Effect of Educational Guidelines Program about Nursing Care of Neonates Receiving Continues Positive Airway Pressure

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Abstract: *The majority of neonates, premature, and low birth weight infant vulnerable to respiratory problem and complications. Continuous Positive Airway Pressure (CPAP) is a means of providing respiratory support to neonates with either upper airway obstruction or respiratory failure. Respiratory failure constitutes either failure of ventilation or failure of lung function. The study aimed to evaluate the effect of educational guidelines program about nursing care of neonates receiving continues positive airway pressure. The study utilized a quasi-experimental research design. The sample consisted of all (80) nurses and (160) neonates they were assigned to the study using a consecutive sample. The study was conducted in the neonatal intensive care units at Benha Specialized Pediatric Hospital. The required data were collected using the following three tools, tool (I) self-administered questionnaire sheet, tool (II) Nurses' knowledge regarding CPAP device and tool (III) clinical practice guidelines of CPAP. The study results revealed that nurses who received the educational guidelines program demonstrated a statistically significant mean score of knowledge and practice. Recommendation: A training program for nurses working in neonatal intensive care units with continuous updates in their knowledge and practice regarding neonatal CPAP.*

Key Words: *Continuous Positive Airway Pressure (CPAP), Educational guidelines program, Nursing care, neonates,*

I.   Introduction

Continuous Positive Airway Pressure provides mild air pressure on a continuous basis to maintain the airways continuously open **(Werman, et al, 2014).** CPAP is indicated for neonates who have breathing problems, respiratory distress syndrome. In some preterm infants whose lungs haven't fully developed, CPAP enhances respiratory rate and survival in children with the primary pulmonary disease; researchers founded nurses had an important role in caring for neonates receiving CPAP **(Patrick, et al, 2017).**

CPAP is providing respiratory support to neonates have either upper airway obstruction or respiratory failure. The respiratory failure means failure of ventilation or failure of lung function. CPAP delivers oxygen concentrations and distending airway pressures via the ventilator without the hazards associated with full endotracheal intubation and mechanical ventilation. CPAP maintain adequate oxygen in alveoli to prevent atelactasis and improve oxygen and carbon dioxide exchange within the pulmonary circulation that enhance neonate' breathing **(The Royal Children Hospital Melbourne, 2016).**

CPAP acts by improving the functional residual capacity of the lungs by exceeding the closing capacity of the lungs, which steady and prevents the collapse of alveoli, making inflating the lungs easier. It also provides a splint to the chest wall and airway, producing in increased lung volumes, recruitment of atelectic alveoli, and prevention of further atelectasis. Majority of infants who are having respiratory problems as distress, lung collapse when CPAP is indicated, it decreases the compliance of the chest wall and allows for easy breathing, causing in a decreased effort of breathing, improved gas exchange and improved cardiac function **(Kavanagh, et al, 2016).**

CPAP can be indicated for respiratory problems as respiratory distress syndrome, meconium aspiration syndrome, apnea of prematurity, and other indications. The positive airway pressure helps to keep the alveoli open during expiration **(Maternal and Neonatal Directed Assessment of Technology, 2014).**

The nurse has a vital role and big responsibility in caring for infant receiving CPAP. Assess the heart rate, respiratory rate, SpO2% range, CPAP settings (water level, temperature, pressures, size of nasal prongs/mask in use), equipment safety checks such as suction, resuscitation devices and the ventilator, intravenous syringe drivers/pump and monitor alarms, blood gases should also be requested to assess the baby's response to CPAP, the axilla temperature should be checked at least 4 hourly, application of skin probe to continuously monitor temperature, changes in the infant's condition including response to handling, changes to

skin integrity, administration of medications, fluid balance, procedures and investigations and parental interaction should be documented. Always maintain optimal humidity for the inspired gases to facilitate mucociliary action, clear secretions optimize gas exchange and minimize the risk of infection, if suction is required the color, consistency, and quantity of secretions should be recorded (**Newborn Care Clinical Practice Guidelines, 2012).**

The nurse should be aware of the complication of CPAP and take in consideration all necessary precaution to achieve infant safety. Assess frequently any abnormalities to avoid pneumothorax. The risk of nasal trauma can be minimized by adherence to the recommended fixation technique and close observation. To avoid distension by placement of an oro-gastric tube aspirate air prior to each feed (**Stanley & Agrawal, 2016).**

1.1. Significance of the Study:
Million of neonates not only preterm infants are at risk of mortality and also at risk for developing more and serious morbidities Preterm neonates are not only at high risk of mortality but also are at risk for developing serious morbidities like respiratory distress syndrome, apnea of prematurity, bronchomalacia with terminal airway collapse, intraventricular hemorrhage, necrotizing enterocolitis, infections and in other conditions that require positive pressure. CPAP therapy is widely used in neonates, while the clinical nursing practice differs, and an inappropriate method of application may delay the treatment, and increase complications. Therefore, The researchers found urgent to conduct this research to increases nurses' knowledge and improving their clinical practice about Nursing Care of Neonates Receiving Continues Positive Airway Pressure. Meanwhile, The effective and quality of nursing care improve neonates outcomes.
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1.2. Aim of the Study:
To evaluate the effect of educational guidelines program about nursing care of neonates receiving continues positive airway pressure through:
- Evaluate knowledge and practice of nurses regarding neonates receiving continues positive airway pressure
 -Evaluate the effectiveness of educational guidelines program on knowledge and practice of nurses regarding neonates receiving continues positive airway pressure
-To find out the association between knowledge and practice of nurses regarding neonates receiving continues positive airway pressure with their selected baseline variables.

