

# Critical Care Nurse's Knowledge of Ventilator-Associated Pneumonia Prevention in Selected Hospitals, Khartoum

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## Abstract

**Background:** Ventilator-associated pneumonia (VAP) continues to be a common and potentially fatal complication of ventilator care and often encountered within intensive care units (ICUs). Nurses' lack of knowledge may be a barrier to adherence to evidence based guidelines for preventing ventilator-associated pneumonia.

**Objective:** This study aimed to evaluate critical care nurse's knowledge regarding VAP prevention.

**Methods:** A cross-sectional hospital based study design from 20th of December 2015 to 15th of February 2016 in intensive care unit for Khartoum Teaching, Omdurman Military and Al-Ribat University Hospitals in Khartoum State of Sudan. It consisted of 120 nurses who dealing with mechanical ventilation patient. A non-probability, purposive sample selection was used. Data were collected through the using of a structured questionnaire by self-administrated method which consisted of two main parts. First is a sociodemographic characteristic of the nurses and second consisted of 40 items regarding nurses' knowledge about VAP prevention. The data was analyzed through software of SPSS for Windows V.20. It includes descriptive statistical analysis and inferential statistical analysis.

**Results:** With regards to the age, majority of the participants age between 23-30 years old, (71.7%) were female, and (86.7%) had bachelor degree, with (47.6%) had less than 1 year of experience. The items of knowledge about VAP prevention consisted of 40 items distributed on 5 knowledge aspects. Regarding the general information about VAP, anatomy of lungs, mechanical ventilation, diagnosis and treatment of VAP, and international guidelines for VAP prevention aspects the means were (2.46 from 6), (1.17 from 3), (2.66 from 5), (2.20 from 6), (9.71 from 20) respectively.

**Conclusions:** The overall knowledge of nurses regarding the VAP prevention mean is (18.22 from 40) that is a poor result which shows us that most of the nurses have un adequate knowledge about VAP prevention.

**Keywords:** Ventilator-associated Pneumonia; Nurses' knowledge; Critical Care; Nurses

## Introduction

Ventilator-associated pneumonia (VAP) is the most common infectious complication among the patients admitted in the intensive care units (ICUs), which is developed in the patients receiving mechanical ventilation; it is developing within 48 to 72 hours after the intubation of the tracheal tube [1].

VAP represents a common nosocomial complication arising in the ICU, which affect about 8-20% of ICU patients, and up to 27% of the mechanically ventilated patients [2]. It is one of the leading causes of hospital-acquired infections in ICUs [3].

In 2002, an estimated 250,000 cases of healthcare-associated pneumonias developed in the U.S.A. hospitals, and it was an associated cause of the death for 36,000 of them. Patients with mechanically-assisted ventilation have a high risk of developing healthcare-associated pneumonia. For the year 2010, National Health care Safety Network (NHSN) facilities reported more than 3,525 VAPs and the incidence for various types of hospital units ranged from 0.0-5.8 per 1,000 ventilator days [4]. Mortality rate in patients with VAP range from 20 to 50% and may reach more than 70% when the infection is caused by multi-resistant and invasive pathogens [5-7].

The incidence of VAP is 37.2 per 1000 ventilation day in developing countries and the mortality rate for VAP patients was 80% [8]. VAP is also associated with considerable morbidity, including prolonged ICU length of stay, prolonged mechanical ventilation, and increased costs of hospitalization [6,9,10].

A systematic review was conducted to determine the incidence of VAP and its attributable mortality rate, length of stay and costs. Results indicated that 10% - 20% of patients receiving >48 hrs. of mechanical ventilation will develop VAP. Critically ill patients who develop VAP appear to be twice as likely to die compared with similar patients without VAP. Patients with VAP have significantly longer Intensive Care Unit stay of 6days. Patients who develop VAP incur in additional hospital costs [11].

