in at least one of the timings

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Table (1): Percentage distribution of the studied nurses according to their characteristics (no=50)

Items	No=50	%
Age		
< 20 Year	5	10.0
20 – < 25 Year	26	52.0
25 - <30 Year	7	14.0
≥ 30 Year	12	24.0
Mean ± St .D 24.60±4.49		
Gender		
-male	19	38.0
-Female	31	62.0
Years of Experience		
< 3 Years	5	10.0
3 – < 6Years	32	64.0
6 - <9Years	9	18.0
≥ 9 Years	4	8.0
Mean ±St .D3.14 ± 0.98		
Academic Qualification		
- Diploma (Secondary School)	17	34.0
- Technical Institute of Nursing	19	38.0
- Bachelor of Nursing	14	28.0
Training programs related to CPAP		
-Yes	23	46.0
- no	27	54.0
Total	**50**	**100**

Table (2): Percentage distribution of the studied nurses according to their knowledge regarding to CPAP before and after clinical program implementation (no=50).

Nurses' knowledge	Pre program implementation(50)		Post program implementation (50)		X^2	P value
	No	%	No	%		
Definition					23.12	0.000**
- Correct	14	28.0	42	84.0		
- Incorrect	36	72.0	8	16.0		
Indication for uses CPAP						

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- Correct	15	30.0	30	60.0	11.00	0.000**
- Incorrect	35	70.0	20	40.0		
When start to use device (CPAP) for newborn and premature babies						
- Correct	29	58.0	35	70.0	9.28	0.000**
- Incorrect	21	42.0	15	30.0		
Contraindications to use device (CPAP) for newborn and premature babies						
- Correct	20	40.0	34	68.0	8.48	0.000**
- Incorrect	30	60.0	16	32.0		
Fundamentals in the use of device CPAP						
- Correct	14	28.0	34	68.0	15.48	0.000**
- Incorrect	36	72.0	16	32.0		
Do use a one-size nose catheter in this system for all children						
- Correct	30	60.0	35	70.0	15.52	0.000**
- Incorrect	20	40.0	15	30.0		
Does changing the child's position help release secretions						
- Correct	15	30.0	38	76.0	21.52	0.000**
- incorrect	35	70.0	12	24.0		
Does changing a child's position help improve breathing						
Correct	30	60.0	31	62.0	4.88	0.05
incorrect	20	40.0	19	38.0		
-Does changing the child's position help improve abdominal distension						
Correct	14	28.0	32	64.0	13.68	0.000
incorrect	36	72.0	18	36.0		

Figure (1): Distribution of the studied nurses regarding their total knowledge scores pre and post intervention program.

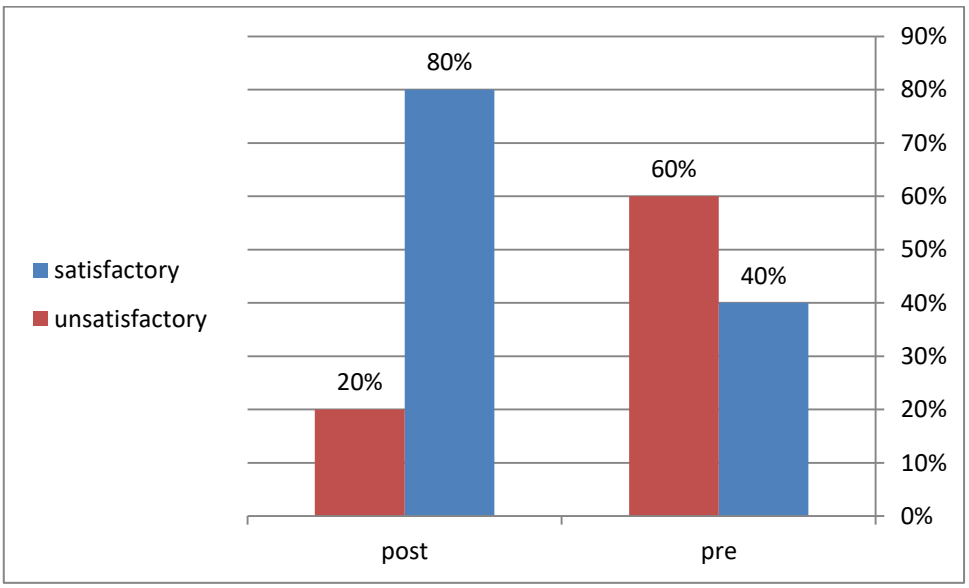

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Table (3): Distribution of the neonates according to their characteristic (no=50).