1.3. Research Hypothesis
- The educational guidelines program will be effective in improving nurses' knowledge and practice regarding neonates receiving continues positive airway pressure.

II.   Subjects And Method

I- Technical Design:
2.1.1. Research Design
A quasi-experimental research design with pre-post intervention assessments was used to measure the effect of the implemented guidelines program about nursing care of neonates receiving continues positive airway pressure

2.1.2. Setting:
The study was conducted in the neonatal intensive care unit (NICU) at Benha Specialized Pediatric Hospital which Affiliated to the Ministry of Health. Benha, Egypt. This admits in-born and out-born neonates with medical conditions. It is a four -room NICU; each room accommodates 9 NICU patients.

2.1.3. Sample:
All the 80 nurses working in NICU, with different qualifications and years of experience, were included in the study. They were both sexes.
A consecutive sample of 160 neonates, receiving CPAP, was recruited in this study from NICU and PICU. The inclusion criteria were both sexes and receiving CPAP. Exclusion criteria were Free from a congenital anoma**ly.**

2.1.4. Tools of Data Collection
Tool I: Self-Administered Questionnaire Sheet: It consisted of two parts:
Part 1: characteristics of the studied infant as gestational age, gender, weight on birth and diagnosis.
  Part 2: characteristics of the studied nurses as age, educational level, experience and training course in CPAP.
Tool II: Knowledge questionnaire (pre-post format).
It is used for assessment of nurse's knowledge about basic principles of total CPAP. It consisted of six sections with a total of 45 questions (fundamental of CPAP device: 3 questions; aim of CPAP device: 7 questions; uses: 10 questions; contraindication: 11 questions; complication related to the infant: 8 questions and complications related to device: 6 questions).

Knowledge Scoring

Each item was assigned a score of (2) given when the answer was correct and a score (0) was given when the answer was incorrect / do not know. nurses' total knowledge score was 90 and classified as the following; poor when total score was < 60%, average when total score was 60% < 75% and good when total score was ≥ 75%.

Tool III: Clinical practice guidelines of CPAP.

It included nursing practice regarding CPAP machine, and infant care receiving CPAP and was constructed to assess the nurses' practice and performance regarding CPAP. It has consisted of 9 procedures with a total of 55 questions; each procedure had a different practice regarding CPAP. It included 9 parts: **Part 1:** Nursing Care and Application of CPAP contain 9 steps. **Part 2:** Methods of Securing CPAP device contain 4 steps. **Part 3:** Bonnet with Ties included 4 steps. **Part 4:** CPAP Mask included 4 steps. **Part 5:** Nasal comfeel application included 3 steps. **Part 6:** Method of Application the CPAP contains 13 steps. **Part 7:** CPAP Nursing Care included 7 steps. **Part 8:** include 5 steps; Observation & continuous monitoring, the infant must be placed on continuous monitoring, change probe site 4 hourly, record all observations respiratory rate, and temperature every 15 minutes as, capillary blood gas monitoring at least 6 hourly until stable Record on Blood Gas Analysis Chart. **Part 9:** included 6 steps; Documentation. The nurse should accurately record and document all steps of all procedures for effective nursing care outcomes.

Scoring system for practice:

Each respond to practice divided into done completely took score 2, done incomplete answer took 1 score and not done answer took zero scores. The total score of the practice of nurses was translated to competent (80% and more) and incompetent (less than 80%).

II- Operational Design:

2.2.1. Preparatory Phase:

A review of the past and current available literature in various aspects of the problem using books, evidence -based articles, periodicals, and magazines was done to be acquainted with all aspects of the study problem and also in order to develop relevant tools for data collection and the content of the guidelines of nursing care for neonates receiving CPAP.

2.2.2 Validity and reliability:

Data collection tools were submitted to three experts of pediatric nursing to test the content validity. The experts agreed on the content, according to their review. Regarding reliability, the reliability coefficients alpha between questions was 0.72. During the program construction phase, the content of nursing care for neonates receiving CPAP was based on the identified nurses' needs, in addition to reviewing related literature (e.g., Neonatology Directorate Management Committee, 2016) In addition, a group of experts reviewed the program and evaluated for inter-rater reliability content; they were Consultant Neonatologists and the Head Nurse of the NICU.

