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Knowledge of Non-invasive Positive Pressure in Acute Respiratory Failure among Nurses in Saudi Arabia 2024

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Abstract:

Background: Over the past three decades, non-invasive positive pressure ventilation (NIPPV) has been a vital technique for managing respiratory failure and has seen a significant increase in use as it has been transferred from critical care to ward settings. Nurses who provide NIPPV care to patients must be knowledgeable and have a positive attitude in their field in order to deliver high-quality care. In the treatment of acute respiratory failure, noninvasive positive pressure ventilation is becoming more popular since it reduces morbidity, mortality, hospital stays, and time spent in intensive care units. **This study aimed:** To assess knowledge of non-invasive positive pressure in acute respiratory failure among nurses. **Method:** A descriptive cross-sectional study design was conducted at the General Hospital in Saudi Arabia. All 136 nurses who were available and willing to take part in the study made up the convenient sample. A self-administered online questionnaire created by the researchers was used to assess nurses' expertise. **Results**: The study found those nurses' knowledge scores on the definition, advantages, nursing duties, purposes, and side effects of non-invasive positive pressure (NIPV) were good. On the other hand, their understanding of modes and signs was inadequate. According to the study's findings, 69.1% of the nurses had overall NIPV knowledge levels that were satisfactory. **Conclusion:** The development of evidence-based clinical guidelines and protocols is recommended.

Keyword: knowledge, Non-invasive Positive Pressure, Acute Respiratory Failure, Nurses.

Introduction:

Respiratory failure occurs when the respiratory system cannot oxygenate the blood and/or remove carbon dioxide from the blood [1]. It can be either acute or chronic and is classified as either hypoxemic (type I) or hypercapnic (type II) respiratory failure [1, 2]. Acute hypercapnic respiratory failure frequently occurs in COPD patients experiencing acute exacerbations of COPD, so this is the focus of this evidence-based analysis [1, 3]. Hypercapnia respiratory failure occurs due to a decrease in the drive to breathe, typically due to increased work to breathe in COPD patients [1, 4].

Noninvasive positive-pressure ventilation (NIPPV) is a technique that applies pressure to the airway to directly inflate the lungs while providing mechanical breathing without the need for an invasive artificial airway. The key to a successful NIPPV is its capacity to provide the same physiological advantages as invasive mechanical breathing without the potentially lethal risks connected to artificial airway use [5]. The non-invasive ventilator (NIV) has proven beyond a reasonable doubt to be a safe and effective way to improve gas exchange for critically ill patients suffering from a variety of acute respiratory failure causes. Additionally, the gadget improves arterial ventilation and oxygenation while lowering the effort required breathing. As a result, there are fewer cases of pneumonia linked to invasive ventilators [6].

Considering its adaptability, the machine can be utilized in high-dependency care units, intensive care units, and general wards. However, it is essential to ensure that nurses are trained on its use because the staff's experience predicts its performance [7]. The majority of virus-infected individuals experience dyspnea, acute hypoxic respiratory failure, and other respiratory issues. Some may require immediate care [8]. Research in the European Respiratory Journal shows that patients treated outside of the intensive care unit can benefit greatly from continuous positive airway pressure [9].

Registered nurses play a key role in establishing nurse-led care in the emergency department. Safe care delivery is made possible by efficient support networks, locally established procedures, audits, and training [10]. The clinical key to achieving successful outcomes in general wards is having healthcare professionals who are qualified to manage NIV patients [11]. Scientific research has repeatedly demonstrated that the limited use of NIV in clinical settings is due to physicians' and nurses' inadequate understanding and proficiency with the technology [10, 11].

Numerous hospital settings, like as emergency and critical care units, have made extensive use of NIV. A patient may often need to be put on NIV for conditions including severe hypoxemic respiratory failure, pneumonia, or asthma [12]. Hospitals around the Hail region aim for excellence in nursing

quality and medical safety in order to manage a range of patients. The use of NIPPV to treat acute respiratory failure is growing in popularity. There was a strong desire for assessment and education to adhere to evidence-based guidelines and prevent contraindications, and some studies found that nurses with NIPPV lacked nursing competence [13, 14].

Therefore, this study aimed to assess knowledge of non-invasive positive pressure in acute respiratory failure among nurses. Research questions: What is the level of knowledge of non-invasive positive pressure in acute respiratory failure among nurses?

Methods:

A descriptive cross-sectional study design was used in this study. The current study was carried out at General Hospital in Saudi Arabia from January to March 2024. All available nurses working at hospital during data collection who agreed to share in the study were involved (136 nurses). A self-administered online questionnaire developed by the researchers founded on recent literature review [12]. Tool for Data Collection consisting of three parts: Part one: The nurses' socio-demographic characteristics including (age, gender, nationality, marital status, occupation, education, place of work, and occupational experience). Part two: Training experience of nurses regarding non-invasive positive pressure ventilation.

