

**Effect of Educational Guidelines Program on Nurses Performance for
Caring of Neonates Receiving Continues Positive Airway Pressure Ventilation**
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Abstract

Background

Continuous Positive Airway Pressure refers to the application of positive pressure to the airway of a spontaneously breathing neonate throughout the respiratory cycle. It is a respiratory support method for neonates with either upper airway obstruction or respiratory failure. **The** present study was aimed to evaluate the effect of educational guidelines program on nurses performance for Caring of neonates receiving Continues Positive Airway Pressure ventilation. **Research design:** A quasi- experimental research design was used in the present study. The study was conducted at Neonatal Intensive Care Unit of Tanta University Hospital. **Subjects:** Convenience sampling of 60 nurses who working at the above previously mentioned setting. **Two tools** were used to collect data: Structured interview schedule for nurses' knowledge regarding Continues Positive Airway Pressure and Observational checklist for nurses caring of neonates receiving Continues Positive Airway Pressure. **Results :** Represented that more than half of nurses had poor knowledge and the majority had unsatisfactory reported practices before educational guide line program implementation. **Conclusion :** There was a significant improvement of total level of nurses' knowledge and practice regarding nursing care of neonate receiving Continues Positive Airway Pressure immediately and after one month from educational guidelines program implementation. **Recommendations:** In -service training program should be conducted periodically and regularly for teaching nurses working at Neonatal Intensive Care Unit for caring of neonate receiving continuous positive airway pressure and manual log book about care of neonates and **Continues Positive Airway Pressure Ventilation** should be available for nurses at Neonatal Intensive Care Unite

Keywords : Continuous Positive Airway Pressure , Educational guideline program , nurses' performance

Introduction

Major function of the respiratory system is to provide oxygen for metabolism and remove carbon dioxide. The metabolic demands of tissues remain unfulfilled and body systems rapidly fail, without an adequate exchange of oxygen and carbon dioxide. When oxygenation and ventilation are inadequate Continuous Positive Airway Pressure is needed. ⁽¹⁻³⁾ Continuous Positive Airway Pressure refers to the application of

positive pressure to the airway of a spontaneously breathing neonate throughout the respiratory cycle. It 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. It delivers oxygen concentrations and distending airway pressures via the ventilator without the hazards associated

with full endotracheal intubation and mechanical ventilation.⁽⁴⁾

Delivery of constant positive pressure to the airway of a spontaneously breathing neonate maintains adequate functional residual capacity within the alveoli to prevent atelectasis and improves oxygen and carbon dioxide exchange within the pulmonary circulation⁽⁵⁾.

Continuous Positive Airway Pressure machine delivers a constant flow of air through tubing and into neonatal airway. It creates enough pressure in neonatal airway to hold the tissue open, so there airway doesn't collapse. The soft, steady jet of air from the CPAP machine creates enough pressure to keep the airway open.⁽⁶⁾

Continuous Positive Airway Pressure 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 atelectatic 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.⁽⁶⁻⁷⁾

Continuous Positive Airway Pressure is indicated for early onset of respiratory distress in preterm neonates (<34 weeks gestation) with good respiratory effort. One of the most common respiratory complications is respiratory distress syndrome (RDS). Moreover, it is a major cause of neonatal respiratory morbidity and

mortality. Neonates with it can be managed by using of Continuous Positive Air way Pressure to maintain alveolar distention during spontaneous breathing.

Continuous Positive Airway Pressure also used following extubation , use for majority of neonates of less than 32 weeks, 'Rescue' CPAP can be used for other neonates who have apnoeas or desaturations and an increasing in their oxygen requirement within first few hours after extubation .⁽⁸⁾

Continuous Positive Airway Pressure contraindicated in cases of chest pneumothorax ,congenital anomalies as diaphragmatic hernia , nasal deformity , cleft lip , cleft palate , neonatal apnea , stomach disorders . In these cases the invasive devices more appropriate .⁽⁹⁾

Complications of NCPAP in preterm neonates which result from the fixation devices include; nasal tube when it didn't fit the nostrils, resulting in gas leak and inability to maintain a baseline pressure. Moreover, the set CPAP level is rarely maintained in the pharynx. It may also include nasal leaks because the nasal tube fits loosely in the nostrils and nasal trauma which considered a common problem with CPAP. It also include increasing O2 requirement or episodes of desaturation and apnea , excessive bradycardia with movement , excessive nasal irritation ,significant apnea or increasing respiratory acidosis or O2 requirement of 80-100%.⁽⁷⁻⁹⁾

Nurse has a vital role in caring for neonate receiving CPAP. which includes; assess the heart rate, respiratory rate, SpO₂% range, CPAP settings (water level, temperature, pressures, size of nasal prongs/mask in use),check of equipments such as suction, resuscitation devices ,the

ventilator, intravenous syringe drivers/pump , monitor alarms, blood gases should also be requested to assess the neonates response to CPAP.⁽⁸⁾

Nurses should checked axillary temperature at least every four hours , apply skin probe to continuously monitor temperature, changes in the neonates condition including response to handling, changes of skin integrity, administration of medications, maintain fluids balance,. Always maintain optimal humidity for the inspired gases to facilitate mucociliary action, clear secretions to optimize gas exchange and minimize the risk of infection, if suction is required the color, consistency, and quantity of secretions should be recorded⁽⁸⁾.