2.2.3. Ethical Considerations:

An official permission was obtained from the director of Benha Specialized Pediatric Hospital after clarifying the purpose of the study and the time for beginning the study. All nurses received written and verbal explanations about the nature of the study; their participation will be voluntary; what study involvement would entail; anonymity and confidentiality issues; and their right to withdraw from the study at any time and based on the basic ethical principle of beneficence.

2.2.4. Pilot Study:

A pilot study was conducted on 10% of nurses (8) and neonate to test the applicability of the tool and questionnaire were omitted.

2.2.5: Field work:

After receiving the approval from ethical committee at faculty of Nursing, Benha University at the 1st of May 2017 these phases were started to carry out by the researchers:

a. Assessment phase*:* The actual field work was carried out from the beginning of June, 2017 and completed at the end of September, 2017 covering four months. The researchers were available at the previously mentioned settings four days/week (Saturday to Tuesday) in the Neonatal Intensive Care Units from 8AM to 2PM and the average number interviewed was 4-5 participant / day. At the beginning of the interview the researchers greeted the nurse, introduced themselves to each participant included in the study, explained all information about the study purpose, duration, and activities and taken an oral consent. Then, each nurse was

asked to fill the data collection tool individually to collect baseline data and to assess nurses' needs At the same time, the researchers were observed each nurse during demonstrating routine care for neonates to receiving CPAP, and asked for her participation. Nurses' knowledge and practice were assessed utilizing the tools of data collection. Based on the result of pretest the studied nurse needs regarding knowledge and practice was detected. The average time for the completion of each participant interview was around (45-50 minutes). The total sample was divided into 8 groups according to the time schedule of NICU at the studied setting divided into subgroups included 5 participants for each session. This phase was taken about four weeks.

b. Planning phase: Based on the results obtained from the interview sheet from pilot study and assessment phase (pre-test) as well as reviewing the related literature the educational guidelines were developed by the researchers. Detected needs, requirements and deficiencies were translated into the aim and objectives of the educational guidelines and given to nurses.

c. Implementation phase: The educational guidelines were implemented in about two months. It was carried out in 4 sessions (2 sessions for theory and 2 sessions for practice). A time schedule suitable for nurses was developed to conduct the program that includes; date, place, topic, time and duration of each session. The educational guidelines consisted of two parts, the theoretical part cover (fundamental of CPAP machine, How does CPAP machine work, the uses (medical uses) of CPAP machine, indication of CPAP machine, the aim of CPAP machine, the type of CPAP machine, the Contraindications for use of CPAP, the Complications of CPAP, and the care & maintenance of CPAP machine) and the practical parts cover the items of guidelines (clinical practice guidelines of CPAP). These sessions have lasted for 11 hours. It was difficult to take all nurses at the same time; thus they were divided into 8 groups of about 10 nurses in every session. The duration of each theory session started from 9.00 to 10.30 AM and from 11.00 AM to 1.00 PM for practical sessions four days/week. At the beginning of each session, the researchers started by a summary about what was given through the previous session and objectives of the new one, taking into consideration using simple and clear language suited the nurses. Different teaching methods were used including small group discussion, lectures, brainstorming, role-playing, demonstration, and re-demonstration. The teaching aids used were colored posters, and PowerPoint presentation. Each nurse of all studied groups obtained a copy of educational guidelines handout. An open channel communication was achieved between researchers and nurse to ensure understanding, answer any question and to verify information given.

d. Evaluation Phase: After the completion of the program contents; the nurses' knowledge and practice about nursing care of neonates receiving CPAP were evaluated post guidelines by using same pretest tools. Additionally, the researchers asked nurses' to assess their opinion regarding educational guidelines. This phase takes four weeks.

2.2.6. Statistical analysis of data:

Data were analyzed using SPSS version 21. Descriptive data were expressed as frequency and percentage. Qualitative data were expressed as the mean and standard deviation. A comparison between variables carried out by using parametric Chi-square test. Comparison between quantitative variables was performed using paired-sample t-test. Level of significance at $p < 0.05$, 0.001 were used as the cut of value for statistical significance.

III. Results
Table (1): Percentage Distribution of Baseline Characteristics of Infants

Items	N(160)	%
Gestational age: 33-<36 36-40	120 40	75.0 25.0
Mean ± SD	34.400 ± 1.288	
Gender: Male Female	100 60	62.0 37.5
Birth Weight: <2500g 2500-<3000g >3000g	110 30 20	68.8 18.8 12.4

