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Evaluation of knowledge Intensive Care anesthesia technicians In Prevention of Ventilator Associated Pneumonia in Libyan public Hospitals

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تقييم معرفة فنيي التخدير بالعناية المركزة في الوقاية من الالتهاب الرئوي المرتبط بأجهزة التنفس الصناعي في المستشفيات العامة الليبية

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Abstract:
Background: Ventilator-associated pneumonia (VAP) is a common hospitals- acquired infection occurs in patients requiring treatment in intensive care units (ICUs) it affects between 6–52% of the cases requiring the use of berating ventilators in hospitals, resulting in hospital length of stay (LOS) of more than 48 hours. This increases morbidity, mortality, and healthcare cost
Aim: to evaluate the knowledge and performance of anesthesia technicians in preventing Ventilator-associated pneumonia in intensive care unit ICU.
Method: The study was descriptive, data were collected from100 technicians anesthesia working in Zawia and Al Khadra public Hospital in Tripoli in intensive care, to assess their knowledge Ventilator-associated pneumonia, in relation to their sociodemographic characteristics, qualification level and years of experience, starting from March to May 2024. It was based on proved multiple- choice questionnaires developed to assess ICU medical knowledge about the evidence based guidelines for the prevention of VAP using (ANOVA test)
Results: In this study ICU technicians displayed generally good understanding of Ventilator-associated pneumonia prevention, with an average knowledge score of (0.76 ± 0.12) out of 18 questions. And the 57% of technicians showed good knowledge, while 43% showed inadequate knowledge. Also, Marital status was also demographic factor significantly associated with knowledge scores, with married technicians showing better knowledge than single ones.
Conclusion: Although some anesthesia technicians showed good performance in preventing (VAP) in the ICU. This study recommended many educational and training programs to improve the knowledge level of anesthesia technicians in ICUs.

Keywords: Intensive care unit (ICU), Ventilator associated pneumonia (VAP), Anesthesia technician, Acquired infections, Al-Zawia hospital, Al Khadra Hospital.

الملخص

الخلفية: يعد الالتهاب الرئوي المرتبط بأجهزة التنفس الصناعي أحد أكثر أنواع العدوى المكتسبة في المستشفيات انتشاراً بين مرضى وحدات العناية المركزة، حيث يؤثر على نسبة تتراوح بين 6% و52% من المرضى الذين يحتاجون إلى التنبيب والتهوية الميكانيكية، مما يؤدي إلى زيادة مدة الإقامة في المستشفى لأكثر من 48 ساعة. وهذا يزيد من معدلات الإصابة والوفيات وتكاليف الرعاية الصحية.

الطريقة: كانت الدراسة وصفية، تم جمع البيانات من 100 فني تخدير يعملون في مستشفى الزاوية والخضراء العام في طرابلس في العناية المركزة، لتقييم معرفتهم بالالتهاب الرئوي المرتبط بجهاز التنفس الصناعي، فيما يتعلق بخصائصهم الاجتماعية والديموغرافية ومستوى التأهيل وسنوات الخبرة، بدءًا من مارس إلى مايو 2024. وقد استندت إلى استبيانات متعددة الخيارات تم تطويرها لتقييم المعرفة الطبية في وحدة العناية المركزة حول المبادئ التوجيهية القائمة على الأدلة للوقاية من الالتهاب الرئوي المرتبط بجهاز التنفس الصناعي باستخدام (اختبار التباين)

النتائج: في هذه الدراسة أظهر فنيو العناية المركزة فهمًا جيدًا بشكل عام للوقاية من الالتهاب الرئوي المرتبط بجهاز التنفس الصناعي، بمتوسط درجة معرفة (0.76 ± 0.12) من أصل 18 سؤالاً. وأظهر 57٪ من الفنيين معرفة جيدة، بينما أظهر 43٪ معرفة غير كافية. كما كانت الحالة الاجتماعية أيضًا عاملًا ديموغرافيًا مرتبطًا بشكل كبير بدرجات المعرفة، حيث أظهر الفنيون المتزوجون معرفة أفضل من غير المتزوجين

الاستنتاج: على الرغم من أن بعض فنيي التخدير أظهروا أداءً جيدًا في الوقاية من الالتهاب الرئوي المرتبط بجهاز التنفس الصناعي في وحدة العناية المركزة، فقد أوصت هذه الدراسة بالعديد من البرامج التعليمية والتدريبية لتحسين مستوى المعرفة لفنيي التخدير في وحدات العناية المركزة.

الكلمات المفتاحية: وحدة العناية المركزة، الالتهاب الرئوي المرتبط بالتنفس الصناعي، فني التخدير، العدوى المكتسبة، مستشفى الزاوية، مستشفى الخضراء.