Items	No	%
Gender		
-Male	34	68.0
- Female	16	32.0
Gestational age		
- >28 weeks	8	16.0
-28-32weeks	11	22.0
-32-≥36weeks	31	62.0
Mean±St.D34.02-2.86		
Current age		
-1-10days	27	54.0
-10-20days	21	42.0
-20-≥30day	2	4.0
Mean± St.D4.58-3.28		
Type of labor		
- Normal	30	60.0
- Cesareans	20	40.0
Weight of admission		
- >1500g	17	34.0
- 1500-2000g	14	28.0
- 2000-≥2500g	19	38.0
Mean±St.D2.28-0.85		
Current weight		
- >1500g	17	34.0
- 1500-2000g	5	10.0
- 2000-2500g	40	40.0
- 2500-≥3000g	16	16.0
Mean±St.D2.27-0.87		

Table (4): Distribution of the studied preterm infants mean scores regarding abdominal circumference in supine and prone position

Premature positions	Stable status	After 30minutes	After 60 minutes	After 90minutes	After 120minutes
Abdominal Circumference in Supine Position	28.52±4.53	28.86±4.39	28.86±4.39	29.66±4.52	29.96±4.73
Abdominal Circumference in Prone Position	28.62±4.39	29.34±4.26	29.32±4.31	28.34±4.16	27.38±4.21

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Table (5): Distribution of the studied preterm infants mean scores regarding physiological characteristics in supine position

Physiological characteristics	Stable status	After 30minutes	After 60minutes	After 90minutes	After 120minutes
- Respiratory rate	54.96±5.22	54.56±6.42	53.00±7.83	54.64±6.18	53.80±5.85
-SO^2	95.08±1.76	96.68±1.65	95.56±2.75	94.22±3.13	95.45±1.62
- Heart rate	136.56±13.43	136.50±13.20	136.46±11.02	137.86±10.82	138.98±9.82
-Temp	37.04±0.17	37.07±0.19	37.24±0.14	37.022±0.66	37.028±0.08

Table (6): Distribution of the studied preterm infants mean scores regarding physiological characteristics in prone position

Physiological characteristics	Stable status	After 30minutes	After 60minutes	After 90minutes	After 120minutes
- Respiratory rate	56.88±5.78	56.16±5.56	55.74±7.90	53.40±6.73	51.92±6.99
-SO^2	95.12±0.86	94.66±1.81	95.06±1.07	95.77±0.42	96.70±0.65
- Heart rate	136.96±13.25	137.68±11.85	136.48±13.58	138.54±11.62	140.16±11.21
-Temp	37.02±0.04	37.09±0.11	37.13±0.12	37.12±0.16	37.14±0.09

Table (7): Distribution of the studied preterm infants mean scores regarding abdominal Circumference in supine and prone position

Premature positions	Stable status	After 30minutes	After 60 minutes	After 90minutes	After 120minutes
Abdominal Circumference in supine Position	28.52±4.53	28.86±4.39	28.86±4.39	29.66±4.52	29.96±4.73
Abdominal Circumference in prone Position	28.62±4.39	29.34±4.26	29.32±4.31	28.34±4.16	27.38±4.21
Paired t test	0.927	3.830	3.145	9.345	21.231
P-value	0.35	0.00	0.00	0.00	0.00

Table (8): Distribution of the studied preterm infants mean scores regarding their physiological characteristics in supine and prone position:

