

Assessment of Nurses' Knowledge and Practice Regarding Nursing Care for Neonates on Non-Invasive Continuous Positive Airway Pressure

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Abstract

Background: Continuous Positive Airway Pressure (CPAP) is a fundamental non-invasive respiratory support modality widely used in neonatal intensive care units. Its effectiveness in reducing the need for invasive ventilation underscores the importance of ensuring that nurses possess adequate knowledge and skills to ensure its safe and effective application. **Aim of the study:** To assess nurses' knowledge and practices regarding nursing care for neonates on non-invasive CPAP. **Design:** A descriptive cross-sectional research design was used. **Setting:** The study was conducted at the Neonatal Intensive Care Unit (NICU) of Beheira Specialized Children's Hospital, affiliated with the Ministry of Health and Population, Egypt. **Subjects:** A convenience sample of all available nurses (n=90) working in the NICU during the data collection period. **Tools:** Two tools were used to collect data: tool I: a structured interview questionnaire to assess nurses' knowledge, and tool II: an observational checklist to evaluate their practices. **Results:** The findings revealed that 60% of the nurses had poor knowledge regarding CPAP. However, 91.1% demonstrated good practice levels in CPAP care. Statistically significant associations were found between nurses' knowledge and both age and prior training ($p < 0.05$), and between nurses' practice and both gender and training attendance ($p < 0.01$). A significant positive correlation was also observed between knowledge and practice, especially tasks such as CPAP setup and troubleshooting. **Conclusion:** Despite knowledge deficits among the studied nurses, most exhibited proficient CPAP-related practices. **Recommendations:** Ongoing in-service training programs should be implemented to enhance nurses' theoretical knowledge and practical skills regarding neonatal CPAP care.

Keywords: Continuous Positive Airway Pressure, Knowledge, Practice

Introduction

The neonatal period, defined as the first 28 days of life, represents a critical phase in human physiological development. During this time, the newborn undergoes significant adaptations across all organ systems, with the most profound changes occurring in the cardiovascular and respiratory systems. These physiological transitions are primarily driven by the shift from fetal to postnatal circulation, facilitating the newborn's adaptation to extrauterine life. (Rey y Formoso, Barreto Mota, & Soares, 2022)

The use of Continuous Positive Airway Pressure (CPAP) has recently increased, particularly due to its role in protecting various organs and body systems. It is now widely recommended as a primary method of respiratory support, with the World Health Organization strongly advocating its use,

especially in the management of respiratory distress in premature infants. (Kinshella et al., 2020) CPAP is also an essential treatment for various neonatal respiratory conditions, including congenital pneumonia, respiratory distress syndrome (RDS), meconium aspiration syndrome, apnea of prematurity, and transient tachypnea of the newborn (TTN). (Polin & Sahni, 2025).

CPAP increases tidal volume, improves lung compliance, and increases functional residual capacity (FRC) by stabilizing the alveoli and avoiding their collapse. Additionally, it reduces ventilation-perfusion mismatch, maintains endogenous surfactants, and optimizes respiratory efficiency, all of which collectively improve neonatal pulmonary function. (Shayani & da Silva Marães, 2024).

CPAP is not recommended in situations of pneumothorax, congenital chest abnormalities

such as diaphragmatic hernia, nasal deformity, cleft lip, cleft palate, neonatal apnea, unrepaired gastroschisis, upper airway obstruction, pneumothorax and hemodynamic instability. The invasive modalities are more suitable in these situations. (Sequera-Ramos, Garcia-Marcinkiewicz, Riva, & Fuchs, 2022)

Neonates on CPAP require intricate and specialized care to survive and avoid problems from the CPAP. This requires highly skilled and knowledgeable professional carers to manage neonates. For newborns receiving CPAP, nurses play a crucial role in assessing, monitoring, supporting, educating, and determining their needs because they are in close contact with the neonate and their family. (Taghinejad, Nikfarid, Monfared, Hoseini, & Habibi, 2021)