1. Introduction

Ventilator -associated pneumonia, has been acknowledged as a problem in different Intensive Care Units of the world [1]., as it causes the higher morbidity and mortality rates for patients' ventilator [2], also rise in the cost of hospitalization, and an increase in the length of hospital stay [3, 4].

Ventilator-associated pneumonia (VAP) is one of the most prevalent hospitals acquired infections among intensive care units (ICUs) patients, affecting 6–52% incidence of patients requiring and mechanical ventilation [10]. patients with serious illness who are hospitalized and on ventilators can be in a life or death situation [22]. Respiratory care and mechanical ventilation procedures applied in the Intensive Care Unit (ICU) can cause complications in patients such as acute respiratory disease and chronic obstructive pulmonary disease or ventilator-associated pneumonia is known as pneumonia that occurs after two days or more the patient is placed on a ventilator [9]. Endotracheal tube intubation, nasogastric tube feeding, malnourishment and insufficient saliva flow, leading to colonization of oropharynx in patients are other prompting factors. [12,13] VAP increases the need for oxygen, sputum formation, alveolar damage, and reduced gas exchange [14] added concerns of VAP include prolonging the recovery period

An anesthesia technician working in the ICU are awaited to play avital role in the prevention of prevalence VAP by following protocols. [15,16] Healthcare providers Knowledge of this protocol is successful in the preventing of VAP and can significantly decrease its spread. [17,18,19]. Some researchers have shown the importance of nurses' level of awareness preventive measures from VAPE. The practical application this knowledge is necessary in healthcare. few studies have been conducted on nurses adherence to the preventive properties of VAP [20], as questionnaires may not reliable for assessing adherence performance [21]. However, studies that directly observe of VAP. prevention practice in the ICU is insufficient. The awareness of HCWs in intensive care units of the evidence-based guidelines for the prevention of VAP, as adherence to them in their performance can lead to positive outcomes in patient's health and recovery process. Found most researchers assessing the knowledge level of nurses in ICU for prevention of VAP [29,30,31]. As there were lack studies to conduct regarding of evidence-based research, this prompted the researchers to assess the performance efficiency of all Health care workers (Physician, anesthesia technicians and nurses) in the prevention of VAP in ICUs.

The main aim of the study was to evaluate the knowledge and performance of anesthesia technicians in the prevention of VAP in ICU in relation to selected demographic characteristics of Al Khadra public Hospital in Tripoli and Al- Zawia Medical Center in Zawia, Libya.

2. Material and methods

2.1 Setting study and participants

A cross-sectional descriptive study design was used to evaluate Libyan anesthesia technicians working in intensive care, knowledge regarding prevention of VAP and to assess their knowledge in relation to their sociodemographic

characteristics during the of three months starting from March to May 2024. It was based on proved multiple-choice questionnaires advanced to assess the knowledge medical staff of ICU l on the evidence based guidelines for VAP prevention.
The research site included the selected public hospitals in the western region of Libya. The study included all anesthesia technicians working in the intensive care unit of Al Khadra general Hospital Tripoli and Al- Zawia Medical Center, except for anesthesia technicians with less than six months of experience. The total sample size of males and females was100 anesthesia technicians.

2.2 Purpose of the questionnaire
The purpose of the questions was to assess the knowledge of the anesthesiologists working in the intensive care unit regarding the prevention of pneumonia related with the ventilator and its serious and how to handle with the intensive care equipment and use for the patient.

2.3 Design of questionnaire
The questionnaire consists of two sections: personal information and professional characteristics and knowledge level of anesthesia technicians with concern to VAP prevention. The questionnaires were distributed to respondents by obtaining their promptness and collecting filled data. The first section is a social and demographic feature of anesthesia technicians, including age, gender, marital status, qualification level, years of experience, workplace and training in the prevention of infection of the intensive care unit. The second section consists of 18 questions, but three of them are options (yes, no, I don't know). The questions were used to assess the level of knowledge of anesthesia technicians, and were translated into Arabic to facilitate their understand and answering their by anesthesia technicians and then translated back into English. The data was then collected and sorted to ensure completeness and accuracy.

2.4 Data analysis
The collected data were analyzed and calculated using The Statistical Packages for Social Sciences (SPSS) version 23. Data descriptive statistics of the data were used for analysis including (frequencies and percentage and means (+/- SD), and were used to described 'characteristics of the participants' and their response to each questionnaire item. (ANOVA test was used to determine whether knowledge score was associated with demographic variables of participants. The difference considered to be statistically significant if p-value <0.05.

