

Nurses' knowledge and Performance regarding Infection Preventive Measures for Ventilators Associated Pneumonia



1 Asmaa Abdallah Gerida, 2 Ohoud Youssef El-Sheikh and 3 Samar Elhoseiny Abdelraouf

1BSc, Faculty of Nursing, Mansoura University, 2Assistant Professor of Pediatric Nursing, 3Professor of Community Health Nursing,

Faculty of Nursing, Mansoura University, Egypt

1. ABSTRACT

Ventilator associated pneumonia is an ongoing iatrogenic burden within the healthcare system for pediatrics. So most of critically ill children experience Ventilator Associated Pneumonia and it is the most fatal of hospital acquired infections, with high mortality rates. Nurses play a serious role in prevention of it by adherence to infection preventive measures. **This study aimed to** assess nurses' knowledge and performance regarding infection preventive measures of ventilators associated pneumonia. **Method:** Across section study design was utilized. **Setting:** The study was conducted at Pediatric Cardiac Intensive Care Unit at Mansoura University Children Hospital (MUCH). **Tool I:** Nurses' socio demographic and occupational characteristics self-administrated questionnaire. **Tool II:** Nurses' knowledge self-administrated questionnaire to examine nurses' level of knowledge regarding infection preventive measures for VAP. **Tool III:** The researcher developed this observational checklist to assess nurses' level of performance regarding infection preventive measures for VAP. **Results:** the current study indicates that, 90% and 96.7% of the studied nurses have poor total knowledge scores level and classified as beginner with total performance score level respectively regarding VAP infection preventive measures. **Conclusion:** The study concluded that, most of studied nurses have poor total knowledge score level regarding VAP infection preventive measures. Concerning studied nurses' total performance score level about VAP infection preventive measures, ventilator care measures, suction care, oral care and preventive measures for peptic ulcer and deep vein thrombosis, score level of most of them were classified as beginner. **Recommendation:** develop and implement on job training sessions for newly hired nurses regarding VAP infection preventive measures.

Keywords: Infection Preventive Measures; Knowledge; Nurses; Performance; Ventilators Associated Pneumonia

2. Introduction:

Multiple risk factors, such as frequent invasive operations, use of medical equipment, and prolonged exposure to multidrug-resistant bacteria, contribute to the highest rates of infections in pediatric intensive care units (MDROs) (Attia, Dagher & Ahmed, 2018).

Despite generally acceptance of guidelines and prevention bundles, the rate of HAI after pediatric cardiac surgery remains high, with rates ranging from 6.0 to 30.8%. As a result, identifying and modifying risk factors for postoperative HAI is crucial (Hatachi et al., 2018).

The incidence of Ventilator Associated Pneumonia (VAP) was higher in poorer nations with insufficient resources. VAP was found to be prevalent in 32.5% and 20% of children ventilated in PICUs in two Indian studies. The incidence of VAP was estimated to be 17.5 per 100 children in research conducted in northern India (Latief, Kamel & AbdAllah, 2019). A research in Egypt found that the total prevalence of Pediatric Intensive Care Unit (PICU) device-related infections (DAI) was 24.5 percent, and the

incidence of VAP was 31.8 per 1000 ventilator days (Attia, Fatma, Ahmed, & Naglaa, 2018).

The researchers Jansson, Syrjälä, Talman, Meriläinen and Ala-Kokko (2018) classify active implementation of intensive Infection Control (IC) programs, such as Ventilator Care Bundles (VCBs), may reduce the risk of ventilator-associated complications by increasing critical care nurses' knowledge and performance regarding current clinical guidelines and adherence to them. Therefore, a care bundle is a set of key interventions derived from Evidence-Based Guidelines (EBGs) that are expected to improve pediatric patients' health outcomes by facilitating, promoting changes in patient care and encouraging guideline compliance (Osti, Wosti, Pandey & Zhao, 2017).

The ventilator care bundle are included: head of the Bed Elevation (HOB), daily sedation interruption (DSI), daily assessment of extubation readiness, peptic ulcer disease (PUD) prophylaxis, deep vein thrombosis (DVT) prophylaxis and chlorhexyl gluconate (CHX) regular oral care. Recent research suggests that using a VCB to

monitor VAP, hand hygiene (HH), and endotracheal tube (ETT) cuff pressure (Pcuff) can improve pediatric patient and clinical outcomes (Alcan, Korkmaz & Uyar, 2016).

Nurses are at the center of attempts to improve hospital care quality. The critical care nurse is responsible for implementing the VCB, but there are a variety of factors that can influence the nurse's decision to implement the VCB, such as perceiving the severity of the disease, present complications benefits or barriers to the action and demographics (Sobeih, Abd-Elsalam & Ahmed, 2018).