Significance of the Study:

Continuous Positive Airway Pressure (CPAP) distends the continuous pressure in a spontaneously breathing neonate and increases the functional residual capacity of the lung resulting in better gas exchange for neonates. Also it has been shown to reduce the risk of mortality by 48% and the need for surfactant and mechanical ventilation by about 50% . So, it has become the standard of care in managing sick neonates with respiratory distress .

Neonates need Continuous Positive Airway Pressure is estimated by 10%- 12% from neonates born in Egypt Meanwhile, neonates in Neonatal Intensive Care Unit (NICU) of Specialized Pediatric Hospital at Benha city at 2016 are estimated 920 as neonates with majority of them under CPAP ventilation .So, this intervention program is performed to improve the nursing care provided to neonates under going CPAP.

Aim of the study

The present study aimed to :

Evaluate the effect of educational guidelines program on nurses performance for caring of neonates receiving Continues Positive Airway Pressure ventilation .

Research Hypothesis:

Nurses' performance for caring of neonates receiving Continuous Positive Airway Pressure ventilation are expect to improve after receiving educational guideline program.

Subjects and Method

Research design:

A quasi- experimental research design was used in the present study.

Setting:

The study was conducted at Neonatal Intensive Care Unit of Tanta University Hospital It consists of four rooms (A,B,C,D) ,The unit contains 30 incubator ,24 monitors , 33 syringe pump , 30 mechanical ventilator and 8 Neonatal Continuous Positive Airway Pressure .

Subjects:

-Convenience sampling of all available nurses (60) who working in the above previously mentioned setting regardless of their age, years of experience and level of education.

Tools of Data Collection:

Two tools were used to collect data, they were included the following:

Tool I: Structured interview schedule for nurses' knowledge regarding Continues Positive Airway Pressure:

It was developed by the researcher after reviewing the related literature ^(49'50) to assess nurses' knowledge before, immediately and after one month from the implementation of educational guidelines program.

It was consisted of two parts:

Part 1: Sociodemographic characteristics of the studied nurses such as; age, educational level, years of experience at Neonatal Intensive Care Unit and attendance of related training courses

Part 2: Studied nurses' knowledge about Continues Positive Airway Pressure, it included: definition, purpose, indications, contraindications, methods of administration, complications and nursing interventions.

Scoring system:

It contained 7 questions , each question was scored from 0-2 grades :

Correct and complete answer was scored (2).

Correct and incomplete answer was scored (1).

Incorrect or didn't know was scored (0).

The total score of nurses' knowledge was classified as following:

- Less than 60% was considered poor knowledge.

- From 60- <75% was considered fair knowledge.

- From 75-100 % was considered good knowledge.

Tool II: Observational checklist for nurses caring of neonates receiving Continues Positive Airway Pressure.

It was developed by the researcher after reviewing the related literature ⁽⁵¹⁻⁵²⁾ to assess nurses' practices before, immediately and after one month from implementation of the educational guidelines program. It included the following items:

Before caring of neonates receiving Continues Positive Airway Pressure:

Prepare safe environment , Humidifier chamber with temperature control set at

invasive setting ,prepare resuscitation equipment correctly set-up and working , prepare CPAP machine and ensure that all connections work well, suction and a appropriate sized catheter ,scissors for cutting, endotracheal tube of appropriate sized , Pre-cut length to ensure external space, cotton sponge , Leucoplast tape : 2 pieces each cut into “trouser leg “ , Lubricating gel or use neonatal saliva as lubrication and Comfeel protectant wafer :2 pieces each cut to fit under tapes on neonate's checks - cotton sponge for face wash : moist and dry⁽⁵²⁻⁵³⁾.