Neonatal nurses play a pivotal role in the care of infants receiving CPAP. Their responsibilities encompass delivering safe and effective respiratory support, maintaining vigilant and ongoing monitoring, and accurately documenting all observations and interventions. This comprehensive approach helps to identify potential complications early, address them promptly, and support the infant throughout CPAP therapy, including the weaning process. (Taghinejad et al., 2021)

Nurses must remain highly attentive to subtle changes in the infant's condition, as early recognition of deviations in vital signs or respiratory parameters can significantly reduce the risk of deterioration. Key assessments include monitoring heart rate, respiratory rate, blood pressure, oxygen saturation, CPAP settings (such as pressure levels, water level, and temperature), arterial blood gases, and performing regular chest auscultation. (Sayed Mohamed Farag, El-Sayed Ouda, & Amin Mohammed, 2024) Additionally, nurses must ensure the correct selection and secure fixation of nasal prongs or masks to minimize the risk of nasal trauma. (Mohamed Thabet, Abd El Hamid Zakie, Ahmed Sayed, Shawky Mahmud, & Sayed Masood, 2021)

They are also responsible for checking all equipment involved in respiratory support, including suction devices, resuscitation

equipment, syringe drivers or infusion pumps, and ventilator alarms. The axillary temperature should be checked at least every four hours, with continuous monitoring via skin probes to detect thermal instability. (Puspitasari, Titisari, & Lamidi, 2023)

The nurse must observe and document the infant's response to handling, any changes in skin integrity, medication administration, fluid balance, and any procedures or investigations performed. Maintaining adequate humidity in inspired gases is essential to support mucociliary function, optimize gas exchange, and prevent infection. When suctioning is necessary, the color, consistency, and quantity of secretions must be recorded. (Asress, Ferede, Chekol, & Bizuneh, 2023)

Significance of the study

Neonatal respiratory complications are among the leading causes of morbidity and mortality during the neonatal period, particularly in low- and middle-income countries. According to the World Health Organization (2023), approximately 2.3 million neonates died globally in 2022, with respiratory disorders contributing significantly to early neonatal deaths. (World Health Organization 2023) In Egypt, respiratory distress remains a common reason for neonatal intensive care unit (NICU) admissions, with an increasing number of neonates requiring non-invasive respiratory support. (Lategan et al., 2023)

Non-invasive continuous positive airway pressure (NCPAP) has become a standard and effective modality in the management of neonates with respiratory distress syndrome (RDS), particularly those who are spontaneously breathing. Evidence from recent studies has demonstrated that early initiation of CPAP can significantly reduce the need for invasive mechanical ventilation and surfactant administration, in addition to lowering neonatal mortality rates. These findings support the growing global recommendation for the use of CPAP in neonatal respiratory care, especially in resource-constrained settings. (Thukral et al., 2016; Pillay et al., 2021).

Bowden V, 2015; Elsobkey & Amer, 2018; Hegazy & Abusaad, 2019)

Aim of the study

Assess nurses' knowledge and practice regarding nursing care for neonates on non-invasive continuous positive airway pressure.

Research question:

- 1- What is the nurses' knowledge regarding nursing care for neonates on non-invasive continuous positive airway pressure?
- 2- What is the nurse's practice regarding nursing care for neonates on non-invasive continuous positive airway pressure?

Subjects and Methods:

Research design: A descriptive cross-sectional research design was used to conduct this study.

Research Setting:

This study will be conducted in the Neonatal Intensive Care Unit (NICU) at Beheira Specialized Children Hospital, which is affiliated with the Ministry of Health and Population (MOHP) in El-Bahira Governorate. This unit includes 3 departments, A, B, and C, and 39 incubators. Part A houses 12 incubators, Part B includes 11 incubators, and Part C includes 16 incubators.

Research subjects:

A convenience sample of all available nurses (n=90) at the time of data collection who were working in the above-mentioned setting. They were assigned to provide bedside nursing care for neonates on non-invasive continuous positive airway pressure in the Neonatal Intensive Care Unit.