3.Results and discussions

Results
3.1Socio-demographic characteristics
The total participants in this study were 50 participant were working in ICUs of Zawia Medical Center (ZMC) and 50 in Al Khadra General Hospital (AGH). Table 1 shows that more than half (57%) of the sample were female, and about half of the participants (51%) were in the age group of 30–40 years. Half of the participants 50% were marital. [Figure 1] also shows three-quarter (75%) of the participants had a bachelor's degree in their academic qualification, while the smallest number of post graduate (2%). Nearly one third of them (30%) had 1-3 years of working experience in the ICU [Figure 2]. The great majority (98%) of the technicians have formal training in ICU[Table1].

Table (1): Demographic characteristics of study population (n=100).

Variable	Category	Frequency
Age	<29	37
	30-39	51
	>40	12
Gender	Female	57
	Male	43
Marital status	Married	50
	Single	50
Taking ICU training	Yes	97
	No	3

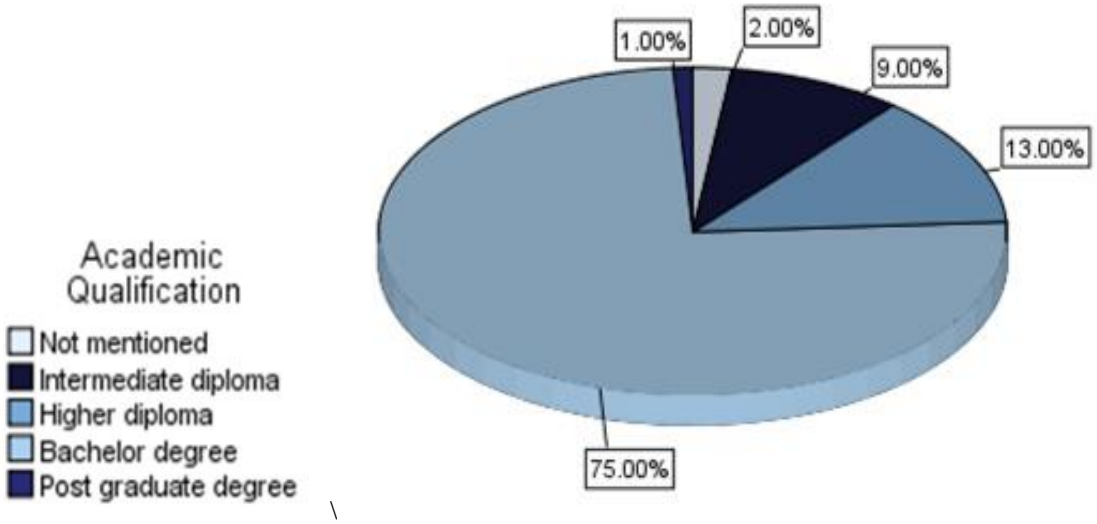

Figure (1): Academic qualification of study population.

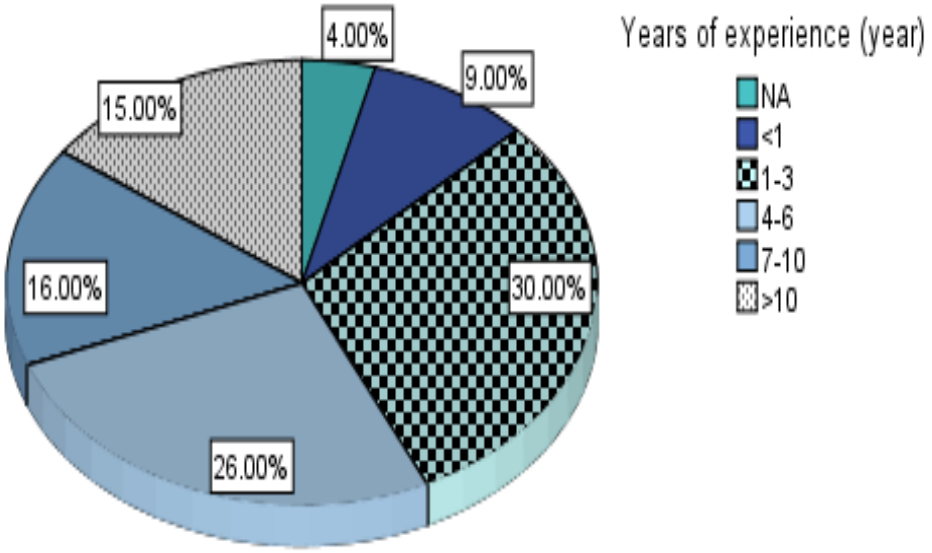

Figure (1): Years of work experience of study population.

