Nurses' knowledge Regarding Noninvasive Positive Pressure in Acute Respiratory Failure

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Abstract

Noninvasive positive pressure ventilation is becoming more common in treating acute respiratory failure, it shortens hospital stays, time spent in the intensive care units, morbidity, and mortality. This study **aimed** to assess the nurses' knowledge regarding non-invasive positive pressure in acute respiratory failure. A descriptive cross-sectional **research design** was applied at the emergency departments of Hail General Hospital and King Khaled Hospital in Saudi Arabia. **A convenient sample** consisted of all available nurses who agreed to participate in the study (males & females) were recruited (68 nurses). Nurses' knowledge was evaluated using **a self-administered** online questionnaire developed by the researchers. **Results** revealed that reveals that, the studied nurses had satisfactory knowledge scores as regards to definition, benefits, nursing roles, purposes, and side effects of non-invasive positive pressure (NIPV). However, they had unsatisfactory knowledge regarding indications and modes. The study results **concluded** that (69.1%) of the nurses had overall total satisfactory knowledge scores regarding NIPV. The development of evidence-based clinical guidelines and protocols is **recommended**.

Keywords: Nurses' knowledge, Noninvasive Positive Pressure, Acute Respiratory Failure

Introduction:

Noninvasive positive-pressure ventilation (NIPPV) is the delivery of mechanical ventilation without using invasive artificial airway, it is applied to the airway to inflate the lungs directly. The turning point for the successful NIPPV is its ability to produce the same physiological benefits as invasive mechanical breathing while avoiding the potentially fatal hazards associated with the use of an artificial airway **(Scala & Pisani, 2018).**

A non-invasive ventilator (NIV) has shown beyond doubt that it is a safe and useful method of enhancing gas exchange for those patients who are critically ill with various causes of acute respiratory failure. Moreover, the machine reduces the work of breathing, enhances arterial oxygenation and arterial ventilation. This in turn reduces the incidences of pneumonia which is associated with invasive ventilators **(Akoumianaki, et al., 2021).**

The machine is adaptable and can be used in general wards, intensive care units, and high-dependency care units. However, since the staff's experience predicts its performance, it is crucial to make sure that nurses are taught on how to use it **(Goel, et al., 2020).**

The COVID-19 outbreak, which spread globally in recent years, caused millions of deaths and disabilities. Most patients who are infected with the virus have breathing problems, acute hypoxic respiratory failure, and some may need urgent care because of dyspnea **(Withers, et al., 2021).** Using noninvasive strategies are of major importance in COVID-19 patients because of numerous life-threatening complications associated with intubation and mechanical ventilation **(Tobin, 2020 and Tobin et al., 2020).**

Studies published in the European Respiratory Journal reveal dramatic benefits with use of continuous positive airway pressure in COVID-19 patients managed outside the intensive care unit **(Tobin, et al., 2021).** The establishment of nurse-led care in the emergency room depends heavily on registered nurses. Effective support systems, locally set protocols, audits, and training enable the safe delivery of care. The healthcare personnel with adequate skills to manage NIV patient is the clinical key to reach positive

outcomes in general wards. Scientific literature frequently showed the lack of doctors' and nurses' knowledge and competence about NIV is the reason behind its scarce application in clinical settings **(Bambi, et al., 2023; and Corrêa, et al., 2015).**

Significance of study

The use of NIV has been widespread in a number of healthcare settings, including the emergency and critical care departments. Asthma, pneumonia, and severe hypoxemic respiratory failure are among the illnesses that frequently require a patient to be placed on NIV **(Tarhan, et al., 2015).**

In order to manage a variety of patients, hospitals around the Hail region strive for excellence in providing nursing quality and medical safety. NIPPV is becoming more common in treating acute respiratory failure. According to some researches, nurses with NIPPV had limited nursing knowledge, and there was a high desire for assessment and education to follow evidence-based guidelines and avoid contraindications **(Kim, et al., 2019, and Salmond & Echevarria, 2017).**

Aim of the Study

This study aimed to assess the nurses' knowledge regarding non-invasive positive pressure in acute respiratory failure.

Research questions:

1. What is the level of nurses' knowledge regarding noninvasive positive pressure in acute respiratory failure?
2. Is there a significant relation between the demographic characteristics of the studied nurses and the total knowledge scores regarding NIPPV?

Subjects and Methods

Research design:

A descriptive cross-sectional research design was utilized in this study.

Study setting:

The current study was carried out at the emergency departments of Hail General Hospital & King Khaled Hospital in Hail, Saudi Arabia.

Subjects: All available nurses (males & females) working at previous settings who agreed to participate in the study were included (68 nurses).

Tool for Data Collection:

A self-administered online questionnaire developed by the researchers based on recent literature review **(Tarhan, et al., 2015)** consisting of three parts:

Part 1: The nurses' sociodemographic characteristics including (age, gender, nationality, marital status, occupation, education, place of work, and occupational experience).

Part 2: Training experience of nurses regarding non-invasive positive pressure ventilation.

Part 3: 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).