During caring of neonates who receiving continues positive airway pressure:

Select the proper size of oropharyngeal or nasopharyngeal tube ,Suction oral and nasal secretion ,Place the neonate in proper position during the insertion of nasopharyngeal tube - lubricate the nasopharyngeal tube , Put orogastric tube to drainage the excessive air from the stomach and Connect to Continues Positive Airway Pressure CPAP. ⁽⁵⁴⁻⁵⁵⁾

After caring of neonates who receiving continue positive airway pressure:

Monitor vital signs of the neonates as (respiratory rate , heart rate , chest rise and fall , work of breathing , oxygen requirements , pulse oximetry, capillary refill time)

,Monitor blood gases as required (determined by clinical condition and previous blood gases) , Monitor oxygen saturation ,Ensure patency of SNP: suction as necessary ,Maintain neutral thermal environment, Consider elective tube changes if secretions are thick or copious ,Ensure gastric decompression with naso/oro gastric tube, Ensure cardio –respiratory and pulse oximetry monitoring ,Correct alarm setting

parameters, and documentation., Care for pressure area : especially to nostrils and septum :

(Avoid nasal trauma/erosion by ensuring SNP is always secure and strapping is not loose, position tube in a downward arch to avoid pressure on the nares) ,Ensured CPAP circuit tubing appropriately supported /secure and Used of circuit holders /devises to prevent tension on tube ,Considered using alternate nostrils when changing tube to avoid pressure area development ⁽⁵⁷⁾

In addition to the following care : insertion of oropharyngeal tube (17 items) , nebulizer (11 items) , chest physiotherapy (11 items) , suction (17 items) , care of venous catheter (14 items) , IV infusion (26 items) , daily care of incubator (14 items) , infection control (9 items) , terminal care of incubator (18 items).

Scoring system for nurses' practice was as follows:

- Done correctly and complete was scored (1).
- Done incorrectly or didn't do was scored (0).

The total score for nurses' practice classified as follow:

- Less than 75 was considered unsatisfactory.
- From 75-100 % was considered satisfactory.

Method

The study was accomplished through the following steps:

1-Administrative process :

An Official permission for data collection was obtained from the dean faculty of nursing directed to the administrators responsible at neonatal intensive care unit of Tanta University Hospital after explanation of the study aim.

2-Ethical and legal considerations:

a) Ethical approval was obtained from the Faculty of Nursing Scientific Researcher ethics Committee

b) Confidentiality and privacy will be taken into consideration regarding the data collection and will be maintained by coding number.

c) Informed consent will be taken from nurses and neonates parent consent to participate in this study.

d) Nature of the study will not cause any harm to the entire subjects and nurses have the right to with draw from the study at any time.

3-Tools development:

Two tools were developed based on recent literature: Interview schedule was filled in the clinical area by the studied nurses in presence of the researcher (Tool I).Observational checklist was filled out by the researcher to assess the actual nurses' practices before, immediately and after one month from application of educational guidelines program (Tool II).

4-Content validity: The tools of the study were presented to a jury of five experts in the field of Pediatric Nursing to check content validity and clarity of the tools. Modifications were carried out accordingly; the nominal validity of the questionnaire was calculated on the basis of expert opinion and was 99.1%.

5- Reliability of tools:

Test of reliability using Cranach's alpha was 0.890 that indicates high reliability of the tools used for data collection in the current study.

6-A pilot study:

A pilot study was carried out on six nurses (10%) to test the clarity and applicability of the study tools then the necessary

modification was done. This pilot was excluded from the study.

7- Phases of the study: The study was conducted on four phases:

1-Assessment Phase:

It was carried out by the researcher for all study subjects to collect baseline data, to assess the neonate who meets the inclusive and exclusive criteria of this study and to assess nurses' knowledge related to Continues Positive Airway Pressure. (Tool I).The researcher was assessed the actual nurses' practice before, immediately and after one month from application of the program (Tool II).

2- Planning Phase was included the following steps:

- Setting objectives of the educational program.
- Preparation of the content which was cover the reasons behind the application of the session.
- The education program was conducted into 4 sessions, two / week. The time of each session was about 30 minutes including periods of discussion according to the nurses' progress and feedback.
- Different methods of teaching were used including lectures, group discussion and demonstration.
- The education program implementation was carried out for nurses through conduction of successive sessions according to the actual need assessment of the nurses.

3) Implementation Phase:

Through teaching sessions for nurses and will be as the following:

The First Session:-

Focused on definition, purpose, and indications of Continues Positive Airway Pressure.

The Second Session:-

Focused on contraindications and complications of Continues Positive Airway Pressure

The Third Session:-

Focused on ways of administering Continues Positive Airway Pressure

The Fourth Session:

Focused on nursing care of neonates receiving Continues Positive Airway Pressure.

3-Evaluation Phase:

The evaluation of the educational guidelines program on nurses 'knowledge and practice was carried out using the same assessment tools (I,II) Each nurse was evaluated immediately after implementation of the program(post-test) and one month later (follow-up), and these were compared to pre-test levels.