Table (1): Showed that nearly two-third (75.0%) of studied infant their gestational age between 33-< 36 and mean of gestational age was 34.400 ± 1.288. More than half of the infant (62%) was male and 68.8% of them their birth weight <2500g.
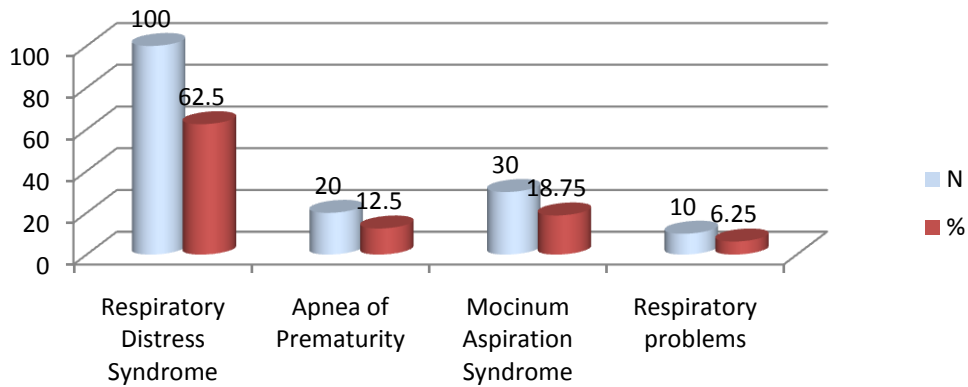
Figure (1): Distributions of studied infant related to their Diagnosis

Figure (1): This figure illustrated that more than half (62.5) of the studied infant have respiratory distress syndromes.

Table (2): Percentage Distribution of Baseline Characteristics of the Nurses

Items	N(70)	%
Nurses' age:		
<20 years	10	12.4
20-<25 years	33	41.3
25- <30 years	24	30.0
>30 years	13	16.3
Mean +SD	26.40 ± 5.23	
Sex:		
Female	65	81.3
Male	15	18.7
Years of Experience:		
<5 years	10	12.5
5- <10 years	57	71.3
> 10 years	13	16.2
Training Course in CPAP:		
No	53	66.3
Yes	27	33.7

Table (2): Demonstrated that most (81.3%) of the nurses were female. Nearly two-third (71.3%) of them has 5-<10 years of experience and 66.3% of them haven't training course in CPAP.
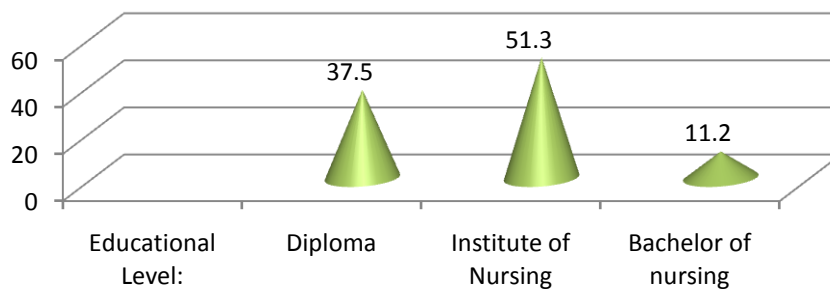

Figure (2): Distributions of the Nurses related to Educational level.

Figure (2): This figure showed that more than half (51.3) of the nurses graduated from Institute of nursing.

Table (3): Distribution of the Nurses related to their Knowledge about Fundamental, Aim and Uses of CPAP Pre and Post-Guidelines.

Items	Pre				post				X^2	P
	Correct		Incorrect		Correct		Incorrect			
	N	%	N	%	N	%	N	%		
Fundamental of CPAP device										
CPAP refers to Continuous Positive Airway Pressure. Effective treatment for sleep apnea.	30	37.5	50	62.5	71	88.7	9	11.3	39.50	<.001
CPAP an air pump works by maintaining an open, obstruction-free airway through the flow of pressurized air	24	30.0	56	70.0	66	82.5	14	17.5	10.87	<.001
Maintenance of an increased positive pulmonary pressure during the breathing cycle.	17	21.3	63	21.3	61	76.3	19	23.7	6.72	<.001
Mean ± SD	1.77 ± 2.11				4.95 ±2.06					
Aim of CPAP device										
Keep the airway open during the night.	10	12.5	70	87.5	71	88.7	9	11.3	.018	<.005
Conserves surfactant and reduces alveolar fluid	14	17.5	66	82.5	68	85.0	12	15.0	2.99	<.001
Improve the patient's quality of sleep.	11	13.7	69	86.3	69	86.3	11	13.7	1.96	<.005
Reduce the sleep apnea symptoms, like daytime sleepiness.	20	25.0	60	75.0	67	83.8	13	16.2	46.65	<.001
Prevent high blood pressure	13	16.3	67	83.7	61	76.3	19	23.7	12.24	<.001
Maintains lung volume	21	26.2	59	73.8	63	78.8	17	21.3	7.68	<.005
Lowers upper airway resistance	15	18.8	65	81.2	73	91.2	7	8.8	1.77	<.005
Mean ± SD	2.60 ± 2.57				11.80 ±2.26					
Uses of the device (CPAP) for premature babies and newborns										
It is used for patients with respiratory distress syndrome (RDS).	18	22.5	62	77.5	70	87.5	10	12.0	3.31	<.005
Uses for treat Apnea of premature babies.	18	22.5	62	77.5	70	87.5	10	12.0	3.31	<.005
Used in case of a premature baby with respiratory dysfunction and bradycardia.	16	20.0	64	80.0	60	75.0	20	25.0	40.61	<.001
It used in the child with Pneumothorax.	26	32.5	54	67.5	66	82.5	14	17.5	7.81	<.005
If the child has bleeding in the upper gastrointestinal tract is used.	20	25.0	60	75.0	62	77.5	28	22.5	0.96	<.005
Used to eliminate excessive respiratory secretions of Baby.	20	25.0	60	75.0	72	90.0	8	10.0	2.96	<.005
When there is pulmonary bleeding may not use the (CPAP) device.	15	18.7	65	81.3	64	80.0	16	20.0	4.61	<.005
Used to Lung collapse prevention	23	28.7	57	71.3	65	81.7	15	18.3	7.44	<.005
It works to increase intracranial pressure (ICP) for premature.	12	15.0	68	85.0	69	86.3	11	13.7	2.25	<.005
The goal of (CPAP) is to reduce the need for the respiratory tube in emergencies.	17	21.3	63	78.7	71	88.7	9	11.3	2.73	<.005
Mean ± SD	4.62 ± 6.21				16.72 ±3.92					