Scoring system: For the questions that evaluate the nurses' level of knowledge, correct answers took one point, and wrong answers took zero. 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.

* **Validity**:

Validity was assessed through five expertise of Medical- Surgical and Community Health Nursing Staff.

* **Reliability.**

Reliability was assessed using Cronbach alpha (0.81).

Pilot study: Conducted on 10% (7 nurses) of the total sample, there were excluded from the study sample.

Preparatory phase:

It includes a reviewing of related literature, different studies, and theoretical knowledge of various aspects of the study using books, research articles, internet, periodicals, and magazines.

Ethical considerations:

The ethical approval was obtained from the Ethics Committee for Bioethics Research in Hail Health and from the hospital directors. Furthermore, a written consent was obtained from the participants through an opening question after explaining the aim of the study. Confidentiality and anonymity were assured, and

the nurses had the right to withdraw from the study at any time.

The field work:

This study took roughly six months to finish in total, reviewing related literatures and development of the tool (one month), the requirements to obtain approval from the local ethics committee took approximately one month, followed by the collection of data through a self-administered questionnaire, including the SPSS process and data analysis, as well as the conclusion and recommendations (two months), and two months for complete the overall study work.

Statistical design:

Data was coded, statistically analyzed using the IBM SPSS Statistics for Windows, Version 26). Results were organized & presented in numbers, percentages. Independent t-test and one-way Anova were used to test the significance of the results. Eventually, statistical significance was considered at p-value <0.05, and the significant difference obtained at p-value < 0.01

Results:

Table 1. shows 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 2. shows 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 3. Table (3) reveals 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.

Figure 1. Figure 1 reveals that 69.1% of the studied nurses had overall total satisfactory knowledge scores regarding NIPPV.

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 (I): Demographic Characteristics of The Studied Nurses (n=68).

Variables	No.	Percent
Age (in years)		
20-	12	17.6
30-	46	67.6
≥ 40	10	14.7
(Mean ± SD): (33.89 ± 4.9)		
Gender		
Male	18	26.5
Female	50	73.5
Nationality		
Saudi	43	63.2
Non-Saudi	25	36.8
Marital status		
Single	20	29.4
Married	37	54.4
Widow/divorced	11	16.2
Occupation		
Charge Nurse	22	32.4
Head Nurse	8	11.8
Nurse supervisor	13	19.1
Staff Nurse	25	36.8
Level of Education		
Diploma	17	25.0

BSN	43	63.2
MSN	8	11.8
Years of Experience		
Less than 5 years	4	5.9
5- < 10 years	35	51.5
≥ 10 years	29	42.6

Table (2): Nurses' Experience Regarding Non-Invasive Positive Pressure (n=68).

	No.	Percent
Level of experience with NIPPV		
Novice	4	5.9
Advanced beginner	18	26.5
Competent	36	52.9
Proficient	2	2.9
Expert	8	11.8
Previous training with NIPPV procedure		
Yes	36	52.9
No	32	47.1
If yes, rate the training or education received		
Good	30	83.3
Poor	6	16.7
Previous experience with applying NIPPV procedure		
Yes	44	64.7
No	24	35.3

Table (3): Nurses' Knowledge Regarding Non-Invasive Positive Pressure (n=68)

Nurses' Knowledge Regarding NIPPV	Satisfactory		Unsatisfactory	
	No.	%	No.	%
1. Definition	60	88.2	8	11.8
2. Purposes	64	94.1	4	5.9
3. Modes (Methods)	11	16.2	57	83.8
4. Indications	5	7.4	63	92.6
5. Advantages	59	86.8	9	13.2
6. Disadvantages	49	72.1	19	27.9
7. Side effects	56	82.4	12	17.6
8. Contraindications	54	79.4	14	20.6
9. Nursing Roles	66	97.1	2	2.9

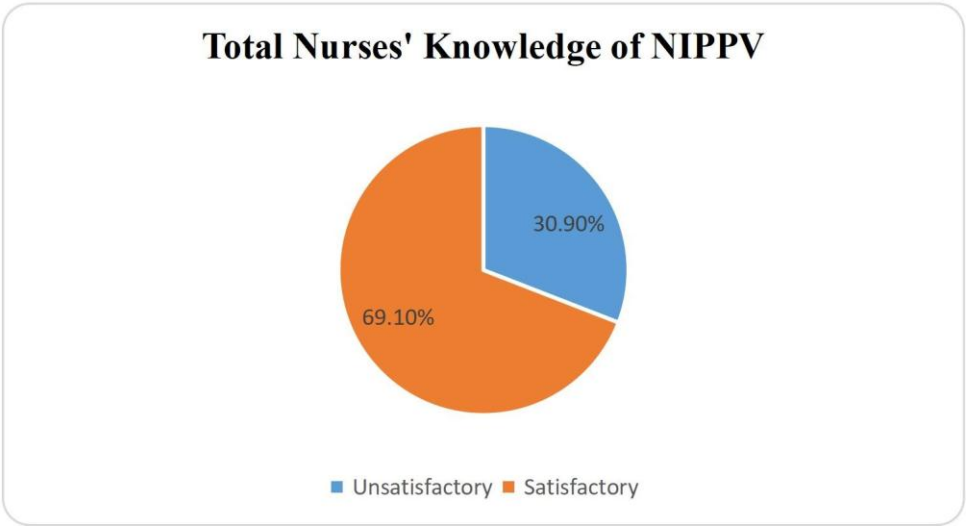

Figure (1): Total Knowledge Scores of the Studied Nurses.