-The data was collected over period of one year from December 2020 to November 2021 . The study work took a period of 2 year .

Statistical Analysis:

The collected data was organized, tabulated, and statistically analysed using SPSS software computer package version 20. For quantitative variables, mean and standard deviations were calculated. For qualitative variables, the number and percentage distribution were calculated. Chi-square test was used to examine the relation between qualitative variables. Fisher exact test (p) was used to compare observations before, immediately and after one month from the guide lines application. Significance was adopted at $p < 0.001$ for interpretation of results of tests of significance.⁽⁵⁸⁾

Results

Table (1) illustrates percentage distribution of studied nurses regarding their socio-demographic characteristics. It was observed that 46% of studied nurses their age was between 30 and less than 35 years old . Regarding nurses' educational level it was found that 50% of them had bachelor of nursing science ,while 28.33% of them were graduated from technical nursing institute and the rest of them 21.67% graduated from secondary school of nursing .

Regarding nurses' years of experience at Neonatal Intensive Care Unit , it was found that 40 %of them had less than 5 years of experience and 68.3 % didn't attend any training programs related to continuous positive air way pressure.

Table (2) Shows percentage distribution of of studied nurses' knowledge regarding CPAP before, immediately and after one month after implementation of educational guide line program. It was observed that , there were highly statistical significant differences in nurses' knowledge related to definition, purpose , indications , contraindications , methods of CPAP, Complications , nursing care for neonate on CPAP before ,immediately ,and after one month after implementation of educational guidelines program with, $\chi^2=120,000$, $p < 0.001$, $\chi^2=40.000$, $p < 0.001$ respectively .

Table (3) Shows percentage distribution of the studied nurses' practice before connecting the neonate with continuous positive airway pressure before ,immediate and after one month of program . There were highly statistically significant differences in the studied nurses' practice as regarding , prepare scissors for cutting $\chi^2=32.175$, $p < 0.001$ respectively .

Moreover, it was found that there were statistically significant differences in the studied nurses' practice as regarding prepare CPAP machine and ensure that all connections work well $\chi^2=18.775$ $p < 0.001$ respectively .

On other hand it was observed that there were not statistically significant differences in the studied nurses' practice as regarding prepare suction and appropriate sized catheter $\chi^2=1.011$, $p=0.603$ respectively

Table 4: Shows percentage distribution of studied nurses' practice during connecting neonate with continuous positive airway pressure before ,immediate and after one month of program ,there were highly statistically significant differences in the studied nurses' practice regarding place comfeel or cotton dressing on neonate's cheeks $\chi^2=61.604$, $p < 0.001$ respectively .

It was found that there weren't statistically significant differences in studied nurses' practice as regarding Connect neonate to CPAP $\chi^2=2.011$, $P=0.366$ respectively .

Table (5) Shows percentage distribution of studied nurses' practice after connecting the neonate with continuous positive airway pressure before ,immediate and after one month of program . There were highly statistically significant differences in the studied nurses' practice as regarding Care for pressure area : especially to nostrils and septum $\chi^2=19.540$, $p < 0.001$ respectively . It was found that there statistically significant differences in the studied nurses' practice regarding measure and record respiratory rate $\chi^2=6.102$, $p=0.047$, put pulse oximetry on neonate sole $\chi^2=6.102$, $p=0.047$, maintain neutral thermal environment $\chi^2=9.216$, $p=0.010$, ensure CPAP circuit tubing appropriately supported

and secured $\chi^2 = 8.704$, $p=0.013$ respectively .

On other hand, it was found that there were not statistically significant differences in the studied nurses' practice regarding measure and record heart rate $\chi^2 = 4.045$, $p=0.132$, observe oxygen saturation $\chi^2 = 2.034$, $p=0.362$, ensure patency of tube : suction as necessary $\chi^2 = 3.151$, $p=0.207$, ensure cardio-respiratory and pulse oximetry monitoring correct alarm setting parameters and documentation $\chi^2 = 0.137$, $p=0.934$, , position nasopharyngeal tube in a downward arch to avoid pressure on the nares $\chi^2 = 2.807$, $p=0.246$, use alternate nostril when change nasopharyngeal tube to avoid pressure area development $\chi^2 = 2.607$, $p=0.272$ respectively.

Table (6): there were statically significant relation between nurses educational level

and their practice score before educational program $p=0.011$ as nurses who were bachelor of nursing had a higher mean scores of practice 31.81 ± 4.38 .

there were statically significant relation between nurses attend training course and their practice score before educational program $p=0.001$ as nurses who were attend training course related to continuous Positive Airway Pressure had a higher mean score of practice 30.951 ± 4.159 .