3.2 Knowledge of technicians towards the prevention of VAP

In the current study, 89% of respondents distinguished that endotracheal (oral) disturbance is the acclaimed route for intubation. Among respondents, 86% knew that contaminated hands of health workers, contaminated respiratory therapy equipment, and suction of secretions are participating factors for contamination bacterial and eighty-eight percent reported favoring the semi-recumbent is a position to decrease the risk of VAP. In this survey, the average awareness score (± SD) of ICU technicians associated the prevention of Ventilator-Associated Pneumonia (VAP) was 0.76 ± 0.12, derived from 18 questions. This mean score was used as a cut- off to point to classify the participants into two classes for evaluation: those with good knowledge (scoring ≥0.76 correct answers out of 18) and those with not enough knowledge (scoring <0.76). The findings showed that 57 participants (57%) had good knowledge, while 43 participants (43%) demonstrated not enough knowledge correlated to VAP prevention [Table 2].

Table (2): Technician's answers to questions about VAP prevention knowledge (n=100).

Variable	Response	Frequency
The Recommended route for endotracheal intubation is? (oral intubation)	Correct	89
	Incorrect	11
Semi-recumbent is a recommended type of position for a patient on a ventilator (if there are no contraindications)	Correct	88
	Incorrect	12
Benefit of using extra- lumen endotracheal tubes to drain- of sub laryngeal secretion	Correct	82
	Incorrect	18
Factors contributing to colonization microbial of the aerodigestive tract include? (contaminated hands of health workers, contaminated respiratory therapy apparatus, suction of secretions?)	Correct	86
	Incorrect	14
Should the technician dispose of a suction catheter? (immediately after a single use)	Correct	90
	Incorrect	10
Is closed suction systems is the recommended type for patients who need a breathing tube?	Correct	81
	Incorrect	19
Insertion of the suction catheter into the endotracheal tube (sterile procedure)	Correct	6
	Incorrect	94
Head elevation of the bed for mechanical ventilation should be at height of (30-45 degrees)	Correct	91
	Incorrect	9
Anesthesia technicians who are caring for a patient on ventilator should wash their hands? (before and after endotracheal tube suction)	Correct	96
	Incorrect	4
Anesthesia technicians who are caring for a patient on ventilator should wear sterile gloves during endotracheal tube suction?	Correct	11
	Incorrect	89
It is recommended to Perform oral care by using a swab moistened with mouthwash and water every 4-6 hours	Correct	78
	Incorrect	22
Does Prolonged use of stress ulcer prophylaxis in ventilated patient lead to increase the colonization density of the aero-digestive tract?	Correct	75
	Incorrect	25
Frequency should the patient's intubation tube be suctioning (as needed)?	Correct	99
	Incorrect	1
separation early of mechanical ventilation reduces the danger of (ventilator associated pneumonia)	Correct	87
	Incorrect	13
Excessive feeding of a patient on a ventilator may increase the risk of aspiration, which leads to increase the risk of (VAP)	Correct	72
	Incorrect	28
Endotracheal tube with pressure cuff for ventilation patients benefits reduce the danger of (ventilation associated pneumonia)	Correct	71
	Incorrect	29
Can unplanned extubation increase the danger of aspiration leading to an increase the risk of (VAP)?	Correct	78
	Incorrect	22
is Chest physiotherapy recommended for ICU patients (to decrease the risk for VAP)?	Correct	89
	Incorrect	11

they were Identified using analysis of variance (ANOVA) and the results are p are described in Table 3. Generally, the study showed that most demographic characteristics were not significantly associated with the overall mean score of VAP prevention awareness, except for the marital status (0.76±0.12; p=0.034). Those who are married have relatively higher mean score than single participant

Table (3): Analysis of variance showing respondents' demographic predictors of awareness towards prevention of ventilator-associated pneumonia (VAP).

Variable	Mean (±SD)	Analysis of variance (ANOVA)
Age	0.76 (±0.12)	F= 0. 34 P= 0.85
Gender Female Male	0.77(± 0.13) 0.79(±0.10)	F=1.4 P= 0.2
Marital status Married Single	0.79((±0.11) 0.73 (±0.13)	F=4.44 P= 0.038*
Academic qualification	0.76 (±0.12)	F=0.97 P=0.4
Year of experience	0.76 (±0.12)	F=0.318 P=0.9

Discussions

General Knowledge: ICU technicians displayed a good overall understanding of VAP prevention, with an average knowledge score of 0.76 out of 18 items. and the 57% of technicians showed good knowledge, while 43% showed inadequate knowledge.