Tool of data collection:

Two tools were used to collect the necessary data. Both were developed by the researcher after reviewing the related literature (Asress et al., 2023; Aziz & Abdul-Hamza, 2017;

Tool (I): Nurses' knowledge regarding nursing care for neonates on noninvasive continuous positive airway pressure structured interview questionnaire:

This tool was used to assess nurses' knowledge regarding the nursing care for neonates on noninvasive continuous positive airway pressure.

It includes two parts:

Part 1: Characteristics of the Nurses; this part was used to collect demographic and academic data of nurses, and it included 8 items: age, gender, academic qualification, years of experience in the current department, and previous attendance of training programs about care for neonates on noninvasive CPAP.

Part II: Nurses' knowledge about CPAP, such as general information about CPAP, indication of CPAP machines for infants, contraindications for CPAP use in infants, complications of CPAP, and criteria for weaning from CPAP

Scoring of Nurses' Knowledge on CPAP:

- To evaluate nurses' knowledge regarding CPAP therapy, responses were assessed using a three-point scoring system:
- (0 points): Incorrect answer or lack of knowledge ("don't know").
- (1 point): Incomplete answer.
- (2 points): Correct and complete answer.
- The total obtained knowledge scores were then transformed into qualitative categories as follows:
- Good Knowledge ($76\% \leq 100\%$)
- Fair Knowledge ($61\% \leq 75\%$)
- Poor Knowledge ($\leq 60\%$)

Tool (II): Nurses' practices observational checklist regarding nursing care for neonates on noninvasive continuous positive airway. The researcher developed this tool based on current and related literature to assess nurses' practices regarding nursing care for neonates on non-invasive continuous positive airway

pressure.(Asress et al., 2023; Bowden V, 2015; Hegar & Abusaad, 2019) It includes 10 procedures: initial nursing care before starting CPAP; setting up the CPAP system; getting the neonate ready for CPAP; connect the nasal prong system to the neonate; different ways secure the CPAP device; checking for safety issues at fixing them; monitoring CPAP and ongoing neonatal assessment; oropharyngeal/nasopharyngeal suctioning; oral care; and chest physiotherapy.

Scoring system

Each step of the observed nurse's practice will be categorized on a 3-point Likert scale as follows:

- 0= not done or done incorrectly.
- 1= done correctly and incomplete.
- 2= done correctly and complete.

The total score for nurses' practices will be calculated, summed, and converted into a percentage to evaluate their proficiency in providing neonatal care on CPAP. The classifications are as follows:

- Good($71\% \leq 100\%$)
- Satisfactory ($61\% \leq 70\%$)
- unsatisfactory $\leq 60\%$

Pilot study

A pilot study was conducted on 10% of the total sample size (n=9 Nurses), who were excluded from the study sample to ensure the feasibility and clarity of the study tool and to identify obstacles or problems that may be encountered during data collection.

Methods

- An official letter of permission was obtained from the Dean and Vice Dean for Postgraduate and Research at the Faculty of Nursing, Damanhour University. The obtained official letter was directed to the administrative authorities of the selected setting to obtain their permission to collect the data after an explanation of the study's aim.
- Tools I and II were developed and submitted to a jury of 5 experts in the field of pediatric nursing to assess content validity. No modification required. The

reliability of tools I and II was tested using Cronbach's Alpha test, and the result was $r=0.82$ and $r=0.94$, respectively, which is acceptable.

- The structured interview schedule was conducted individually with each nurse during their break time. Each interview lasted between 10 to 15 minutes. Each nurse assigned to care for neonates on non-invasive continuous positive airway pressure (NCPAP) was observed twice according to the assignment schedule before the structured interview questionnaire was conducted. The nurses were unaware that their performance was being observed.
- The two observations were as follows: the first one was done during the morning shift, and the second one was done during the evening shift.
- The researcher attended the previously mentioned setting twice per week throughout morning and evening shifts according to nurses' working schedules to observe their practices regarding the care of neonates on CPAP.
- Data was collected over a period of five months the beginning of January to June 2024.