Table 7 : there were statically significant relation between nurses years of experience and their knowledge score immediately after educational program $p=0.015$ as nurses who have 5- 10 years of experience had a higher mean scores of knowledge 13.647 ± 0.493 .

Table (1): Percentage Distribution of Studied Nurses regarding their sociodemographic characteristics .

Sociodemographic characteristics of nurses	The studied nurse (n=60)	
	No	%
Age / years		
25 -	10	16.7
30 -	28	46.6
35 -	22	36.7
Range	22-38	
Mean \pmSD	29.283 \pm 4.927	
Educational Level		
Secondary School of Nursing	13	21.7
Technical Institute of Nursing	17	28.3
Bachelor degree of Nursing	30	50.0
Range	2-18	
Mean \pmSD	8.433 \pm 5.251	
Years of Experience inside Neonatal Intensive Care Unit /year		

< 5	24	40.0
5 -	17	28.3
10 -	19	31.7
Attendance of any training programs Related to Continuous Positive Airway Pressure		
Yes	19	31.7
No	41	68.3

Table (2): Percentage Distribution of Studied Nurses' knowledge regarding Continues Positive Airway Pressure.

Nurses' knowledge (n= 60)																
Nurses' Knowledge regarding continuous positive airway pressure	Before guideline Program (n=60)						Immediately After guide line Program (n=60)				One Month After guide line Program (n=60)				X ²	P-value
	Incorrect answer		Incomplete correct answer		Complete correct answer		Incomplet correct Answer		Complete correct answer		Incomplet correct Answer		Complete correct answer			
	%	No	%	No	%	No	%	No	%	No	%	No	%	No		
Definition	5	8.33	13	21.67	42	70.00	0	0.00	60	100.00	0	0.00	60	100.00	40.000	<0.001*
Purpose	8	13.33	48	80.00	4	6.67	7	11.67	53	88.33	9	15.00	51	85.00	108.816	<0.001*
Indications	26	43.33	5	8.33	29	48.33	1	1.67	59	98.33	4	6.67	56	93.33	65.975	<0.001*
Contraindications	24	40.00	35	58.33	1	1.67	2	3.33	58	96.67	1	1.67	59	98.33	163.156	<0.001*
Methods	14	23.33	46	76.67	0	0.00	28	46.67	32	53.33	28	46.67	32	53.33	66.353	<0.001*
Complications	5	8.33	54	90.00	1	1.67	14	23.33	46	76.67	12	20.00	48	80.00	96.711	<0.001*
Nursing care	3	5.00	42	70.00	15	25.00	0	0.00	60	100.00	0	0.00	60	100.00	120.000	<0.001*

*Statistically significant difference at (p < 0.05)

Table (3) :Percentage Distribution of Nurses' Practice before connecting The neonate with Continues Positive Airway Pressure.

Nurses' practice (n=60)														
Nurses' practice before connect neonate with CPAP	Before guide line program				After guide line program				One month after guide line program				Chi-Square	
	Not Done		Done		Not Done		Done		Not Done		Done		X ²	P-value
	No	%	No	%	No	%	No	%	No	%	No	%		
Prepare safe environment	52	86.67	8	13.33	0	0.00	60	100.00	3	5.00	57	95.00	9.489	0.009*
Humidifier chamber with temperature control set at invasive setting	53	88.33	7	11.67	2	3.33	58	96.67	0	0.00	60	100.00	9.123	0.010*
Prepare resuscitation equipment	14	23.33	46	76.67	0	0.00	60	100.00	2	3.33	58	96.67	23.598	<0.001*
Prepare CPAP machine and ensure that all connections work well	39	65.00	21	35.00	4	6.67	56	93.33	7	11.67	53	88.33	18.775	<0.001*
Prepare Suction machine and appropriate sized catheter	59	98.3	1	1.67	0	0.00	60	100.00	1	1.67	59	98.33	1.011	0.603
Prepare Scissors for cutting	33	55.00	27	45.00	7	11.67	53	88.33	11	18.33	49	81.67	32.175	<0.001*
Prepare endotracheal tube of appropriate sized ,pre-cut length to ensure external space	58	96.67	2	3.33	0	0.00	60	100.00	2	3.33	58	96.67	2.045	0.360
Prepare leucoplast tape :2 pieces each cut into "trouser leg "	48	80.00	12	20.00	2	3.33	58	96.67	1	1.67	59	98.33	16.145	<0.001*
Prepare lubricating gel or use neonatal saliva as lubrication	55	91.67	5	8.33	3	5.00	57	95.00	1	1.67	59	98.33	2.807	0.246
Prepare comfeel protectant wafer :2 pieces each cut to fit under tapes on neonate's checks	25	41.67	35	58.33	4	6.67	56	93.33	7	11.67	53	88.33	26.875	<0.001*
Prepare cotton sponge for face wash : moist and dry	20	33.33	40	66.67	4	6.67	56	93.33	2	3.33	58	96.67	26.254	<0.001*

*Statistically significant difference at (p < 0.05).