Given the above statistics, it would be safe to conclude that the high incidence, costs of treatment and the high mortality rates associated with VAP are suggestive of either a gap in knowledge of VAP or a failure to translate that knowledge into practice by those caring for this patient population. Healthcare delivery has shifted

toward evidence-based practice in recent years and the goal of evidence-based practice is to improve and provide high quality health care, resulting in positive patient outcomes [12].

A number of evidence-based guidelines have been developed in recent years to direct clinical practice in an attempt to improve patient care, and in particular care of the critically ill. Specific guidelines have been developed to both prevent VAP and treat it appropriately as soon as possible. Main preventive strategies include proper positioning, use of sterile equipment and educational strategies for educating health care personnel regarding prevention of VAP [13].

To ensure the highest standards of nursing care, nursing practice must be based on a strong body of scientific knowledge and proper practice. This can be achieved through adherence to the evidence based guidelines for prevention of ventilator associated pneumonia, ultimately improving patient outcomes [14].

Numerous studies exist regarding evidence-based measures for preventing VAP, however, remains a deficiency in literature regarding nurses' knowledge of VAP and its preventive measures.

Given the deficiency in current literature regarding direct studies to examine ICU nurses' knowledge of VAP, this study will provide an opportunity to examine groups of ICU nurses' knowledge.

## Objective

To assess the critical care nurses' knowledge regarding Ventilator Associated Pneumonia prevention in selected hospitals, Khartoum state.

## Methodology

### Research Design

Cross-sectional hospital based study.

### Duration of the Study

This study was carried out from 20th of December 2015 to 15th of February 2016.

### Setting

The study was conducted in the Khartoum Teaching Hospital, Omdurman Military Hospital and Al-Ribat

University Hospital. The criteria for selecting these setting were geographical proximity, feasibility for conducting the study, availability of the required sample because nurses working in these units are responsible for a larger population of mechanically ventilated patients than other nurses in an acute care hospitals.

### Study Sample

The sample size for the present study was 120 nurses. A non-probability, purposive sample selection was used in order to obtain the representative sample according to the following criteria: registered nurses with an intensive care (ICU) qualification, registered nurses with no formal training in ICU (these nurses were included as they are in close contact with mechanically ventilated patients and need to be familiar with ventilator associated pneumonia and the current evidence based guidelines for prevention of VAP.)

### Tools and Methods of Data

Data were collected through the using of structured knowledge questionnaire. was developed by the researcher based on CDC guideline (Center for Diseases Control and prevention 2003 and 2008, in addition to some items were adopted from a reliable questionnaire developed by Blot, Labeau, Vandijck, Clas, and Van Aken,2007).The developed and validated tool for the knowledge questionnaire was tested for reliability on a sample of 10 subjects. Test retest using Alpha Cronbach revealed that all items are significantly differed and has a correlation coefficient above the threshold of significance ( $r=0.87$ ) for knowledge questionnaire. The questionnaire consisted of two main parts. First part is a socio demographic characteristic of the nurses which included age, gender, qualification level, and years of experience. The second part consisted of 40 items regarding knowledge of VAP prevention distributed on 5section. The responds contained of four closed ended questions, and each item of the questionnaire had one correct answer, every correct answer would fetch one mark, and

the total score of the knowledge questionnaire was 40 scores. Data was collected through self-administered.

### Ethical Considerations

The researcher obtained the permission from the Ethical Committee at the College of Nursing/National Ribat university. Before collecting the data, the official permission from the ministry of health (Khartoum), the administrative of all three hospitals included in the study. The researcher promised to keep the participant's information confidential, and use these data for this study only then they explained the purpose of this study to each participant.

### Statistical Analysis

The data was analyzed through software of SPSS for Windows V.20 (Statistical Package for Science Service) application for statistical data analysis. It includes descriptive statistical analysis (frequency, percentage, mean and standard deviation).

