



Determination of Knowledge Levels of Nurses Working in the Emergency Department and Intensive Care Units about Evidence-Based Practices in the Prevention of Ventilator-Associated Pneumonia

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ABSTRACT

Objective:The aim of this study was to determine the level of knowledge of nurses working in the Emergency Departments (ED)and Intensive Care Units (ICU)about evidence-based practices in the prevention of ventilator-associated pneumonia(EBP-VAP).

Materials and Methods:This descriptive,two-center study was conducted on nurses working in the EDs and ICUs of two public hospitals in the city center of Malatya.A total of 199 nurses who worked in the ED or ICU for at least one year were included in the study,on voluntary basis.The data were collected by using “Personal Information Form” and the “Information on Evidence-Based Practices for the Prevention of Ventilator-Associated Pneumonia Form”(EBP-VAP).

Results:The mean age of the nurses was 35.92 ± 6.54 ,58.8% of them were females and 6.7% were undergraduates.The mean total VAP score of the nurses was found to be 4.76 ± 1.57 .It was determined that there was a weak positive correlation between the ages of the nurses,their years in the profession,years of working in the emergency room/intensive care unit, and their average total VAP scores ($p<0.05$).It was found that the mean total VAP score of the nurses who received ICU/ventilation training was 5.09 ± 1.32 ,the mean total VAP score of those who did not receive training was 4.47 ± 1.72 ,and the difference between the groups was statistically significant ($p<0.05$).The rates of correct answers given by the nurses to the questions on EBP-VAP form were endotracheal intubation type 45.2%,ventilator circuit replacement frequency 50.8%,airway humidifier type 35.2%,humidifier replacement frequency 61.8%,use of an open or closed aspiration system 57.3%,frequency of changing aspiration systems 30.2%,drainage type of subglottic secretions 55.3%, use of kinetic beds 60.3%,and patient positioning 80.4%,respectively.

Conclusion:It was found that the knowledge level of nurses about EBP in the prevention of VAP was moderate.In addition,it was concluded that receiving training about ICU/ventilator,age,working years,and working years in the ED/ ICU were variables that increase the level of knowledge of the nurses about EBP-VAP.

1. INTRODUCTION

VENTILATOR-associated pneumonia (VAP) is a nosocomial lung infection with a high mortality rate, that usually develops 48-72 hours after hospitalization in the ICU [1].

The factors affecting the development of VAP include age, gender, presence of comorbid disease, and invasive procedures performed in the ED or ICU. Since it is among the nosocomial infections, the implementation of hospital

surveillance procedures decreases the possibility of the development of VAP. It usually develops 48 hours after invasive mechanical ventilation. In the literature, it has been reported that the possibility of the development of VAP increases 6 to 21 times as the duration of the dependence on mechanical ventilation increases [1,2].

The indicators of the development of VAP include fever exceeding 38.5°C , leukocytosis, increased secretions, and an increased infiltration in the chest X-ray. It is classified as early-onset and late-onset VAP. In early-onset cases, Methicillin-susceptible staphylococcus Aureus has been

blamed, whereas *Pseudomonas aeruginosa* is blamed in late-onset cases [1-3].

The training of the personnel working in the ED and ICU, about the techniques of approach to the patient, has a very important place in the prevention of VAP. Therefore, it is necessary to update the knowledge of the personnel working in the ED and ICU by providing in-service training and evidence-based guides [4].

The aim of this study was to determine the level of knowledge of nurses working in the Emergency Departments (ED) and Intensive Care Units (ICU) about evidence-based practices in the prevention of ventilator-associated pneumonia (EBP-VAP).

2. MATERIALS AND METHODS

2.1. Study Design, Place and Time

This descriptive, two-centre study was conducted between July 2021 and August 2021 on the nurses working in the ED and ICUs of two public hospitals in the city centre of Malatya. The total number of nurses working in the ED and ICUs in the two mentioned public hospitals was 599, at the time of the study. When power analysis was performed, it was calculated that a sample size of at least 187 nurses was required for 80% power to represent the universe with a 5% error level and 90% confidence interval. All nurses who worked in the emergency room or intensive care unit for at least one year and volunteered to participate in the study were included in the study and the study was completed with 199 nurses. All nurses included in the study were selected by a simple random sampling method.