Table (4): Percentage Distribution of Nurses' Practice During connecting neonate with Continues Positive Airway Pressure.

Nurses' practice during connect neonate with CPAP	Before guide lines program				After guide lines program				One month after guide lines program				Chi-Square	
	Not Done		Done		Not Done		Done		Not Done		Done		X ²	P-value
	No	%	No	%	No	%	No	%	No	%	No	%		
Select proper size of nasopharyngeal tube	58	96.67	2	3.33	0	0.00	60	100.00	2	3.33	58	96.67	2.045	0.360
Suction oral and nasal secretions	55	91.67	5	8.33	4	6.67	56	93.33	2	3.33	58	96.67	1.356	0.508
Place comfeel or cotton dressing on neonate's Cheeks	36	60.00	24	40.00	4	6.67	56	93.33	4	6.67	56	93.33	61.604	<0.001*
Lubricate tube with neonate's saliva or lubricating gel	54	90.00	6	10.00	1	1.67	59	98.33	3	5.00	57	95.00	4.024	0.134
Place the neonate in proper position during the insertion of nasopharyngeal tube	59	98.33	1	1.67	3	5.00	57	95.00	3	5.00	57	95.00	1.189	0.552
Put orogastric tube to drainage the excessive air from the stomach	54	90.00	6	10.00	1	1.67	59	98.33	0	0.00	60	100.00	9.216	0.010*
Connect to Constances Positive Airway Pressure	60	100.00	0	0.00	0	0.00	60	100.00	0	0.00	60	100.00	2.011	0.366

*Statistically significant difference at (p < 0.05)

Table (5): Percentage Distribution of Nurses' Practice after Connecting The neonate with Continues Positive Airway Pressure.

Nurses' practice after connect neonate with CPAP	Before guide line program				After guide line program				One month after guide line program				Chi-Square	
	Not Done		Done		Not Done		Done		Not Done		Done		X ²	P-value
	No	%	No	%	No	%	No	%	No	%	No	%		
Monitoring blood gases as required	38	63.33	22	36.67	4	6.67	56	93.33	10	16.67	50	83.33	17.500	<0.001*
Measure and record respiratory rate	57	95.00	3	5.00	0	0.00	60	100.00	0	0.00	60	100.00	6.102	0.047*
Measure and record heart rate	58	96.67	2	3.33	0	0.00	60	100.00	0	0.00	60	100.00	4.045	0.132
Observe chest rise and fall	48	80.00	12	20.00	1	1.67	59	98.33	3	5.00	57	95.00	14.131	0.001*
Observe oxygen saturation	58	96.67	2	3.33	0	0.00	60	100.00	1	1.67	59	98.33	2.034	0.362
Put pulse oximetry on neonate sole	3	5.00	57	95.00	0	0.00	60	100.00	0	0.00	60	100.00	6.102	0.047*
Measure and record capillary refill time	34	56.67	26	43.33	5	8.33	55	91.67	6	10.00	54	90.00	28.645	<0.001*
Ensure patency of tube : suction as necessary	53	88.33	7	11.67	2	3.33	58	96.67	4	6.67	56	93.33	3.151	0.207
Maintain neutral thermal environment	54	90.00	6	10.00	0	0.00	60	100.00	1	1.67	59	98.33	9.216	0.010*
Change tube if secretions are thick or copious it	52	86.67	8	13.33	0	0.00	60	100.00	2	3.33	58	96.67	11.012	0.004*
Ensure gastric decompression with orogastric tube	51	85.00	9	15.00	0	0.00	60	100.00	1	1.67	59	98.33	15.459	<0.001*
Ensure cardio-respiratory and pulse oximetry monitoring correct alarm setting parameters .	54	90.00	6	10.00	5	8.33	55	91.67	5	8.33	55	91.67	0.137	0.934
Care for pressure area : especially to nostrils and septum	43	71.67	17	28.33	3	5.00	57	95.00	3	5.00	57	95.00	19.540	<0.001*
ensuring tube is always secure and strapping is not loose	48	80.00	12	20.00	1	1.67	59	98.33	5	8.33	55	91.67	11.481	0.003*
Position nasopharyngeal tube in a downward arch to avoid pressure on the nares	55	91.67	5	8.33	1	1.67	59	98.33	3	5.00	57	95.00	2.807	0.246
Ensure CPAP circuit tubing appropriately supported /secured	49	81.67	11	18.33	4	6.67	56	93.33	2	3.33	58	96.67	8.704	0.013*
Use alternate nostril when change nasopharyngeal tube to avoid pressure area development	52	86.67	8	13.33	3	5.00	57	95.00	5	8.33	55	91.67	2.607	0.272