Table(3): the nurses' knowledge related fundamental of CPAP device illustrated that more than half (50.0%, 56.0% ,and 63.0% respectively) had incorrect knowledge about items of fundamental of CPAP device pre guideline. To evaluate the knowledge retention among nurses post implementation 88.7. 82.5 and 76.3respectively had correct knowledge about the same items. As regard to the nurses knowledge about aim of CPAP, the most (87.2%, 82.5%, 86.3 &83.7% respectively) of them had incorrect knowledge about the aim of CPAP keep the airway open during the night, conserves surfactant and reduces alveolar fluid, improve the patient's quality of sleep and prevent high blood pressure respectively. To evaluate the knowledge retention among nurses post-guidelines implementation most (88.7%, 85.0%, 86.3% & 76.3% respectively of the nurses had correct of knowledge and there was a statistically significant difference between pre and post-implementation (p=<0.005). the same table also illustrated the most (80.0 %, 81.3% & 85.0% respectively) of them had incorrect knowledge about uses of CPAP device related items, used in case of premature baby with respiratory dysfunction and bradycardia, used when there is pulmonary bleeding may not use the (CPAP) Machine and it works to increase intracranial pressure (ICP) for premature respectively. To evaluate the knowledge retention among nurses post-implementation 75.0%, 80.0% & 86.3% respectively of the nurses had correct of knowledge and there was a statistically significant difference between pre and post (p=<0.005).

Table (4): Distribution of the Nurses related to their Knowledge about Contraindication and Complications of CPAP Pre and Post-Guidelines.

Items	Pre				Post				X^2	P
	Correct		Incorrect		Correct		Incorrect			
	N	%	N	%	N	%	N	%		
Contraindications to use the device (CPAP) for newborn and premature babies										
Congenital anomalies such as cleft lips or cleft palate.	13	16.3	67	83.7	72	90.0	8	10.0	1.72	<.005
It can be used in case of severe cardiovascular instability, such as low blood pressure.	25	31.3	55	68.8	66	82.5	14	17.5	7.71	<.005
If the child is unconscious and does not respond to stimuli, cannot use the (CPAP) device in this condition.	14	17.5	66	82.5	63	78.7	17	21.3	8.38	<.005
It contraindicates the device in the case of pneumonia	12	15.0	68	85.0	66	82.5	14	17.5	2.99	<.005
Pneumothorax without chest drain	21	26.3	59	73.7	67	83.7	13	16.3	5.52	<.005
If the child has surgery in the stomach, that does not affect the use of CPAP device.	24	30.0	56	70.0	68	85.0	12	15.0	.075	<.005
Nasal trauma/deformity so severe that it might be exacerbated by the use of nasal prongs.	34	42.5	46	57.5	63	78.7	17	21.3	15.95	<.001
Tracheo-oesophageal fistula and gastroschisis	20	25.0	60	75.0	60	75.0	20	25.0	1.42	<.005
The device is not effective in the case of meconium aspiration	25	31.3	55	68.7	65	81.3	15	18.7	7.10	<.005
CPAP device prevent to use in the case of Post-extubation in preterm VLBW infants	34	42.5	46	57.5	66	82.5	14	17.5	12.54	<.001
CPAP cannot be used together with the Nebulizer.	46	57.5	34	42.5	67	83.7	13	16.3	21.0	<.001
Mean ± SD	6.70 ± 5.79				18.07 ±4.90					
Complications of CPAP Related to Infant										
Obstruction of SNP or bi-nasal prongs from secretions	27	33.7	53	66.3	72	90.0	8	10.0	.056	<.005
Pneumothorax	22	27.5	58	72.5	62	77.5	18	22.5	.024	<.005
Pneumomediastinum	22	27.5	58	72.5	64	80.0	16	20.0	7.58	<.005
Pulmonary interstitial emphysema	20	25.0	60	75.0	67	83.7	13	16.3	5.17	<.005
Decreased cardiac output (due to decreased venous return) with excessive CPAP levels	18	22.5	62	77.5	67	83.7	13	16.3	4.50	<.005
Gastric distension and feed intolerance	26	35.5	54	67.5	72	90.0	8	10.0	4.28	<.005
Increased work of breathing related to increased airway resistance (related to the diameter of SNP or bi-nasal prong)	35	43.8	45	56.2	63	78.7	17	21.3	8.93	<.005
Inadequate ventilation	23	28.7	57	71.3	64	80.0	16	20.0	.97	<.005
Mean ± SD	4.82 ± 6.19				13.27 ± 4.10					
Complications of CPAP Related to Device										
Obstruction of prong due to kinking of the prong and/or delivery circuit	19	23.8	61	76.3	70	87.5	10	12.5	.247	<.005
In-efficient delivery due to mal-position of bi-nasal prongs/mask	21	26.3	59	73.7	65	81.2	15	18.8	3.97	<.005
Skin irritation from securing tapes to the face (SNP)	8	10.0	72	90.0	67	83.7	13	16.3	1.72	<.005
Pressure necrosis around nostrils and distortion of the nasal	20	25.0	60	75.0	61	76.2	19	23.8	.207	<.005