The prevention of VAP is primarily the responsibility of the bedside nurse whose knowledge, beliefs and performance influence the health outcome of PICU (Attia et al., 2018). Critical care nurses play an important role in identification of risk factors and prevention of VAP. Therefore, nurses' education and reinforcement is considered as the cornerstone and the first step in preventing VAP (Aysha, El-Din, Attia & Ibrahim, 2016).

Nurses who are educated and given opportunities to demonstrate their nursing skills have a better probability of improving the outcomes of critically ill children. VAP rates will decrease if newly employment nurses in the Intensive Care Unit (ICU) trained or taught how to follow a VCB before entering PICU (Ismail & Zahran, 2015).

Aim of the study

Assess nurses' knowledge and performance regarding infection preventive measures for ventilators associated pneumonia.

Research Questions

What is the nurses' knowledge regarding infection preventive measures for ventilators associated pneumonia?

What is the nurses' performance regarding infection preventive measures for ventilators associated pneumonia?

3. Method

Study Design

A cross section study design was utilized to carry out the current study.

Setting

The study was carried out at the Pediatric Cardiac Intensive Care Unit (PCICU) affiliated to Mansoura University Children Hospital (MUCH).

Participants and Sampling

A convenience sample of 30 nurses on duty during the period of data collection at the PCICU over the period of three months was included in the study, under the following criteria:

- Both gender

- Assigned to give direct care to pediatric patients
- Different qualifications
- At least one-year experience

Tools of Data Collection

The researcher collected the data through using of the following three tools:

Tool I: Nurses' socio demographic and occupational characteristics self-administrated questionnaire. The researcher developed this questionnaire to assess socio demographic and occupational characteristics of nurses such as gender, age, educational level, and years of experience.

Tool II: Nurses' knowledge self-administrated questionnaire. The researcher developed this questionnaire related to knowledge of nurses based on Lin, Lai, and Yang, (2014); Ahmed and Abosamra, (2015); Feria, (2017) and Sanders-Thompson, (2020). It constructed in Arabic language and included 20 items used to examine nurses' level of knowledge regarding infection preventive measures for VAP. According to Saleh, (2019) "one" mark was awarded for each correct answer and "zero" for false or do not known answer. As the following **scoring system:** The total score of knowledge was 29 marks. Based on the researcher cut of point, knowledge levels were categorized into three levels:

- Poor. Scores less than 60% from the total (<17.4 marks)
- Fair. Scores from 60% to less than 80% from the total (17.4 to <23.2 marks)
- Good. Scores from 80% and more from the total (≥23.2 marks)

Tool III: Nurses' performance observational checklist. The researcher developed this observational checklist based on Ali, (2013) and Feria, (2017) to suite the study's aim. It constructed in English language and included six items used to assess nurses' level of performance regarding infection preventive measures for VAP. According to Saleh, (2019) "one" mark was awarded for each correct step and "zero" for done incorrect and not done. As the following **scoring system,** the total score of nurses' performance was 34 marks. Based on the researcher cut of point, performance level was categorized into three levels:

- Beginner less than 70% (23.8)
- Advanced beginner 70% to less than 80% from the total (23.8 to <27.2 marks)
- Competent 80% to less than 90%, from the total (27.2 to <30.6 marks)
- Expert 90% or more; from the total score (≥30.6 marks)

Phases of the Study

I. The preparatory phase

Ethical consideration. The researcher obtained an approval from Research Ethics Committee, Faculty of Nursing, Mansoura University. The researcher obtained a verbal consent from each participant before starting of the study after explain its aim and assured them that their participation had no any bad effect. Privacy and confidentiality of the collected data was assured and was used only for research purpose. Any participant had the right to withdraw from the study at any time without any responsibility.

Administrative process. Faculty of Nursing issued an official letter to the manager of PCICU, Children Hospital (MUCH), Mansoura University to permit the researcher conducting the current study.

Literature review. A review of past, current local and international related literature using available books, articles, periodicals and magazines was necessary to be acquainted with all aspects of the study problem and also in order to develop relevant tools for data collection.

Face and content validity. The researcher submitted the study tools to a jury panel of five professors in Community Health Nursing and Pediatric Nursing, Faculty of Nursing, Mansoura University. The professors tested and evaluated these tools for the appropriateness and relevant items, to achieve the criteria of trust worthiness and elicited responses that were either agree or disagree for the face and content validity. The items in which 85% or more of the professors had agreed were included in the proposed tools.

Tools' reliability. It was assured by means of Cronbach's coefficient alpha test. Tool's reliability test carried out on three nurses at the PCICU to achieve the criteria of trust worthiness. Tool's reliability was 80% which consider good reliability.