Physiological characteristics	Stable status		After 30minutes		After 60minutes		After 90minutes		After 120minutes	
	supine	prone	supine	prone	supine	prone	supine	prone	Supine	prone
- Respiratory rate	54.96±5.22	56.88±5.78	54.56±6.42	56.16±5.56	53.00±7.83	55.74±7.90	54.64±6.18	53.40±6.73	53.80±5.85	51.92±6.99
Paired t test	3.881		2.892		6.142		2.219		3.160	
P-value	0.00		0.00		0.00		0.03		0.00	
-SO^2	95.08±1.76	95.12±0.86	96.68±1.65	94.66±1.81	95.56±2.75	95.06±1.07	94.22±3.13	95.77±0.42	95.45±1.62	96.70±0.65
Paired t test	0.156		4.647		1.371		3.422		5.036	
P-value	0.87		0.00		0.177		0.00		0.00	
- Heart rate	136.56±13.43	136.96±13.25	136.50±13.20	137.68±11.85	136.46±11.02	136.48±13.58	137.86±10.82	138.54±11.62	138.98±9.82	140.16±11.21
Paired t test	0.851		2.362		0.036		1.406		40.36	
P-value	0.56		0.02		0.97		0.16		0.00	
-Temp	37.04±0.17	37.02±0.04	37.07±0.19	37.09±0.11	37.24±0.14	37.13±0.12	37.022±0.66	37.12±0.16	37.028±0.08	37.14±0.09
Paired t test	0.898		53.288		63.844		4.283		4.993	
P-value	0.37		0.00		0.00		0.00		0.00	

4. DISCUSSION

Concerning characteristics of the studied neonates, it was found that more than two thirds of them were males. Whereas, the mean gestational age of them was 34.02-2.86weeks with a mean current age at the study time was 4.58-3.28days.. Regarding their weight on admission it was found that, the mean weight was 2.28-0.85. While their mean weight at the

time of the study was2.27-0.87.This is in accordance with **khalaf and Shafik, (2016**) in a study entitled "effect of body positioning intervention program on relieving gastro-esophageal reflux disease in preterm infants". Who found that, Whereas, the mean gestational age of them was 31.65± 1.96 weeks with a mean current age at the study time was 5.550±3.254 days. Moreover, more than two thirds of them were males

In relation to, the mean score of changes in the abdominal circumference of the neonates was measured at stable, 30, 60, 90, and120 minutes in the prone position had statistical significance differences compared with supine position. This is in accordance with **Pourazaret al., (2018)**,according to the results, of a study entitled "Comparison of the Effects of Prone and Supine Positions on Abdominal Distention in the Premature Infants Receiving Nasal Continuous Positive Airway Pressure (NCPAP). Whereas, they found that, the abdominal circumference of the neonates increased in the supine position within 15 minutes to 30 minutes, while it decreased within 30 minutes and 60minutes, followed by a significant reduction.

Concerning the mean score of changes in the physiological parameters of the studied neonates which measured at stable, 30, 60, 90, and120 minutes in the supine and prone positions. It was found that there was a statistical significant improvement on prone position compared with supine position. This is in the same line with **Bredemeyer& Foster (2012)**,who found that, compared the effects of positioning on the arterial blood oxygen saturation, vital signs, and abdominal distention in the preterm and low-birth-weight infants receiving NCPAP in Alzahra Hospital in Tabriz (Iran). Findings of the mentioned study are in line with the results of the present study (Globally, one in 10 of these premature NICU infants were diagnosed with RDS and undergoing nasal continuous positive airway pressure which is associated with substantially increased length of hospital stay (LOS) and elevated costs. Better diagnostic and management strategies are needed to enhance quality of care for those vulnerable NICU population (**Sangers et al., 2013**).

According to the results of the present study, infants who received assisted ventilation with NCPAP via nasal prongs or masks had lower abdominal circumference in the prone position compared with the supine position. This considered an indicator for the occurrence of abdominal distension which increases the abdominal circumference.

This result is supported by **Chen et al., (2013**) who stated that, changing the position of neonates plays a key role in their feeding, especially during the first half-hour after feeding. In terms of statistical analysis, the reduced gastric residual volume in the supine position is not significantly different and is consistent with the results regarding the supine position in the present study. Rather more, our results are in the same line with the study by **Valizadeh et al. , (2015**), which conducted to compare the effects of the breastfeeding of infants in the arms of the mother and supine positioning on the gavage residual volume in preterm infants. According to the results regarding the supine position, the gavage residual volume increased as a result of measuring the abdominal circumference at different stages, which is consistent with the present study.