2.1. Data Collection Tools

2.2.1. Personal Data Form

The personal data form, which was prepared by the researchers, consisted of 12 questions about socio-demographic characteristics (age, gender, educational status, and perceived income) and working conditions (institution of work, department or unit of work, total working years in the ED or ICU, working type, weekly working hours, number of beds in the department/unit worked, and having an intensive care certificate) of the nurses.

2.2.2. Information on Evidence-Based Practices in the Prevention of Ventilator-Associated Pneumonia (EBP-VAP) Form

The EBP-VAP was developed by Dodek et al. (2004) as an evidence-based practice guide to preventing VAP and a validity study was performed by Labeau et al. (2007) [5,6]. The Turkish adaptation of the form was performed by Akın Korhan et al. (2013) [5-7]. The Evaluation Form consists of titles containing 9 universal measures, including endotracheal intubation type, frequency of replacing ventilator circuits, airway humidifier type, frequency of humidifier replacement, use of open or closed aspiration system, frequency of replacing aspiration systems, drainage of subglottic secretions, use of kinetic beds, and patient positioning. Each question has four multiple-choice answers one of which shows evidence-based correct practice. For each correct answer, 1 point is given and incorrect answers are not scored. The highest score that can be obtained from the form is 9, and the lowest score is 0 [7].

2.3. Data Collection

The data were obtained by using the google form method. Data collection forms prepared online were sent to the chief nurses in the ED or ICUs via WhatsApp application and they

were asked to forward the data collection forms to their working groups. The informed consent forms were obtained from the nurses who agreed to participate in the study before they were asked to fill online data collection forms. The data were recorded by the online self-report method. Data collection took approximately 5-7 minutes for each participant.

2.4. Evaluation of Data

The data were evaluated by using the SPSS 24.0 statistical package program. The independent groups' t-test, One-Way ANOVA test and Pearson correlation analysis were used in the evaluation of the data. The descriptive statistics were given as a number, percentage, mean, standard deviation, and min-max. The results were evaluated at the 95% confidence interval and a value of $p < 0.05$ was accepted statistically significant.

2.5. Ethical Approval

Ethical approval for the study was obtained from the Inonu University Health Sciences Ethics Committee for Non-Interventional Clinical Research (No: 2021/2177). In addition, institutional permissions from the public hospitals where the study would be conducted were obtained. In addition, the participants were informed about the purposes of the study and they were asked to approve the informed consent forms before the data collection forms were filled.

3. RESULTS

TABLE I
DISTRIBUTION OF NURSES' DESCRIPTIVE CHARACTERISTICS (n=199)

Variable	n	%
Age (Mean±SD)	35.92±6.54	
Total Working Years (Mean±SD)	13.50±6.67	
Working Years in the ED/ICU (Mean±SD)	9.46±6.00	
Gender		
Female	117	58.8
Male	82	41.2
Educational status		
High school	22	11.1
Associate degree	44	22.1
Undergraduate	113	56.7
Postgraduate	20	10.1
Perceived income status		
Income more than the expenses	22	11.0
Income equal to the expenses	102	51.3
Income less than the expenses	75	37.7
Working unit		
ED	30	15.1
1st degree ICU	41	20.6
2nd degree ICU	48	24.1
3rd degree ICU	80	40.2
Working type		
Shift	45	22.6
Regular hours	64	32.2
Shift and regular hours	90	45.2
Weekly hours of working		
40 hours	116	58.3
>41 hours	83	41.7
Status of receiving training about ED/ICU ventilator		
Yes	93	46.7
No	106	53.3
Total	199	100.0

The distribution of the descriptive characteristics of the nurses working in the ED and ICUs is given in Table I. The mean age of the nurses was 35.92±6.54, 58.8% of the nurses are women, 56.7% of them are undergraduate. The mean total working year was 13.50±6.67, the mean working year in the ED/ICU was 9.46±6.00 years, and 51.3% of the nurses stated that their income is equal to their expenses. It was determined

that 45.2% of the nurses worked in the 3rd level intensive care units, 40.2% of them worked on shifts and daytime work hours, 58.3% worked 40 hours a week, and 53.3% did not receive any intensive care/ventilator training (Table I).