Pilot study. A pilot study was conducted on 10% of the study participants (three nurses) who met the predetermined criteria to test the contents'

validity, reliability, and feasibility of the study tools, according to the results and the time needed to complete them. Participants in the pilot study were included in the main study sample.

II. Field work phase

Data collection period. After obtaining the official permissions, researcher attended three days per week (Saturday, Sunday and Tuesday) covering the work's three shifts. Researcher introduced herself to the nurses and gave them a brief orientation about the aim and nature of the study. The data collection consumed six months from the beginning of July 2020 to the end of December 2020. The following themes were covered:

- Socio demographic and occupational characteristics of each nurse were collected by using tool I.
- Nurses' knowledge about infection preventive measures for VAP at PCICU by using tool II.
- The researcher observed nurses' performance during implementing infection preventive measures for VAP at PCICU by using tool III.

4. Results

Table (1): shows that nurses' mean age was 27.53 years. Related to gender, marital status, residency area and qualification 70%, 56.7%, 83.3%, and 73.3% of nurses are female, married, resident at rural and had bachelor degree of nursing respectively. The mean of nurses' years of experience in nursing carrier-was 4.8 years and the mean of nurses' years of experience in PCICU was 4.5 years. Finally, only 6.7% of nurses attended training programs on VAP prevention.

Table (2): Illustrates nurses' total knowledge score levels about VAP infection preventive measures. It was observed that, 90% of the nurses had "poor" knowledge score level.

Table (3): indicates that 96.7% of nurses classified as beginner with total performance score level of VAP infection preventive measures.

Table (4): demonstrates that, there was no statistically significant correlation between nurses' knowledge and performance total scores levels.

Table1.Nurses' Socio-demographic and occupational characteristics (N=30)

Items	N	%
Age/ years \bar{X} (SD)		
27.53 (3.6)		
Gender		
Male	9	30
Female	21	70
Marital status		
Single	11	36.7
Married	17	56.7
Divorced	2	6.7

Residency area		
Urban	5	16.7
Rural	25	83.3
Qualification		
Technical institute of nursing	7	23.3
Bachelor degree of nursing	22	73.3
Postgraduate studies	1	3.3
Experience years in nursing carrier \bar{X}(SD)		
4.8 (3.9)		
Experience years in PCICU \bar{X}(SD)		
4.5 (3.9)		
Attended training programs on VAP prevention		
Attended once	2	6.7

Table2.Nurses’ total knowledge score level about VAP infection preventive measures (N=30)

Items	N	%
Poor	27	90
Fair	3	10

Table3Nurses’ total performance score level about VAP infection preventive measures (N=30)

Items	N	%
Beginner	29	96.7
Advanced beginner	1	3.3

Table4.Correlation between nurses' total knowledge and performance total scores levels

Items	R	P
Total knowledge and total performance	0.772	0.706

5. Discussion

Ventilator-associated pneumonia is a NI that occurs 48 hours after the commencement of mechanical ventilator support in a young patient who requires ventilation. VAP is still a major cause of morbidity and mortality in the PICU, and it's linked to longer LOS, more MV days, and higher healthcare expenses. EBGs now propose that preventing VAP can be accomplished by implementing several therapies at the same time. "VAP bundling" is the term for this method (Osman, Al Talhi, AlDabbagh, Baksh, Osman, & Azzam, 2020).

Infection control is an important part of any nurse's job, not just for their own health, but also to prevent NIs and increase patient safety. There's no denying that nurse competency is crucial in the critical care scenario. Pediatric patients who have received MV and are experiencing life-threatening circumstances require optimal performance and infection control measures (Perveen, & Habib, 2017).

Nurses are in charge of patients' total care from admission to discharge. They are members of the medical team and spend the majority of their time caring for patients; therefore, they are crucial in preventing VAP. Knowledge alone, however, is insufficient; it must also be used in the correct place at the right time to give comprehensive treatment tailored to the patient's

needs. As a result, critical care nurses play a crucial role in avoiding VAP (Osti, Wosti, Pandey, & Zhao, 2017).

Nurses that are knowledgeable and skilled are critical in providing patient care and making fast and correct decisions reduces patient risk. The use of a systematic educational programme on VCB knowledge and performance will help to prevent VAP and hence greatly reduce morbidity (Al Shameri, 2017). The backbone of reducing NIs, particularly VAP in the PICU, is knowledge. Continuing nursing education aims to improve knowledge and performance in order to improve the quality of pediatric patients care (Abou Zed, & Mohammed, 2019).