Ethical considerations:

Permission was obtained from the ethical committee in the faculty of nursing at Damanhour University to conduct the study, witness-informed written consent was obtained from the director and the head nurses of the hospital after an explanation of the aim of the study. Anonymity, privacy, and confidentiality of the study participants were ensured throughout the data collection and study implementation process.

Statistical analysis:

-The collected data were coded, entered by the researcher, and analyzed using the Statistical

Package for the Social Sciences (IBM SPSS)
version 23.0.

The following statistical analysis measures were used:

- 1-Paired t-test for normally distributed quantitative variables, to compare the 1st and 2nd observations.
- 2- Student t-test for normally distributed quantitative variables, to compare between two studied categories
- 3 - Pearson coefficient to correlate two normally distributed quantitative variables
- 4-The significance of the obtained results was judged at a 5 % level.

Results:

Table (1) shows the characteristics of the studied nurses. It is clear from the table that the majority of nurses (97.8%) are in the age group of 20–<30 years, with a mean age of 26.1 ± 1.7 years. Most of the nurses are female (96.7%). More than half of them hold a bachelor's degree (53.3%), while 46.7% have technical qualifications. Regarding years of experience, it was noted from the same table that the majority of nurses (95.6%) have less than 5 years of experience, with a mean of 2.6 ± 1.2 years. In addition, less than half (42.2%) of them have attended a training course on CPAP.

Table (2) presents nurses' general knowledge about CPAP. It was found that more than half of the studied nurses had incomplete answers regarding general information about CPAP, indications, Contraindications, Complications, and time of weaning from CPAP machines. 52.2%, 56.7%, 54.4, 63.3% and ,61.1% respectively. Regarding the total score of nurses' knowledge about CPAP, the table revealed that 60% of nurses had poor knowledge, with a total mean score of 6.07 ± 2.00 .

Table (3) illustrates the total percentage score of nurses' knowledge in relation to their characteristics. The table indicates a statistically significant difference between nurses' overall knowledge and their age, as well as their prior attendance at training courses on CPAP, with p-values of <0.001 and 0.008, respectively.

Table (4) shows the total percentage scores of nurses' practices in providing care for neonates on CPAP. The findings indicate that the vast majority of nurses (91.1%) demonstrated a high level of competency, achieving a "good" practice score. A smaller proportion (7.8%) attained a "satisfactory" rating, while only a single nurse (1.1%) in each observation exhibited "unsatisfactory" practices.

Table (5) highlights the total percentage scores of nurses' practices in relation to their characteristics. It was revealed that there was a statistically significant difference between nurses' overall practice scores and both their gender and prior attendance of a CPAP training course. Specifically, in the first observation, these factors were significantly correlated with practice performance ($p = 0.006$ and $p = 0.004$, respectively). This association remained evident in the second observation, with p-values of <0.001 and 0.006, respectively.

Table (6) present the correlation between nurses' knowledge and their practical performance in providing CPAP care for neonates. The findings indicate a significant positive correlation between knowledge and practice in the CPAP setup across both observations ($R = 0.324$, $P = 0.002$ in the first observation; $R = 0.311$, $P = 0.003$ in the second). Similarly, performing safety checks and troubleshooting in CPAP also demonstrated a significant correlation ($R = 0.252$, $P = 0.017$ in the first observation; $R = 0.247$, $P = 0.019$ in the second), emphasizing the critical role of knowledge in ensuring safe and effective neonatal respiratory support. The same table also presents the correlation between nurses' overall knowledge and total practice scores across all CPAP-related tasks. The results indicate a weak and non-significant correlation in both observations ($R = 0.149$, $P = 0.161$ in the first observation; $R = 0.151$, $P = 0.155$ in the second).