Part three: Knowledge Questionnaire Regarding Non-invasive Positive Pressure: Nine open ended questions about NIPPV including (definition, purposes, modes, indications, advantages, disadvantages, side effects, contraindications, and nurses' roles). System of scoring: Correct answers received one point, while incorrect responses received zero for the questions that assess the nurses' level of knowledge. Total score was calculated by sum of correct answers, then considered as: Satisfactory: If the total score is equal or more than 65% of correct answers. Unsatisfactory: If the total score is less than 65% of correct answers.

Face validity was assessed through five expertise of relevant field. Reliability was assessed using Cronbach alpha (0.81). Pilot study was conducted on 10% of the total sample, there were excluded from the study sample. The Ethics Committee and the hospital directors provided their ethical approval. Additionally, after outlining the purpose of the study, an introductory question was used to get the participants' signed agreement. The nurses had the freedom to leave the study at any moment, and confidentiality and anonymity were guaranteed.

Data was coded, statistically analyzed using the IBM SPSS Statistics for Windows, Version 28. The results were arranged and displayed using percentages and figures. The significance of the findings was tested using a

one-way ANOVA and an independent t-test. Ultimately, a p-value of less than 0.05 was deemed statistically significant, and a p-value of less than 0.01 indicated a substantial difference.

Results:

Table (1) displays that, 67.6% of the studied nurses were between the ages of 20 and 30; 73.5% were females; and 63.2% were Saudi nurses. 63.2 nurses had a BSC in nursing, and 36.2 nurses were staff nurses. Regarding experience, 51.5% of the nurses had five to less than 10 years of professional experience.

Table (1): Demographic Characteristics of the Studied Nurses (n=136).

Variables	Percent
Age (in years)	
20-	**17.6**
30-	**67.6**
≥ 40	**14.7**
(Mean ± SD): (33.89 ± 4.9)	
Gender	
Male	**26.5**
Female	**73.5**
Nationality	
Saudi	**63.2**
Non-Saudi	**36.8**
Marital status	
Single	**29.4**
Married	**54.4**
Widow/divorced	**16.2**
Occupation	
Charge Nurse	**32.4**
Head Nurse	**11.8**
Nurse supervisor	**19.1**
Staff Nurse	**36.8**
Level of Education	
Diploma	**25.0**
BSN	**63.2**
MSN	**11.8**
Years of Experience	
Less than 5 years	**5.9**
5- < 10 years	**51.5**
≥ 10 years	**42.6**

Table (2) displays that, 52.9% of the studied nurses had previous training with NIPPV procedure and rated their level of experience as competent. 83.3 of them rated the training as good. Only 64.7% of them had previous experience with applying NIPPV procedure.

Table (2): Nurses' Experience Regarding Non-Invasive Positive Pressure

	Percent
Level of experience with NIPPV	
Novice	**5.9**
Advanced beginner	**26.5**
Competent	**52.9**
Proficient	**2.9**
Expert	**11.8**
Previous training with NIPPV procedure	
Yes	**52.9**
No	**47.1**
If yes, rate the training or education received	
Good	**83.3**
Poor	**16.7**
Previous experience with applying NIPPV procedure	
Yes	**64.7**
No	**35.3**

Table (3) exposes that, the study's nurses had satisfactory knowledge scores related to nursing roles, purposes, definition, benefits, and side effects of NIPPV with scores of (97.1, 94.1, 88.2, 86.8, and 82.2%). However, (92.6 & 83.8%) of the nurses had unsatisfactory knowledge scores regarding indications and modes respectively.

Table (3): Nurses' Knowledge Regarding Non-Invasive Positive Pressure

Nurses' Knowledge Regarding NIPPV	Satisfactory %	Unsatisfactory %
1. Definition	88.2	**11.8**
2. Purposes	94.1	**5.9**
3. Modes (Methods)	16.2	**83.8**
4. Indications	7.4	**92.6**
5. Advantages	86.8	**13.2**
6. Disadvantages	72.1	**27.9**
7. Side effects	82.4	**17.6**
8. Contraindications	79.4	**20.6**
9. Nursing Roles	**97.1**	**2.9**

Table (4) reveals that there was significant statistical relation between total knowledge level of the studied nurses and their demographic variables except gender and marital status.