septum due to incorrect strapping and positioning									
Pressure necrosis around head/ears and head molding due to failure to release hat and strapping regularly (bi-nasal prongs)	27	33.7	53	66.3	67	83.7	13	16.3	30.47	<.001
High air leak around prongs due to mouth being open (SNP and bi-nasal prongs) or air escaping from another nostril (SNP)	31	38.7	49	61.3	54	67.5	26	32.5	3.98	<.005
Mean ± SD	3.15 ± 3.21				9.60 ± 1.66				

Table (4): The study results proved the most of the nurses (83.7%, 82.5%, 85.0% and 75% respectively) had incorrect knowledge about contraindication of CPAP related to items, congenital anomalies as cleft lips and palate, if the child is unconscious and does not respond to stimuli, it contraindicates the machine in the case of pneumonia and Tracheo-oesophageal fistula and gastroschisis respectively. While post- implementation of guideline 90%, 78.7%, 82.5% and 75% respectively they had the correct knowledge and there was a statistically significant difference between pre and post-implementation (p=<0.005). The same table also illustrated the nearly two-third of the nurses had incorrect knowledge about all items related to complications that may occur in the infant. To evaluate the knowledge retention among nurses post- implementation most of them had correct knowledge about all items and there was a statistically significant difference between pre and post (p=<0.005).

Table (5): Distribution of the Nurses related to their CPAP Practice Pre and Post-Guidelines Implementation

Items	Practice pre				Practice post				X^2	P
	Adequate		Inadequate		Adequate		Inadequate			
	N	%	N	%	N	%	N	%		
Nursing Care and Application of CPAP	12	15.0	68	85	69	86.25	11	13.75	100.47	☐.001*
Mean ± SD	10.75 ± 12.17				15.50 ± 2.10					
Methods of Securing CPAP Device	14	17.5	66	82.5	67	83.75	13	16.25	62.60	☐.001*
Mean ± SD	4,00 ± 1.44				6.45 ± 1.15					
Bonnet with Ties	17	21.25	63	78.75	63	78.75	17	21.25	94.26	☐.001*
Mean ± SD	4.81 ± .99				6.52 ± 1.52					
CPAP Mask	14	17.5	66	82.5	74	92.5	6	7.5	62.02	☐.001*
Mean ± SD	3.86 ± 1.58				6.53 ± .88					
Nasal Comfeel Application	15	18.75	65	81.25	72	90.0	8	10.0	109.77	☐.001*
Mean ± SD	2.36 ± 1.03				4.77 ± .85					
Method of Application	23	28.75	57	71.25	64	80.0	16	20.0	328.64	☐.001*
Mean ± SD	14.96 ± 4.82				20.51 ± 3.29					
CPAP Nursing Care	17	21.25	63	78.75	70	87.5	10	12.5	97.18	☐.001*
Mean ± SD	8.01 ± 2.56				12.15 ± 1.84					
Observation	11	13.75	69	86.25	71	88.75	9	11.25	69.41	☐.001*
Mean ± SD	6.01 ± 1.16				8.00 ± .96					
Documentation	17	21.25	63	78.75	70	87.5	10	12.5	38.26	☐.005*
Mean ± SD	5.87 ± 1..57				9.08 ± 1.21					

Table (5): The study results indicated that most (85%%, 82.5%, 81.25., 86.25 and 78.75% respectively) of nurses had inadequate practice related to nursing care and application of CPAP, methods of securing CPAP, CPAP mask, nasal comfeel application, and nursing care, observation of infant on CPAP and documentation respectively. While post-guidelines implementation most (86.25%,83.75, 92.5,90.0,88.75% and 87.5%) of them had adequate practice on the same mentioned items. There was a statistically significant relation between pre and post-guidelines implementation (p=<0.001).