Table (1): Characteristics of the Studied Nurses (n =90)

Nurses' characteristics	No (n=90)	%
Age (years)		
20 - <30	88	97.8
30-40	2	2.2
Mean $\pm$ SD	26.1 $\pm$ 1.7	
Gender		
Male	3	3.3
Female	87	96.7
Academic qualifications		
Diploma	0	0.0
Technical	42	46.7
Bachelor's degree	48	53.3
Post-graduate studies	0	0.0
Years of experience in NICU		
<5 years	86	95.6
5-10	4	4.4
Mean $\pm$ SD	2.6 $\pm$ 1.2	
Attending a Training course about CPAP		
Yes	38	42.2
No	52	57.8

Table (2): Distribution of Nurses regarding their 'General Knowledge and Total Percent Score about Care for Neonates on Non-Invasive CPAP (n =90)

	Wrong Answer or don't know		Incomplete answer		Correct and complete answer	
	No.	%	No.	%	No.	%
General information about CPAP	21	23.3	47	52.2	22	24.4
Indication of CPAP in neonates	2	2.2	51	56.7	37	41.1
Contraindications of CPAP	14	15.6	49	54.4	27	30.0
Complications of CPAP	8	8.9	57	63.3	25	27.8
The criteria for weaning from the CPAP machine.	1	1.1	55	61.1	34	37.8
Level	No.			%		
Poor	54			60.0		
Fair	17			18.9		
Good	19			21.1		
Total score						
Min.- Max.	3.00-10.00					
Mean ± SD	6.07±2.00					
Percent score						
Min.- Max.	30.00-100.00					
Mean ± SD	60.67±20.04					

Table (3): Nurses' Total Percent Score of Knowledge according to their Characteristics (n =90)

Characteristics of the nurses	Knowledge		
	Mean $\pm$ SD	T	P
Age (years)			
20 - <30	60.45 $\pm$ 20.22	4.428*	<0.001*
30<40	70.0 $\pm$ 0.0		
40<50	-		
Gender			
Male	46.67 $\pm$ 28.87	1.234	0.220
Female	61.15 $\pm$ 19.73		
Academic qualifications			
Diploma	-	0.084	0.933
Technical	60.48 $\pm$ 20.60		
Bachelor's degree	60.83 $\pm$ 19.77		
Post-graduate studies	-		
Years of experience in NICU			
<5 years	60.23 $\pm$ 20.0	0.952	0.344
5<10	70.0 $\pm$ 21.60		
10<15	-		
$\geq$ 15	-		
Previous attendance at a training course about CPAP			
Yes	54.21 $\pm$ 16.87	2.703*	0.008*
No	65.38 $\pm$ 21.0		

t: Student t-test

*: Statistically significant at $p \leq 0.05$ **Table(4): Nurses' Total Percent Score of Overall Practices Regarding CPAP (n =90)**

Overall practices	1 st Observation		2 nd Observation	
	No.	%	No.	%
Score of practices				
Unsatisfactory	1	1.1	1	1.1
Satisfactory	7	7.8	7	7.8
Good	82	91.1	82	91.1
Total score				
Min.- Max.	171.0±-285.0		169.0-285.0	
Mean ± SD	236.50±24.36		236.09±24.57	
Percent score				
Min.- Max.	59.38-98.96		58.68-98.96	
Mean ± SD	82.12±8.46		81.98±8.53	
t(p)	1.497(0.138)			

t: Paired t-test

Table (5): Nurses' Total Percent Score of Practices According to their Characteristics (n =90)

Characteristics of the nurses	Practices					
	1 st Observation			2 nd Observation		
	Mean ± SD	T	p	Mean ± SD	T	P
Age (years)						
20 - <30	81.94±8.43			81.79±8.50		
30<40	90.10±7.61	1.357	0.178	90.10±7.61	1.370	0.174
40<50	-			-		
Gender						
Male	73.84±2.36			74.42±1.40		
Female	82.40±8.45	5.227*	0.006*	82.24±8.56	6.385*	<0.001*
Academic qualifications						
Diploma	-			-		
Technical	82.39±7.21	0.290	0.773	82.28±7.31	0.325	0.746
Bachelor's degree	81.88±9.49			81.71±9.54		
Post-graduate studies	-			-		
Years of experience in NICU						
<5 years	81.81±8.40			81.66±8.48		
5<10	88.72±7.71	1.610	0.111	88.72±7.71	1.632	0.106
10<15	-			-		
≥15	-			-		
Previous attendance at a training course about CPAP						
Yes	85.10±7.82	2.980*	0.004*	84.84±8.0	2.830*	0.006*
No	79.94±8.30			79.88±8.37		

t: Student t-test

*: Statistically significant at $p \leq 0.0$ **Table (6): Correlation Between Nurses' Total Knowledge Scores and Total Practice Scores in Neonatal CPAP Care C (n =90)**