### Results

#### Sociodemographic Characteristics of Nurses

Table1 shows the following characteristics of the study sample regarding the sociodemographic information: The majority of the participants age between (23-30 years). Most of the participants (71.7%) were females. The experience years varies (47.6%) of them had less than 1 year, (39.2%) had 1 to 5 years and the remaining (13.2%)had more than 5years experience. Also the majority of them (86.7%) had bachelor degree in education levels and only (7.5% and 5.8%) had diploma and master degree respectively. Concerning the possession specialized diploma in ICU the majority of them (80.0%) didn't had, while the more than half (53.3%) of them had attended an education program in infection control.

Sociodemographic characteristics of nurses	n=120	
	Freq.	Percent
Gender:		
- Male	34	28.30%
- Female	86	71.70%
Age:		
- Mean		26.71
- Std. deviation		3.41
Level of qualifications:		

- Diploma	9	7.50%
- Bachelor	104	86.70%
- Master	7	5.80%
Experience years:		
- Less than 1 year	57	47.60%
- (1-5) years	47	39.20%
- (6-10) years	11	9.10%
- More than 10 years	5	4.10%
Possession Diploma in I.C.U:		
- Yes	24	20.00%
- No	96	80.00%
Attendance an education program in infection control:		
- Yes	64	53.30%
- No	56	46.70%

Table 1: Sociodemographic characteristics of nurses.

### Knowledge of Nurses about VAP Prevention

Table 2 shows the items of knowledge of nurses about VAP prevention which consist of 40 items distributed on 5 knowledge aspects. Regarding the General information of VAP aspect that consists of 6 items; about VAP abbreviation meaning, incidence, time of occurrence, characteristics, developing mechanism and risk factors, major of the study samples answered un correctly (mean= 2.46±1.45) which less than the half of maximum score. The items related to Anatomy of lungs aspect, the mean of the nurses' correct answers was (1.17±0.90). About the

Mechanical ventilation aspect, the 5 items were stressed on indications, routes, and common setting abbreviation, the mean of the nurses' correct answers was (2.66±1.28). Regarding the 6 items in the diagnosis and treatment of VAP aspect, the mean of the nurses' correct answers was (2.20±1.50). The final aspect in the present study was in the nurses' knowledge regarding international guidelines for VAP prevention 20 items, the mean of the nurses' correct answers was (9.71±3.20). So, as a general the overall knowledge of nurses regarding the VAP prevention is (mean= 18.22±5.98).

No	Knowledge aspects	Max. score	Respondents knowledge (n=120)	
			Mean	SD
I	General information of VAP	6	2.46	1.45
II	Anatomy of Lungs	3	1.17	0.9
III	Mechanical ventilation	5	2.66	1.28
IV	Diagnosis and treatment	6	2.2	1.5
V	International guidelines for VAP Prevention	20	9.71	3.2
Overall (total)		40	18.22	5.98

Table 2: Knowledge of nurses about VAP prevention.

The (Table 3) shows the (64.1%) of the nurses had inadequate knowledge level, (34.2%) had moderate knowledge level, and only the (1.7%) of them had

adequate knowledge level, that is a poor result which shows us that most of the nurses have un adequate knowledge about VAP prevention.

Category of total Knowledge level for participants nurses		Respondents of knowledge (n=120)	
		Freq.(f)	Percent (%)
Inadequate	< 50% Score	77	64.10%
Moderate	50-75 % Score	41	34.20%
Adequate	> 75% score	2	1.70%
Total		120	100

Table 3: Total nurses' knowledge category regarding VAP prevention.