Table (4): Relation between the Demographic Characteristics of the Studied Nurses and the Total Knowledge Level Regarding NIPPV (n=68).

Sociodemographic variables	Total Knowledge		Test of Sig.	
	Satisfactory (47)	Unsatisfactory (21)	t/F	p-Value
Age				
20-	10	2	F=9.56	0.000**
30-	34	12		
≥ 40	3	7		
Gender				
Male	11	7	t= 0.236	0.814
Female	36	14		
Nationality				
Saudi	32	11	t= 2.04	0.046*
Non-Saudi	15	10		
Marital Status				
Single	17	3	F=2.86	0.064
Married	24	13		
Widow/divorced	6	5		
Occupation				
Charge Nurse	12	10	F=3.013	0.032*
Head Nurse	7	1		
Nurse supervisor	10	3		
Staff Nurse	18	7		
Education				
Diploma	4	13	F=26.73	0.000**
BSN	35	8		
MSN	8	0		
Years of Experience				
Less than 5 years	2	2	F=6.904	0.002**
5- < 10 years	26	9		
≥ 10 years	19	10		

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

Discussion:

NIPPV is increasingly employed in a variety of acute settings, including pre-hospital care, hospital wards, palliative or pediatric units, critical care and emergency departments. Also, it is employed as a form of at-home therapy for people with long-term pulmonary or sleep issues **(Mas & Masip, 2014)**. The current study aimed to assess the nurses' knowledge regarding non-invasive positive pressure in acute respiratory failure.

The results of the study reveal that, more than two thirds of the investigated nurses were between the ages of 30 and 40, with a mean age of (33.89 4.9) years This finding is consistent with **Goktas et al.** (**2016),** who found that nurses mean age was 33.2±7.3. This is because during this age nurses working in different departments. Because nursing is a profession that is mainly held by women, fewer than three quarters of the nurses in the study were female. Five to 10 years was the range of experience for slightly more than half of the nurses. This finding is supported by **Elsobkey & Amer (2018)** who found that the majority of nurses were female and more than two thirds of them had from five to less than ten years of experience.

It was found that, slightly more than half of the studied nurses rated their level of

experience with NIPPV as competent. This finding is congruent with **Cifer et al. (2022)** who concluded that more than three quarters of respondents believe they had a good understanding of non-invasive mechanical ventilation. A lack of training and guidelines regarding NIV needs to be addressed to make NIV usage safer and more effective **(Cabrini et al., 2015).**

More than half of the nurses in the current study reported that they received previous training about NIV procedures. This finding was congruent with **Kim et al. (2021),** who reported that the majority of the participants had undergone ventilator training. While this finding is inconsistent with **Elena et al. (2020)** who said that structured training to improve NIV abilities is similarly restricted, especially to a few developed countries.

Regards to the level of knowledge (the main purpose of the study), the results reveal that more than two thirds of he studied nurses had overall total satisfactory knowledge scores regarding NIV. This may be due to the continuous training that nurses received those aids in development of their knowledge about numerous NIPPV topics. This finding is incongruent with **Annarani et al. (2017)** who stated that more than two thirds of nurses had insufficient information of NIV treatment. Additionally, **Ahmed (2022)** found that, the medical care provider's knowledge of NIPPV is limited (nurses represented 62% of the study sample). These findings are also coincided with **Lomnyack et al.** (**2020)** who had reported, that slightly under half of the nurses had moderate knowledge of continuous positive airway pressure device use.

The present study revealed that there were significant statistical relations in total knowledge scores of the studied nurses as regards to their educational level and years of experiences. This finding is similar with **Tarhan et al.** (**2015)** who found that statistical significance was discovered between educational level and average score gained from noninvasive questions, nurses with postgraduate degrees received better average scores. Similarly, **Elena et al. (2019)** said that education and training about NIPPV had the opportunity to improve the staff's knowledge and abilities. While this finding is contradicted with **Ahmed (2022)** who concluded that the demographic characteristics of experience years and educational status of participants had no significant association with knowledge level of participants**.**

The results of the current study showed that, there was no significant statistical relation in total knowledge scores of the studied nurses with gender. This finding is supported by **Aziz. & Abdul-Hamza (2017)** who stated that there is no statistically significant relationship between nurses' gender and their knowledge about continuous positive airway pressure.

The study limitation:

Lack of previous studies on this topic.

Conclusion:

The development of evidence-based clinical guidelines and protocols of care are needed for nurses. To improve their knowledge and practices of NIPPV.

Recommendation:

The development of evidence-based clinical guidelines and protocols of care are needed for nurses. To improve their knowledge and practices o f N I P P V .

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