TABLE II
THE RELATIONSHIP BETWEEN THE MEAN TOTAL SCORES OF VAP & AGE, TOTAL WORKING YEARS & WORKING YEARS IN THE ED/ICU (n=199)

Variable	Age	Total Working Years	Working Years in the ED/ICU
VAP Total (Mean±SD)	r=0.164 p=0.021*	r=0.162 p=0.022*	r=0.204 p=0.004*
r=Pearson correlation analysis *p<0.05			

The mean total VAP score of the nurses was 4.76±1.57. We detected a weak positive correlation between the age of the nurses, the years of working, and the years of working in the emergency room/intensive care unit and the mean VAP total scores; it was found that the knowledge level of the nurses about evidence-based practices in the prevention of ventilator-associated pneumonia increases as the age, working years and working years in the ED/ICU increases (p<0.05; Table II).

TABLE III
COMPARISON OF VAP TOTAL SCORES ACCORDING TO SOME CHARACTERISTICS OF NURSES (n=199)

Variable	VAP Mean±SD	Test and p values
Gender		
Female	4.67±1.68	t= -0.945
Male	4.89±1.42	p=0.346
Educational status		
High school	4.95±1.81	
Associate degree	4.90±1.17	F=0.601
Undergraduate	4.70±1.70	p=0.776
Postgraduate	4.55±1.35	
Working unit		
ED	4.43±1.79	
1st degree ICU	5.12±1.14	F=1.016
2nd degree ICU	4.62±1.49	p=0.425
3rd degree ICU	4.78±1.71	
Status of receiving training about ED/ICU ventilator		
Yes	5.09±1.32	t= -2.835
No	4.47±1.72	p=0.005*

t=Independent samples t-test F= One-Way ANOVA *p<0.05

It was found that the mean total VAP score of the nurses working in the ED/ICU, who received ED/ICU ventilator training was 5.09±1.32, the mean total VAP score of those who did not receive training was 4.47±1.72; and the difference between the groups was statistically significant (p<0.05; Table III). On the other hand, no significant relationship was found between the gender, education status and units of working of the nurses and the mean total VAP scores (p>0.05).

The rates of correct answers given by the nurses to the questions on EBP-VAP form were endotracheal intubation type 45.2%, frequency of ventilator circuit replacement 50.8%, airway humidifier type 35.2%, frequency of humidifier replacement 61.8%, use of an open or closed aspiration system 57.3%, frequency of changing aspiration

systems 30.2%, drainage type of subglottic secretions 55.3%, use of kinetic beds 60.3%, and patient positioning 80.4%, respectively (Table IV).

TABLE IV
THE RATES OF CORRECT ANSWER GIVEN BY NURSES TO THE QUESTIONS ON EBP-VAP FORM NURSES (n=199)