Practices	Knowledge			
	1 st Observation		2 nd Observation	
	R	p	R	P
Initial nursing Care before initiation of CPAP	0.008	0.939	0.002	0.985
Setting up CPAP	0.324*	0.002*	0.311*	0.003*
Preparing the neonate for CPAP	0.141	0.186	0.202	0.056
Connect the nasal prongs system to the neonate	0.201	0.058	0.187	0.077
Methods of Securing the CPAP Device	0.073	0.494	0.057	0.593
Performing safety checks for troubleshooting in CPAP	0.252*	0.017*	0.247*	0.019*
Monitor CPAP and ongoing assessment	0.107	0.318	0.109	0.305
Nasogastric feeding checklist	0.131	0.217	0.168	0.112
Nasopharyngeal Suctioning Nurses' Practices Regarding	0.149	0.160	0.142	0.183
Oropharyngeal suctioning	0.121	0.255	0.111	0.298
Oral care	0.011	0.920	0.001	0.993
Chest physiotherapy	0.059	0.579	0.055	0.607
Total practices	0.149	0.161	0.151	0.155

r: Pearson coefficient

*: Statistically significant at $p \leq 0.0$

Discussion

Continuous Positive Airway Pressure (CPAP) remains a widely accepted and effective modality of respiratory support for neonates, especially preterm. Recent advancements in CPAP technology, along with improved understanding of neonatal respiratory pathophysiology, have significantly contributed to the increased survival rates of extremely preterm infants. As clinical practices advance, nurses must stay updated on their knowledge and practice of CPAP application. In low-resource settings, proper use of CPAP can greatly improve neonatal outcomes.(Dawoud Mostafa, Bahgat, & Dawood, 2023)

Regarding the demographic characteristics of the nurses included in the study, the findings revealed that the majority were between 20 and under 30 years of age, as shown in (table1). This age distribution may be attributed to the nursing workforce in NICUs is predominantly composed of newly graduated or early-career nurses. The youthful profile of the sample may reflect recent recruitment trends and a high turnover rate among more experienced staff in critical care units. This finding aligns with the results of a study by (Mohamed Thabet et al., 2021) which reported that more than half of the studied nurses were under 30 years of age. Similarly, (Mostafa, El-Khedr, & Ibrahiem, 2024) found that over one-third of the nurses were between 25 and 30 years old. In contrast, the current study's results differ from those of (Mahfoz, El Sayed, & Ahmed, 2022) who reported that more than half of the participating nurses were between 30 and under 35 years of age.

Regarding gender, the findings revealed that nearly all the studied nurses were female. This reflects the prevailing situation in Egypt, where the nursing workforce is predominantly composed of women, a trend rooted in the long-standing perception of nursing as a female-oriented profession. Although male nurses were underrepresented in this sample, their presence underscores the gradual diversification of the nursing workforce in neonatal care settings. This observation is also consistent with global

patterns, as nursing continues to be largely female-dominated worldwide. Furthermore, it might be impacted by gender-specific responsibilities or preferences in healthcare settings, especially in neonatal care, where nurturing and empathy are highly valued.

This finding is consistent with the result of (Ebrahim, El-Dakhkhny, & AbdElnabi, 2023), who reported that the majority of participants in their study were female. Similarly, (Mostafa et al., 2024) also found that most of the studied nurses were female. On the contrary, a study conducted by (El-Garhy, Ouda, Ismail, & Moneim, 2020) revealed a different pattern, with half of the participating nurses being male.