Most of the nurses in the current study have a poor total knowledge score on the application of the VAP infection prevention measures. This result agrees with Aysha, El-Din, Attia and Ibrahim, (2016), study's title is "Efficacy of Implementing Nursing Care Protocol on the Incidence of Ventilator Associated Pneumonia in Intensive Care Unit at Tanta Emergency Hospital", which shows that the majority of the study sample has low scores for protocol knowledge. This result could be relates to; there is no written protocol and implementation of training sessions regarding VAP infection prevention measures.

As well, **Al Shameri, (2017)** assesses VAP prevention knowledge among ICU nurses in Khartoum Teaching Hospital, Omdurman Military Hospital, and Al-Ribat University Hospital reveals that most of nurses have poor VAP prevention knowledge, including five aspects of VAP common sense, lung anatomy, mechanical ventilation, VAP diagnosis, treatment, and international VAP prevention guidelines.

Also, **Abou Zed and Mohammed, (2019)** study aims to assess nurses' knowledge and performance in avoiding neonatal VAP; and the impact of nursing guidelines on nurses' knowledge and performance in preventing VAP; they report that, only 7% of the nurses have satisfactory knowledge pre implementation of nursing guidelines.

The present study result illustrates that, less than three fourths of studied nurses have bachelor's degree. As well, **Jansson, Syrjälä, Talman, Meriläinen and Ala-Kokko, (2018)** conduct a study about "Critical Care Nurses' Knowledge of, Adherence to, and Barriers toward Institution-Specific Ventilator Bundle" reveal that, less than three fourths of study nurses have bachelor's degree. Although the studied nurses are professional, there is still a need for on job training sessions to improve and update their knowledge regarding VAP infection preventive measures.

Prevention of VAP is primarily the responsibility of the bedside nurse whose performance influences the health **outcome** of ICUs children. Critical care nurses play an important role in identification of risk factors and prevention of VAP (**Attia et al., 2018**). Therefore, education and reinforcement of nurses are considered the cornerstone and first step in the prevention of VAP (**Aysha et al., 2016**).

Concerning studied nurses' total performance score levels about VAP infection preventive measures regarding infection preventive measures, ventilator care measures, suction care, oral care and preventive measures for peptic ulcer and DVT, the current study result indicates that most of studied nurses have beginner performance score level. This result is in the same line with **Dipanjali, Shivananda and Yashoda, (2020)** who assess the impact of educational interventions on nurses' knowledge and performance in regarding VAP prevention in a tertiary care hospital in Karnataka's NICU, under the approval of the National Neonatal Forum of India, they find that, the majority of

nurses have unsatisfactory score level pre prevent VAP prior to the intervention.

The researcher attributes this results as the studied nurses have less than mean of five years of experience in PCICU. This argument is in agreement with **Ibrahim, Al-Rafay and Tantawi, (2021)**, who assess the impact of a bundled approach training program on pediatric and neonatal nurses in terms of avoiding device-related infections in Cairo's Ain Shams University Specialist Hospital's PICU and NICU and find that, 61.4% have ≤ 10 years of experience in PICU and NICU.

Furthermore, the researcher illustrates others contributing factors led to this finding, including lack of training programs prior to engage work in PCICU, unavailability of supplies and equipment as: (sterile gloves, suction catheters, bottles of distilled water and chlorhexidine solution) which necessary for correct application of certain procedures as tracheal suctioning and oral hygiene. Alongside this, unavailability of VAP infection preventive measures, shortage of nursing staff leading to increased workload, lack of close nursing supervision and lack of motivation and financial reward.

These results are consistent with the findings of a research study belonged to **Mishra and Rani, (2020)** who assess the effectiveness of structured instructional programs on knowledge and practice of nursing bundles for the prevention of VAP among nurses in ICUs of tertiary care hospitals in India, and find that, prior to implement the structured teaching program, 53% of nurses have average performance scores in VAP prevention.

In addition to, **Sobeih, Abd-Elsalam and Ahmed, (2018)** who assess nurses' perception regarding VAP bundle in ICUs (surgical ICU, general ICU & CCU) at El Fayoum University Hospitals, report that, more than three fourths of the studied nurses had incompetent level of performance regarding VAP bundle, according to the study.

Finally, hence nurses are milestone in prevention of VAP in PCICU, it is obvious the importance of continuous training sessions' implementation and updating nurses' knowledge and performance regarding VAP infection preventive measures in PCICU.

6. Conclusion

Depend on the finding of the current study; most of studied nurses have poor total knowledge score level regarding VAP infection preventive

measures. Concerning studied nurses' total performance score level about VAP infection preventive measures, ventilator care measures, suction care, oral care and preventive measures for peptic ulcer and DVT, score level of most of them were classified as beginner.

7. Recommendation

The following recommendation is suggested that; develop and implement on job training sessions for newly hired nurses regarding VAP infection preventive measures.

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