This result is consistent with the results of studies Alaswad & Magda, 2022[27]: This survey found that an educational program significantly improved ICU nurses' knowledge about VAP. While the technician group in your study wasn't directly exposed to an intervention, the finding suggests that existing training programs may be contributing to good knowledge levels among technicians [23]. And study by, Singh et al., 2023[24]: This study highlighted that attending in-service education related to VAP care bundles was significantly associated with improved knowledge [24]. Again, it's plausible that technicians have received sufficient training, leading to their good knowledge scores. Consistent this result with a study, Jalal et al., 2022[25]: This study revealed that while some medical professionals (including respiratory therapists) had satisfactory performance regarding VAP prevention, a significant proportion lacked adequate knowledge [25]. The fact that your technician group shows good knowledge suggests that the training of technicians in this setting may be more effective than the training of other medical professionals. While studies Alkubati et al., 2021[18] found a low overall knowledge level among healthcare workers in Yemen, including nurses, physicians, and anesthesia technicians. This emphasizes the importance of context [26]. While your findings are positive, it's crucial to consider whether factors like resources, training standards, or cultural differences may contribute to varying levels of knowledge across different healthcare systems. and study by Getahun et al., 2022[26] found inadequate knowledge among intensive care nurses in Ethiopia [26]. The contrast with your findings points to the need for further investigation into what factors may be contributing to the positive knowledge levels among technicians in your setting, such as specific training programs or institutional emphasis on VAP prevention.

Specific Knowledge Areas: The majority of technicians understood the recommended endotracheal route for intubation, the benefits of semi-recumbent positioning, and the contributing factors to bacterial colonization Most participants recognized the importance of disposing of suction catheters after a single use, using closed suction systems, and practicing hand hygiene before and after suctioning. There was a good understanding of the importance of regular oral care, the potential risks associated with prolonged stress ulcer prevention, and the need to suction as needed. The majority recognized the benefits of early weaning from mechanical ventilation, the risk associated with excessive feeding, and the role of a well-maintained endotracheal tube cuff. Most technicians also understood the increased risk of aspiration and VAP associated with unplanned extubation, and the benefits of chest physiotherapy.

This finding of this survey is consistent with the results of studies Alkubati et al., 2021[18], which emphasized the importance of including evidence-based guidelines in training programs for professionals' health care professionals.

- The technicians' understanding of the Importance of Single-Use Suction Catheters practices, Closed Systems, and Hand Hygiene is critical to preventing VAP, which is consistent with the findings of multiple studies, including those by Jalal et al., 2022 [25] and Singh R. et al2023[24] These studies emphasized the need for ongoing education and training to ensure compliance with VAP prevention guidelines.

-Recognizing the Importance of Oral Care and Suctioning: The technicians' understanding of the importance of regular oral care and suctioning as needed is consistent with the VAP prevention bundles commonly implemented in ICUs. This aligns with studies like Getahun et al., 2022[26] and Bankanie et al., 2021[28], which highlighted the need for training programs to address knowledge gaps related to these practices.

-Awareness of Early Weaning, Feeding Risks, and Cuff Maintenance: The technicians' understanding of these aspects further reinforces their knowledge of key VAP prevention strategies. This aligns with the emphasis on early weaning and careful feeding practices observed in studies like Alaswad & Magda, 2022[27]

-Recognizing Risks Associated with Unplanned Extubation and Chest Physiotherapy: The technicians' awareness of these risks is crucial for minimizing VAP and aligns with the findings of Jalal et al., 2022 [25] which confirms the importance of training programs to develop knowledge and practice gaps in VAP prevention.

Demographic Factors Marital status was the only factor significantly associated with knowledge scores in relation to the demographic factor. Married technicians had a higher mean score than single technicians.

This result of our study is consistent with the results of study by Singh et al. 2023 [24] who found a significant relationship between years of experience and practice related to care bundles for VAP. This implies that with increased experience, nurses develop better knowledge and practice skills over time. This is due to the married individuals might feel a greater sense of responsibility towards their family and therefore strive for better professional knowledge. or Married technicians might have a supportive partner or family who encourages them to stay up-to-date with professional knowledge. and the Married technicians could be further along in their careers, leading to more experience and exposure to relevant training.

Conclusion

This research found that knowledge the levels about VAP and trainings can be developed by creating appropriate learning program for ICU anesthesia technician s, although some of the anesthesia technicians have shown good working about VAP prevention in the ICUs more awareness is needed for continued education and training programs to medical recommendations to improve the quality of health care and decrease the incidence of VAP infections. Finally, our study showed that the demographic factor of Marital status is significantly related with knowledge scores but its influence also requires further research.

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