The present study found that more than half of the participating nurses held a bachelor's degree in nursing. This may reflect hospital policies that prioritize the recruitment of highly qualified staff for critical care units such as NICUs. Employing nurses with advanced academic qualifications is often viewed as improving the quality of care in specialized clinical settings. The findings of the present study are supported by (Khalil, Abd Elsalam Mohamed, Rezk Mohamed, & Abd El Motaleb Mousa, 2021) and (M. Soliman, Elewa, & Helmy, 2024). This is further corroborated by (Mostafa et al., 2024), who similarly reported that more than half of the studied nurses possessed a bachelor's degree. In contrast, the current results differ from those of (Mohamed & Ahmed, 2022) reported that two-thirds of nurses had graduated from technical nursing institute.

According to the findings of the current study, more than half of the nurses had not participated in any training sessions related to their clinical practice. This may be attributed to factors such as heavy clinical workloads, which often limit opportunities for professional development, as well as insufficient institutional support for continuing education. The current study was aligned with (Mohamed Thabet et al., 2021) who revealed that almost all nurses did not attend any training course regarding the care of neonates on mechanical ventilation. Additionally, this was in agreement (Atia, 2024) The findings revealed that the majority of the

studied nurses had between five and less than ten years of experience in the NICU. This may be attributed to the relatively young age of the nursing staff and the recent graduation of many participants, suggesting that the NICU workforce is primarily composed of early-career professionals.

This finding is in harmony with the results reported by (Kim, Seo, Jung, & Kim, 2021) found that more than two-thirds of nurses had less than three years of experience in the NICU. Similarly, a study conducted by (Mohammed, Ahmed, Reyad, & Mohamed, 2023) . On the other hand, it is inconsistent with (Sayed Mohamed Farag et al., 2024) who reported that more than half of the nurses in their study had between 10 and less than 15 years of experience.

Regarding general knowledge about CPAP, more than half of the nurses in the current study exhibited a poor knowledge level (**Table 2**). This result could be due to insufficient formal education or a lack of emphasis on CPAP during nursing training programs, which may contribute to knowledge gaps. Furthermore, almost fifty percent of the nurses in the study did not participate in training programs.

It could be more challenging for nurses to stay current on the newest evidence-based practices if there aren't any refresher courses on neonatal respiratory support or opportunities for continuous professional development. Insufficient hands-on experience with CPAP in clinical settings may also lead to a lower level of theoretical understanding. These results agreed with (Dawoud Mostafa et al., 2023), who revealed that nearly two-thirds of the nurses had poor knowledge of CPAP before the educational guidelines program's implementation. Similarly, (Mostafa et al., 2024) highlighted that most of the nurses had a low level of knowledge about continuous positive airway pressure. However, this result is incongruent with (Irtanti & Soetadji, 2019) , who reported that more than two-thirds of nurses had a good level of knowledge about the indication of CPAP in neonates. Also, contradict with (H. Soliman, 2023) .

A statistically significant difference was found between nurses' total scores of knowledge and both their age and participation in previous training programs. (**Table 3**) This finding may be attributed to the greater clinical exposure and accumulated experience typically associated with older nurses, which can enhance their understanding of CPAP. Furthermore, nurses who have participated in training programs are more likely to remain up to date with current practices and advancements, thereby improving their knowledge and competence in CPAP management.

This result is in harmony with the results of (Elsobkey & Amer, 2018), who reported a statistically significant relationship between nurses' knowledge and their age. Similarly with, (H. Soliman, 2023). Conversely, the current results differ from those of (Mohamed Attia, Tharwat Elbahnasawy, & Rabie Abd El-Sadeik, 2023), who identified no significant correlation between nurses' total knowledge scores and either their age or participation in training programs.

The present study revealed that the majority of nurses demonstrated proficient practices in caring for neonates receiving CPAP therapy (**Table 4**). Several key factors appear to underpin this positive outcome. Notably, the nurses' educational background emerged as a significant contributor; most participants held a bachelor's degree, which is associated with enhanced clinical competence. This improvement may be attributed to a more comprehensive curriculum, increased engagement in self-directed learning, and a deeper understanding of disease management. Furthermore, over one-third of the nurses participated in specialized training programs focused on CPAP, which contributed to the development of their practical skills and further improved their clinical performance. Additionally, whereas the majority of nurses had less than five years of professional experience, their capacity for rapid learning and continuous exposure to clinical environments facilitated the development of robust clinical skills.