Additionally the findings of the current study in the same line with **Pourazar et al., (2018)** found that, prone positioning could effectively reduce abdominal distension in the preterm infants receiving positive air way pressure. Considering the advancement in the field of survival, the feeding of premature infants has gained great importance. Some of the basic problems in this regard include the lack of nutritional skills and possible cardiopulmonary effects on the breathing pattern of these neonates. In addition to reduction of the abdominal circumference in the prone positioning compared to the supine positioning was indicative of a significant difference in this regard, denoting that the abdominal circumference increased in the supine position and decreased in the prone position.

Regarding the improvement in physiological parameters of the studied premature infants, the current study revealed that infants who positioned in prone position had statistical significant improvement on respiratory rate, SPO2, heart rate and temperature compared with infants positioned in supine position. This finding is in accordance with **Eghbalian and Moeinipour, (2012)** who compared the effects of positioning on the arterial blood oxygen saturation, vital signs, and abdominal distention in the preterm and low-birth-weight infants receiving NCPAP in Alzahra Hospital in Tabriz (Iran).

On the other hand **Oliver, (2012)and Chen et al.,(2015**) stated that, the Use of the prone, supine and lateral body positions should all be considered and used intermittently to promote upper airway stability, reduce work of breathing, facilitate physiological flexion of the trunk and limbs, prevent posture and movement problems and encourage midline orientation of the hands to face. Document preferred and best tolerated position. See developmental care protocols for optimal positioning methods

Regarding distribution of the studied nurses in relation to their personal data. As more than half of them had age of 20 < 35. While nearly two thirds of them were females. This could be attributed to, the greater fraction of the nurses in Egypt was females. Moreover, more than one third of them had technical institute of nursing. This may be due to preferences of the highest percentage of them not to complete higher nursing education. In addition, their mean years of experience, was 3.14 ±0.98. For neonatal care. Rather more, more than half of them had attended previous training courses related to CPAP for neonatal care. This could be attributed to increase awareness of hospital administration by the importance of conducting regular training program for nurses at neonatal intensive care units

Regarding distribution of the studied nurses in relation to, their knowledge about CPAP in preterm neonates. It was found that the majority of the studied nurses gave correct answers on post intervention test compared with pre-intervention test. This may be due to the lack of applying standard clinical guidelines for care of preterm infants at NICUs. These findings are supported by **Guay et al., (2018)** there has been a relative lack of publications addressing the practical bedside care of infants managed on NCPAP. Effective use of NCPAP requires a coordinated inter professional team approach, ongoing assessment of the neonate, troubleshooting the NCPAP circuit.

In relation to the studied nurses knowledge pre and post program implementation. It was noticed a highly improvement in their knowledge on post program phase compared with pre program phase. This is attributed to the conduction of training programs are considered as means for providing nurses with theoretical and technical information needed to acquire new skills. This is in accordance with **Hussein, (2014)** who found that there was a statistically significant difference regarding mean scores of nurses' knowledge about pneumonia between pretest and posttest scores.

5. CONCLUSION

Based on the results of the current study, it can be concluded that, the intervention program is highly effective and successful method in upgrading nurses' knowledge, and enhancing their practice regarding care of preterm infants with nasal continuous positive airway pressure. Rather more infants who exposed to the intervention program in the form of body positioning had better mean scores in relation to their physiological parameters on post program compared with preprogram intervention

6. RECOMMENDATIONS

The recommendations for further research in this population are many:

1- Program intervention in the form of body positioning should be integrated as a part of routine daily care of infants with nasal continuous positive airway pressure

2-There is a need for studies in which a more diverse group of infants are studied, both culturally and geographically.

3-Additional research should be completed comparing each of the body positions against each other in improving physiological parameters.

4-Prone position should be proved and applied in improving physiological parameters in preterm neonates during hospitalization in NICU and after discharge.

5-The current nursing textbooks and handbooks need to be updated and each unit's policy and standards of care need evidence based resources with current recommendations from current research.

Limitation of the study:

There was a main limitation encountered in the course of this study which must be acknowledged. That the sample size used in this study was a small purposive sample limits the generalizability of the results of this study to a larger population.

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