## Discussion

The present study aimed to Assess the nurses' knowledge regarding the prevention of Ventilator Associated Pneumonia among Intensive Care Units nurses who had dealing with patient in mechanical ventilator. The findings revealed that most of the study sample were female in the age group between 23-30 years old, with the bachelor degree and varies years of experience equal or less than 5 years in ICUs, furthermore didn't had specialized diploma in ICU. This findings supported by the study which was done by Alkhadir A.M. in 2012 under the title assessment the level of ICU nurses knowledge and practice regarding VAP prevention guidelines in Al-Sha'ab teaching hospital, Sudan which he found the same results [15]. Concerning the nurse's knowledge about Prevention of VAP which contained 5 knowledge aspects of general information about VAP, anatomy of lungs, mechanical ventilation, diagnosis and treatment of VAP, and international guidelines for VAP prevention, most of the nurses have poor information regarding these aspects. All of the findings in the present study were agreed by many studies which were done in the same country and different countries in a different time. The study which was done in 2014 in Sudan under the title Assessment of the nurses' knowledge and practice regarding application of international guidelines for VAP prevention in major governmental hospitals, Khartoum, by Osman OM showed that the Sudanese nurses had a poor knowledge, where the mean percentage for total knowledge was (42.8%) [16]. Additionally, in a study which was done by Gomes V. in 2010 under the title the knowledge of nurses working in ICU with aspect of evidence based guidelines for prevention of VAP in Johannesburg, South Africa, She found that the knowledge of ICU nurses lacking in the evidence based guidelines for VAP prevention [17]. Another study conducted by Ali N.S. in Egypt (2013) to assess the critical care nurses' knowledge and compliance with VAP prevention bundles, revealed that; the participants had unsatisfactory knowledge score (mean=7.46±2.37 out of 20 scores) [18]. Furthermore, in a study which was done by Biancofiore et al. in Italy to evaluate nurses knowledge regarding prevention of VAP. They found that 22.6% nurses had satisfactory knowledge, and 54.8% had poor knowledge [19]. Whereas the study which was done by El-Khatib et al. in Lebanon 2010 under the title critical care clinicians' knowledge of evidence-based guidelines for preventing ventilator-associated pneumonia. They found that the mean total scores of physician, nurses and respiratory physiotherapists were 80.2%, 78.1% and 80.5%

respectively with no significant between them [20].

It's noteworthy that the study which was done in Belgium under the title critical care nurses' knowledge of evidence based guidelines for preventing ventilator associated pneumonia: an evaluation questionnaire by Labeau et al., they concluded that A reliable questionnaire was developed to assess critical care nurses' knowledge of evidence based interventions for preventing VAP [21]. Moreover, in a study which was done by Labeau et al. in 22 European countries under the title Evidence-based guidelines for the prevention of ventilator-associated pneumonia: results of a knowledge test among European intensive care nurses, they concluded that European ICU nurses' low scores on a knowledge test on VAP prevention guidelines [22]? Furthermore, in a study which was done in United State under the title using evidence-based practice to prevent ventilator-associated pneumonia by Sedwick et al. they concluded that Strict adherence to VAP bundled practices, enhancing accountability for initiating protocols by using a feedback system, and interdisciplinary collaboration most likely will improve patients' outcomes and produce marked costs savings for hospitals [3].

Finally, a study which was done in Spain by pe'rez-granda et al. in 2013 under the title prevention of ventilator-associated pneumonia: can knowledge and clinical practice be simply assessed in a large institution? the author showed that the simple, easily completed questionnaire may help large institutions to rapidly evaluate staff knowledge and real clinical practice in the prevention of VAP [23].

## Conclusion

The present study concluded that major nurses who participated in this study were graduated from the college of nursing with bachelor degree, had poor knowledge regarding prevention of ventilator-associated pneumonia.

## Implications of Study

Increasing the average level of knowledge has been the first step in successful multifaceted educational programs. Findings from literature stress the importance of nursing knowledge and an evidence-based practice approach to VAP prevention. This study is valuable, as it will generate questions and hypotheses that can be used to develop further research.

## Recommendations

For the colleges of nursing: it's preferable to put mechanical ventilation care and the prevention guidelines for VAP in the curriculum of nursing lectures for students to have a basic adequate knowledge. For institutions that provide nursing health care services: All nurses should get enough information regarding VAP prevention through courses or workshops to improve quality of health care services.

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