This finding aligns with (Dake, 2020) who observed that over half of nurses

demonstrated average practice levels. Conversely, studies by (Dawoud Mostafa et al., 2023) and (Atia, 2024) revealed predominantly unsatisfactory neonatal care practices prior to CPAP initiation, particularly before educational guideline implementation. This pattern is further corroborated by (Asress et al., 2023) who documented suboptimal nursing practices regarding CPAP application in NICU settings.

Statistically significant differences were found between nurses' overall practice scores and certain demographic characteristics, including gender and participation in training courses (Table 5). This finding could be attributed to the higher representation of females in the NICU setting, resulting in greater hands-on experience and familiarity with neonatal respiratory support procedures. Furthermore, nurses who have attended training programs are more likely to demonstrate enhanced practical skills, as such programs provide hands-on learning opportunities and updated evidence-based guidelines for neonatal care. In contrast, these results differ from those reported (Al Sharkawi, Abd El-Sadek, Said, & Mohamed, 2019), who found that no statistical difference between nurses' gender or training participation and their clinical practice.

On the other hand, there was no statistically significant difference between the total score of nurses' practice and their characteristics, such as age, academic qualifications, and years of experience. This finding is in line with (Qasem, 2022), who clarified that there is no significant relationship between nurses' practice and their age, educational level, and years of employment in the NICU.

The present study revealed a significant positive correlation between nurses' knowledge and their clinical practice, particularly in tasks such as CPAP setup and conducting safety checks for troubleshooting (Table 6). This association may be attributed to the fact that the majority of nurses possessed bachelor's degrees, reflecting a higher level of theoretical understanding. Nurses with greater knowledge are more likely to implement correct techniques,

adhere to evidence-based guidelines, and deliver safe and effective care to neonates.

This finding is consistent with (Mohamed Thabet et al., 2021) reported a positive relation between nurses' knowledge and practice regarding neonate invasive mechanical ventilation. Also agreement with (Dawoud Mostafa et al., 2023) and (Atia, 2024) who revealed a positive correlation between nurses' knowledge and their practice. On the contrary, a study by (Mostafa et al., 2024) found that a weak correlation exists between nurses' knowledge and their performance. Also, A contradiction with the study conducted by (AL Musawi & Mahmud, 2025).

Conclusion:

Based on the findings of the current study, it can be concluded that over half of the participating nurses possessed poor knowledge regarding CPAP therapy, particularly in areas such as its indications, contraindications, and potential complications. On the other hand, the majority of nurses demonstrated satisfactory clinical practices, particularly in tasks related to device setup and safety checks. A statistically significant difference was observed between nurses' knowledge levels and both their age and prior participation in CPAP-related training programs. Furthermore, A statistically significant difference was found between nurses' practice and their gender and attendance in training sessions. The present study also identified a significant positive correlation between nurses' knowledge and their clinical practice, particularly in tasks such as CPAP setup and conducting safety checks for troubleshooting.

Recommendations:

Based on the findings of the present study, the following recommendations are suggested:

- Continuous in-service education and training courses should be offered periodically to update specialist nurses' knowledge and skills regarding the care of neonates on CPAP.

- Employing highly qualified nurses who are responsible for those neonates in neonatal intensive care unit is important.
- Manual handbook procedure including all necessary information and clinical guidelines about nursing procedures related to nursing care of neonates on CPAP should be provided by the hospitals in each NICU.
- Hospitals should provide Internet networks to able the nurses to update their information regarding nursing care of neonates on CPAP .

Further Researches:

- Study nurses' knowledge and Practice regarding nursing care of neonates on CPAP on large number of nurses.
- Evaluate the impact of structured training programs on improving nurses' CPAP knowledge and clinical skills.
- Integrate E-learning modules and interactive training platforms to supplement traditional CPAP education.

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