Table (4): Relation between the Demographic Characteristics of the Studied Nurses and the Total Knowledge Level Regarding NIPPV (n=136)

Socio-demographic variables	Total Knowledge		Test of Sig.	
	Satisfactory (94)	Unsatisfactory (42)	t/F	p-Value
Age				
20-	20	4		
30-	68	24	F=9.56	**0.000****

Socio-demographic variables	Total Knowledge		Test of Sig.	
	Satisfactory (94)	Unsatisfactory (42)	t/F	p-Value
≥ 40	6	14		
Gender				
Male	22	14	t= 0.236	**0.814**
Female	72	28		
Nationality				
Saudi	64	22	t= 2.04	**0.046***
Non-Saudi	30	20		
Marital Status				
Single	34	6	F=2.86	**0.064**
Married	48	26		
Widow/divorced	12	10		
Occupation				
Charge Nurse	24	20		
Head Nurse	14	2	F=3.013	**0.032***
Nurse supervisor	20	6		
Staff Nurse	36	14		
Education				
Diploma	8	26		
BSN	70	16	F=26.73	**0.000****
MSN	16	0		
Years of Experience				
Less than 5 years	4	4		
5- < 10 years	52	18	F=6.904	**0.002****
≥ 10 years	**38**	**20**		

<0.001** highly statistically significant >0.05 not statistically significant

Discussion:

Pre-hospital care, hospital wards, pediatric or palliative units, critical care, and emergency rooms are among the acute settings where NIPPV is being used more and more. Additionally, it is used as a type of at-home treatment for patients with chronic respiratory or sleep disorders [15]. The present study aimed to assess the knowledge regarding non-invasive positive pressure in acute respiratory failure among nurses. The results of the study expose that, more than two thirds of the examined nurses were between the ages of 30 and 40, with a mean age of (33.89 4.9) years.

This result is in line with that of **Goktas et al. (2016)** [16], who discovered that the average age of nurses was 33.2±7.3. This is due to nurses working in several departments at this age. Less than three quarters of the nurses in the survey were female, which is not surprising given that nursing is a profession mostly occupied by women. Slightly more than half of the nurses had five to ten years of experience. **Elsobkey & Amer (2018)** [17] observed that most nurses were female and that over two-thirds of them had five to less than 10 years of experience, which supports this finding.

It was discovered that slightly more than half of the nurses in the study thought they had competent experience with NIPPV. This result is consistent

with that of **Cifer et al. (2022)** [18], who found that over 75% of respondents thought they understood non-invasive mechanical ventilation well. To make NIV use safer and more efficient, there is a need to address the lack of training and recommendations [19]. whereas this finding is in conflict with **Elenaa et al. (2020)** [20], who stated that structured training to improve NIV abilities is similarly restricted, especially to a few developed countries, **Kim et al. (2021)** [21] reported that the majority of the participants had received ventilator training, and the current study found that over half of the nurses reported having received prior training about NIV procedures.

The study's primary goal was to determine the level of knowledge, and the findings show that over two-thirds of the nurses in the study had overall satisfactory knowledge levels on NIV. This could be because nurses got ongoing training that helped them expand their understanding of a variety of NIPPV subjects. This result contradicts the findings of **Annarani et al. (2017)** [22], who reported that over two-thirds of nurses lacked adequate knowledge of NIV treatment. Furthermore, **Ahmed (2022)** [23] discovered that medical professionals have little understanding of NIPPV (nurses made up 62% of the study group).

These results also align with those of **Lomnyack et al. (2020)** [24], who found that slightly less than half of the nurses knew a moderate amount about how to use a continuous positive airway pressure device. The current study found statistically significant relationships between the nurses' total knowledge ratings and their years of experience and educational attainment. This result is comparable to that of **Tarhan et al. (2015)** [12], who reported a statistically significant relationship between average score obtained from noninvasive questions and educational level; nurses with postgraduate degrees scored higher on average.

In a similar vein, **Elenaa et al. (2019)** [20] claimed that staff members' knowledge and skills might be enhanced by NIPPV education and training. This finding is in contrast to **Ahmed (2022)** [23] conclusion that there was no significant correlation between participants' knowledge level and their demographic features, such as their years of experience and educational status. The current study's findings demonstrated that there was no statistically significant correlation between the gender of the nurses under investigation and their overall knowledge levels. **Aziz & Abdul-Hamza** (2017) [25] found no statistically significant correlation between nurses' gender and their understanding of continuous positive airway pressure, which supports this finding.

Conclusion:

According to the study, those nurses had good knowledge scores on the definition, benefits, nursing responsibilities, goals, and adverse effects of non-invasive positive pressure (NIPV). However, they lacked a sufficient comprehension of modes and signs. The results of the study showed that 69.1% of the nurses had satisfactory levels of general NIPV knowledge. It is advised that evidence-based clinical practices and guidelines be developed.

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