Table (6): Total Knowledge and Practice Mean Score Comparison Pre and Post Guideline

Items	Pre	Post	T	P
	(Mean± *SD*)	(Mean ± *SD*)		
Total practice	60.47 ± 13.98	89.53 ± 11.45	-26.61	<.001*
Total knowledge	18.2 ± 7.08	74.42 ± 16.20	- 19.40	<.001*

Table (6): Showed that the mean score of pre-total practice of the nurses was 60.47 ± 13.98 while post-implementation was 89.53 ± 11.45 there was a highly statistically significant relation between total practice pre and post (P= <.001*). The same table showed that the pre mean score of total knowledge was 18.2 ± 7.08 post- implementation was 74.42 ± 16.20 there was statistically significant relation between total knowledge pre and post (P= <.001*).
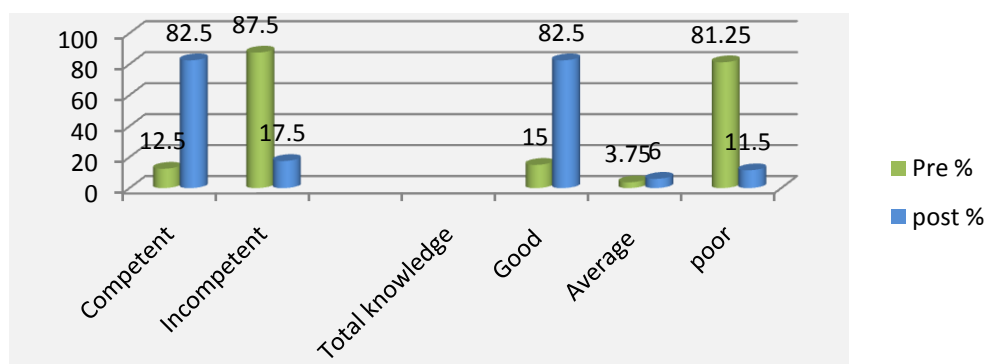

Figure (3) Percentage Distribution of total Knowledge and Practice Pre and Post

Figure (3): Indicated that most (87.5%) of the nurses had incompetent practice, while post guideline most (82.5%) of them had competent practice. 81.25% of nurses had poor knowledge about CPAP pre guideline while 82.5% had good knowledge post guideline.

Table (7): Correlation between total Knowledge and Practice with Nurses baseline Characteristics

Items	Age		Education		Years of Experience	
	R	P	r	P	R	P
Total knowledge Pre	.419	<0.001**	.639	<0.001**	.234	<0.001**
Post	.434	<0.001**	.610	<0.001**	.404	<0.001**
Total Practice: Pre	.525	<0.001**	.637	<0.001**	.301	<0.001**
Post	.495	<0.001**	.569	<0.001**	.447	<0.001**

Table (7): Demonstrated that there was a statistically significant correlation between total knowledge and total practice pre & post guideline with age, education and years of experience (P= <0.001**). It illustrated that with increasing age, level of education and experience total knowledge and practice increase.

IV. Discussion

The nurses play a crucial role in caring of infants connected with CPAP helping in enhance the infant's lungs, respiratory support, protecting skin from infections, in taking a continuous care of the neonate to avoid nasal trauma, and prevent further complication. The aim of the present study was to assess the effect educational guidelines program outcomes on nurses' performance of neonate receiving continues positive airway pressure. The present study supported the stated hypothesis that The educational guidelines program will be effective in improving nurses' knowledge and practice regarding neonate receiving continues positive airway pressure. The result of the present study table(1) revealed that the majority if infants have gestational age from33-<36 this age is preferable and appropriate to connected to CPAP. This is in the same line with **(Roberts, et al, 2011).** In relation to the infant diagnosis, the majority of infant connected to CPAP were had respiratory distress syndrome. CPAP is the most appropriate and effective treatment for treatment of preterm, low birth weight, and respiratory distress **(Schmolzer,2013).** Respiratory distress is a serious complication that was the three major

causes of neonatal mortality and morbidity in low- and middle-income. Continuous positive airway pressure (CPAP), is an effective intervention for respiratory distress in infants **(Roberts, et al, 2011).**

In relation to nurses' personal characteristics table (2) more than half of nurses were female; this result agree with **(Buraihi, & Mohammed, 2015).** The majority of nurses had from 5 to >10 years level of experience indicated low level of nursing experience in caring of the infant with CPAP. These results within the same line with **(Salah, 2013).** Nurse experience is an urgent need for continuous education of nursing staff in preventing any complication. Also more than half of nurses had an institute of nursing. And about 66% of them haven't training course regarding CPAP, this finding supported by **(Al- Ftlawy, 2011).** Regarding nurses' education figure (2) more than half (51.3%) of the nurses graduated from institute of nursing. This result agrees with **(Younis 2014).**