*Statistically significant difference at (p < 0.05)

Table (6): Relation between nurses' practice and the sociodemographic characteristics

Practices		N	Before	ANOVA or T-Test	Immediate	ANOV A or T-Test	After	ANOVA or T-Test
			Mean±SD		Mean ± SD		Mean ± SD	
Age	Less than 25 years old	10	31.700±3.860	0.225	37.200 ±3.011	0.274	37.100 ± 3.281	0.968
	25-30 years old	28	31.429±4.772		38.321 ±1.722		37.286 ± 3.495	
	More than 30 years	22	33.682±4.864		37.364 ±		37.045 ± 3.443	
Education level	Nursing technician	13	34.308±5.154	0.011*	36.692 ± 3.146	0.128	37.385 ± 3.254	0.829
	Institute of Technical healthy	17	30.294±3.965		38.588 ± 1.698		36.529 ± 3.693	
	Bachelor of Nursing	30	31.808±4.382		37.615 ± 2.434		37.500 ± 3.302	
Years of Experience	Less than 5 years old	24	31.583±4.717	0.305	38.083 ±2.185	0.285	36.208 ± 3.945	0.186
	From 5-10 years.	17	31.765±4.493		38.176 ± 1.879		38.059 ± 2.657	
	More than 10 years.	19	33.684±4.854		37.053 ± 3.027		37.579 ± 3.043	
Have you ever attended training courses on Continuous positive airway pressure?	Yes	19	35.211±4.626	0.001*	38.105 ±2.233	0.488	37.842 ± 2.930	0.297
	No	41	30.951±4.159		37.634 ±2.517		36.854 ± 3.568	

*Statistically significant difference at (p < 0.05)

Table (7): Relation between nurses' knowledge and the sociodemographic characteristics

Knowledge		N	Before	ANO VA or T- Test	Immediate	ANO VA or T- Test	After	ANO VA or T- Test
			Mean±SD		Mean ± SD		Mean ± SD	
Age	Less than 25 years old	10	7.000±2.055	0.283	12.900 ±0.994	0.584	13.200 ± 0.789	0.491
	25-30 years old	28	6.679±2.435		13.107 ±0.994		13.214 ± 0.917	
	More than 30 years	22	7.727±2.229		13.273 ±0.883		12.909 ± 1.019	
Education al level	Nursing technician	13	7.769±2.421	0.076	12.615 ±1.193	0.101	12.846 ± 1.214	0.555
	Institute of Technical healthy	17	6.824±2.007		13.176 ±0.809		13.235 ± 0.752	
	Bachelor of Nursing	30	6.615±2.385		13.269 ±0.874		13.192 ± 0.801	
Years of Experienc e	Less than 5 years old	24	6.667±2.444	0.325	12.792 ±1.103	0.015 *	13.125 ± 0.900	0.441
	From 5-10 years.	17	7.059±2.358		13.647 ±0.493		13.294 ± 0.849	
	More than 10 years.	19	7.737±2.077		13.105 ±0.875		12.895 ± 1.049	
Have you ever attended training courses on Continuou s positive airway pressure?	Yes	19	7.895±1.823	0.076	13.105 ±0.875	0.877	13.000 ± 1.202	0.577
	No	41	6.756±2.447		13.146 ±0.989		13.146 ± 0.792	

*Statistically significant difference at (p < 0.05)

Discussion

Continuous educational program for nurses keeps them up to date on the latest advances in nursing care provided for neonates who are receiving CPAP. Therefore the present study was conducted to evaluate the effect of educational guidelines program on nurses' performance for caring of neonates receiving Continuous Positive Airway Pressure.

Nurses use a wide range of theoretical and practical knowledge in their work. They should have a greater amount of recent knowledge to provide the appropriate care for neonates. Knowledge may be acquired by different means, some is hidden in practice but from whatever source it originates. The nurses' acquisition of knowledge should be evaluated frequently.⁽¹²⁾

The finding of the present study revealed that, nearly two third of nurses had poor knowledge level related to CPAP before educational guideline program implementation. This finding could be attributed to more than two thirds of the studied nurses didn't attain training programs regarding to CPAP ventilation and work over load at NICU. Furthermore, nurses only remembered the items related to their clinical practices rather than the theoretical knowledge so they need continuous education and training program to increase their knowledge.