	n	%
1. Oral or nasal route preference in endotracheal aspiration		
× Oral intubation is recommended	90	45.2
□ Nasal intubation is recommended	9	4.5
□ Both ways are recommended	90	45.2
□ I do not know	10	5.1
2. Frequency of ventilator circuits replacement		
□ It is recommended to be replaced every 48 hours (or as clinically necessary)	58	29.1
□ It is recommended to be replaced every week (or as clinically necessary)	29	14.6
× It is recommended to be replaced for every new patient (or as clinically necessary)	101	50.8
□ I do not know	11	5.5
3. Airway humidifier type		
□ Heated humidifiers are recommended	9	4.5
× Heat and humidity exchangers are recommended	70	35.2
□ Both types of humidifiers (heated humidifiers and heat and moisture exchangers) are recommended	85	42.7
□ I do not know	35	17.6
4. Frequency of humidifier replacement		
□ It is recommended to be replaced every 48 hours (or as clinically necessary)	13	6.5
□ It is recommended to be replaced every 72 hours (or as clinically necessary)	42	21.1
× It is recommended to be replaced for every new patient (or as clinically necessary)	123	61.8
□ I do not know	21	10.6
5. Preference of open or closed aspiration system		
□ Open aspiration systems are recommended	12	6.0
□ Closed aspiration systems are recommended	66	33.2
× Booth systems are recommended	114	57.3
□ I do not know	7	3.5
6. Frequency of replacement of aspiration systems		
□ It is recommended to be replaced every day (or as clinically necessary)	97	48.7
□ It is recommended to be replaced every week (or as clinically necessary)	29	14.6
× It is recommended to be replaced for every new patient (or as clinically necessary)	60	30.2
□ I do not know	13	6.5
7. The feature of endotracheal tubes with extra lumen used for aspiration of subglottic secretions		
× Extra-lumen endotracheal tube reduces the risk of ventilator-associated pneumonia	110	55.3
□ Extra-lumen endotracheal tube increases risk of ventilator-associated pneumonia	21	10.6
□ Extra-lumen endotracheal tube does not affect the risk of ventilator-associated pneumonia	11	5.5
□ I do not know	57	28.6
8. Preference of kinetic or standard beds		
□ Kinetic beds increase risk of ventilator-associated pneumonia	12	6.0
× Kinetic beds reduce risk of ventilator-associated pneumonia	120	60.3
□ Kinetic beds do not affect the risk of ventilator-associated pneumonia	27	13.6
□ I do not know	40	20.1
9. Patient positioning		
□ Supine position is recommended	19	9.5
× Semi-sitting position is recommended	160	80.4
□ Patient position does not affect the risk of ventilator-associated pneumonia	6	3.0
□ I do not know	14	7.1

X=Correct Answer

4. DISCUSSION

Ventilation-associated pneumonia has been defined as pneumonia occurring 48 hours after intubation in a patient

who did not have pneumonia before being intubated [8]. The incidence of VAP has been increasing though guidelines have been developed on this subject in recent years.

In the literature, few studies investigate the relationship between VAP and the level of evidence-based knowledge of nurses. Blot et al., found that 46.2% of the nurses working in the ICU had a working experience of 6-10 years [9]. In the study of Akıncı et al, it was found that 44.5% of the nurses had been working in the ICU for less than a year [10]. In our study, the mean working time in the ICU was found to be 9.46 ± 6.00 years.

In the study of Blot et al. [9], it was found that as the working experience of the nurses increased, their EBP-VAP scores increased. Similarly, in our study, a weak positive correlation was found between the level of knowledge of the nurses about evidence-based practices in the prevention of VAP and their age and the years spend in the ICU; as the years in the ICU and age of the nurses increased their EBP-VAP scores increased. This suggests that the experience and the prolongation of the working time in the ICU increase the knowledge of nurses rather than causing boredom.

In the literature, it is emphasized that the personnel working in the ICUs should receive multidisciplinary training programs [9]. Supporting this suggestion, in our study, it was found that the nurses who received training about the prevention of VAP made statistically significantly higher scores on EBP-VAS scale.

The most important risk factor in the development of VAP is endotracheal intubation [11]. Therefore, endotracheal intubation should be avoided unless necessary. About half of the nurses participating in our study stated that endotracheal intubation should be avoided in order to prevent the development of VAP.

In the study of Akıncı et al. [10], it was reported that 64.2% of the participants stated that the frequency of changing the humidifier is important in preventing VAP. This rate was found to be 84% in the study of El-khatib et al. [12], and 54% in the study of Blot et al.[9]. In our study, this rate was found to be 61.8%, which is consistent with the literature.

In the study of Akıncı et al. [10], the rate of correct answers to the question regarding the preference of kinetic beds versus standard beds was 41.6% whereas this rate was 48.7% in the study of Blot et al [9]. It is also noted that the position of the patient is related to the frequency of VAP [4]. In our study, the rate of those who knew that kinetic beds reduced the frequency of VAP was 60.3%, and the rate of those who knew that the position of the patient was important was 80.4%

5. CONCLUSIONS

In our study, it was found that the level of knowledge of the nurses working in the ED and ICUs about evidence-based practices in the prevention of VAP was sufficient. Healthcare personnel working in the ED/ICU need to identify strategies to prevent VAP and increase the chances of survival for many patients. We suggest that it can be achieved by forming multidisciplinary teams and providing the healthcare workers with updated training including evidence-based practices.

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