Regarding nurses' knowledge table(3) and table(4) about fundamental, aim, uses, contraindication, and complication of CPAP, the results showed that the majority of nurses had knowledge deficit regarding all items before the guidelines implementation, while post program implementation there were a statistically significance in the most items and a highly significant in some items. These findings supported by **(Hammod & Mohammed, 2016) & (Aziz, & Abdul-Hamza, 2017).** In the other hand nurses should have appropriate knowledge regarding aim, contraindication, and complication of CPAP it's very important for the adequacy of the nurse's care and knowledge **(Tiryaki, & Cinar, 2016).**

As regard nurses' practice regarding CPAP table(5) the majority of them had inadequate practice related to nursing care and application of CPAP, methods of securing CPAP, CPAP mask, nasal comfeel application, CPAP and nursing care, observation of infant on CPAP and documentation. While there was a statistically significant relation between pre and post guidelines implementation (p=<0.001). The study conducted by **(Do Nascimento, et a., 2009)& (Mathai, et al., 2014)** showed the nurses should be trained before being given direct responsibility to infants on CPAP improve care and prevent further complication. In addition to, successful training of nurses to effectively and safely apply CPAP will be crucial for the quality of nursing care regarding CPAP. **(Waterschoot, et al, 2009)** mention that the quality of nursing care was to be the main factor required for effective outcomes. **(Lamburne, 2014)** stated that nursing caring of infant connected to CPAP requiring adequate and effective practice for competency of caring for the infant.

Concerning the total nurses' knowledge the result showed that table (6), and figure (3) there was a highly statistically significant difference between pre and post guidelines implementation, and the nurses had good knowledge, and competent practice. This result agrees with **(Chen, et al; 2016)** who stated that nurses' knowledge and practice regarding CPAP application will be improved after guidelines implementation.

In relation to a correlation between nurses knowledge and their personal characteristics table (7) the present study revealed that there was a statistically significant correlation between total knowledge and total practice pre & post guideline with age, education and years of experience. These results disagree with **(Hany et al, 2013), Hammod & Mohammed, (2016), &(Aziz, & Abdul-Hamza, 2017).** They showed that there was no significant relationship between nurses' knowledge and age, and years of experience.

The researcher's point of view suggests that the application of CPAP should be performed by trained nurses. Nurses should have opportunities to gain new skills and knowledge to work, access to the training for learning new things encourages the feeling of achievement. It also increases motivation to further expand their skills. The educational guidelines were effective in raising staff nurse knowledge. The educational guidelines showed a significant impact increase of the participants' level of knowledge which reinforces the continuing need for more education about methods of fetal well-being assessment. It also increases motivation to further expand their skills. Finally, educational guidelines have a great effect because continuing education plays a significant role in equipping nurses to deal with the major changes currently making an effect on health care. Nurses today need knowledge and skills to perform and practice their job.

The researchers' view that, CPAP therapy and devices is one of continuous improvement technology all over the world nowadays that is very effective, comfortable and useful. In addition, caring of neonates receiving CPAP is a critical nursing care branch, also there is little of scientific research in this area, so that needed for continuous training to improve nurse's practice, updates their knowledge and more nursing research in this hot area for an effective and efficient nursing care. The nurses must be aware of and have knowledge and practice about CPAP application. Moreover, the result of the present study demonstrated that the nurses had better knowledge and practice on posttest and there was a highly statistically significant difference between pretest and posttest. This could be attributed to the fact that any educational guidelines increase nurses knowledge in turn, changes their practice.

Limitation of the study:
Lack of nurses' experience and training regarding CPAP application and care, and lack of resources that hinders to provide appropriate nursing care.

V. Conclusion

Based on the findings of the present study, it could be concluded that:

There was a significant improvement in total level of nurses' knowledge and practice regarding nursing care of neonate receiving continues positive airway pressure when compared with pre and post guidelines implementation, Moreover statistically significant difference in relation to nurses' knowledge and practice in pre and post implementation of guidelines, also there was highly statistically significant difference in total nurses' knowledge and reported practice in relation to socio-demographic characteristics in post implementation guidelines regarding age, educational level, experience and attendance of training course. Thus this study showed that educational guidelines regarding nursing care of neonate receiving continue positive airway pressure was very effective in improving the nurses' level of knowledge and practice.

VI. Recommendations:

- Regular review of specific procedures in relation to complications (for example, pneumothorax, nasal trauma) is suggested.
- Educational and training program should be designed and implemented for nurses about evidence-based practice of CPAP procedure
- Further researches to provide nurses at NICU with regular updates of knowledge and practice regarding CPAP application to improve the quality and safety of infant care by having nurses acquire sufficient knowledge and skills.

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