The findings were in agreement with **Chen, et al(2016)** who stated that nurses' knowledge and practice regarding CPAP application less than after program implementation.⁽¹²⁾

On the opposite immediately after educational guideline program implementation, nurses' knowledge

improved and all of them had good knowledge level. This could be attributed to the content of program which was developed based on nurses' needs, its clarity and simplicity, using of audiovisual aids, availability of the researcher in the field for more clarification, using simple language, and frequent repetition to fix the knowledge. The previous findings were in agreement with **Girvan L al., (2018)** who demonstrated that, there were statistically significant improvement in the nurses' knowledge post program implementation. Also these findings were in accordance with **Ntigurirwa et al., (2017)** who showed that, nurses' knowledge was improved post program which improved care of neonates on CPAP and mortality was reduced.⁽¹²⁻¹³⁾

Furthermore, one month after the program implementation, this percentage was slightly reduced and the majority of them had good scores in all items of knowledge. This indicated that the improvement in knowledge was partially lost one month after the educational guidelines program implementation. This result might be explained that, knowledge retention is usually affected by time.

Morehead & Rhodes (2016) who were in harmony with current finding, confirmed that information can be easily forgotten if they are not refreshed periodically.⁽¹⁴⁾

Concerning nurses' total level of practice, it was evident from the present study that, all nurses had unsatisfactory practice related to care of neonates receiving CPAP before educational guideline program. From researcher point of view, it may be due to lack of training courses about NCPAP, less than half of them had less than 5 years of experience inside NICU, absence of

motivation from the administrators, no pre-employment orientation program, and insufficient number of nurses.

On the opposite, immediately and one month after implementation of the program it was observed that, the program had effectively achieved its expected objectives, nursing staff had significant higher practice level than before educational program implementation regarding CPAP. This may be attributed to effectiveness of this educational program.

This findings was in harmony with **Elsobkey & Amer, (2018)** who found that, the majority of the studied nurses had competent practice post program implementation. Moreover, in agreement with **Chen et al., (2016)**, who stated that, nurses' knowledge and practice regarding CPAP application improved after implementation of guidelines. This result also in accordance with **Milligan & Goldstein, (2017)** who revealed that, after implementing program , the total nurses' practice improved which impact on neonatal care by decreasing unintended treatment complications.^(11- 18-19)

As regards to relation between nurses knowledge and sociodemographic data and total practice score .the present study revealed that there was a statistically significant relation between total knowledge and total practice pre & post guideline with level of education. It was clear that ,more than one- third of nurses who had Bachelor degree had good level of knowledge and satisfactory practice. This may be explained by the fact that, the high qualified nurses who had Bachelor degree able to provide competent care .They usually had the right knowledge and skills to meet the needs of those high risk

neonates compared by nurses who had diploma degree and secondary education .Furthermore those with university education had been exposed to wider curriculum and self-motivated learning .Moreover ,these nurses likely to had greater knowledge about diseases pathology and management than other nurses with lower academic qualifications .

These results disagree with **Aziz, & Abdul-Hamza (2017)**. They showed that there was no significant relationship between nurses' knowledge and socio-demographic data .⁽²⁰⁾

Moreover, the result of the present study demonstrated that the nurses had better knowledge and practice immediately and one month after educational guideline program and there was a highly statistically significant difference between pretest and post test. This could be attributed to the fact that any educational program increase nurses knowledge in turn, changes their practice.

Regarding to the relation between nurses' knowledge ,practice and their years of experience the current study clarified that , there were a significant positive relation between total nurses' knowledge ,practice and their years of experience .The finding of the present study was in the same line with **Adraa (2014)** who mentioned in their study that ,their was strong significant association between nurses' knowledge and years of experience .Most of the nurses had six years of experience .Most of the nurses had six years of experience at Neonatal Intensive Care Unit , which can increase their knowledge in dealing with CPAP.⁽²¹⁾

Finally , the current study has been able to shed some light on the knowledge and practice of nurses toward neonates on CPAP

.In this respect , the nurse should have complete and accurate knowledge and skills about CPAP by updating their knowledge , attending in -service training programs and reading books related to respiratory diseases and CPAP to improve their quality of nursing care for those critically ill neonates.

The study conclude that there was a significant improvement in total level of nurses' knowledge and practice regarding nursing care of neonate receiving Continuous Positive Airway Pressure immediately and after one month from educational guideline program implementation .there was a positive correlation between the total knowledge score of nurses and their total practice regarding CPAP .

The study recommended that

1. Manual log book about care of neonates and CPAP should be available to nurses at NICU as a reference .
2. In -service training program should be conducted periodically and regularly for teaching nurses working in Neonatal Intensive Care Unit care of neonatal receiving CPAP.
3. A system for accreditation and certification should be developed to motivate nurses' participation in the educational programs which should be conducted.

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