Original Research Article

Ventilator Associated Pneumonia Prevention: Awareness of ICU Nurses on Evidence Based Guidelines

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ABSTRACT

Background: Ventilator associated pneumonia (VAP) continues to be a common complication for mechanically ventilated patients in ICU, leading to increased length of stay, morbidity and mortality. Knowledge of nurses on Ventilator associated pneumonia prevention guidelines may influence adherence to their practices in ICU's.

Objective: To assess the knowledge of intensive care nurses on VAP prevention guidelines in Mumbai.

Methods: A descriptive study was conducted in Intensive care units of multispecialty hospitals in Mumbai. A sample of 150 nurses who were active care givers for mechanically ventilated patients were selected using non- probability convenient sampling. Data was collected using structured self-administered questionnaire which consisted of two sections. Section 1: Demographic characteristics and section 2: Questionnaire on evidence based VAP prevention guidelines. The data was analysed using descriptive statistical analysis and inferential analysis. using SPSS version 17.

Results: Majority (72%) of the participants were females, aged between 25-29 years. The years of experience varied with majority (36%) having more than 5 years and26% with 1-3 years. Majorities (51.3%) of nurses were with diploma in nursing and 43.3%who were graduates. Although43.3% nurses attended ICU trainings conducted in the hospital, more than half (56.7%) did not attend any trainings pertaining to ICU. Most of the nurses worked in non-teaching hospitals and worked in general ICU's. Majority of the nurses were found with inadequate knowledge on VAP prevention. The overall knowledge of nurses was found with mean 24.75 ± 21.35 which implies that most nurses lack knowledge on VAP prevention guidelines

Conclusion: Knowledge and practices of nurses is pivotal in prevention of VAP. Regular in-service education programme at every hospital is required to keep the nurses updated with evidence-based guidelines to achieve positive patient outcomes.

Key Words: Ventilator associated pneumonia, prevention, awareness, ICU nurses, Evidence based guidelines.

INTRODUCTION

Critically ill patients admitted in the hospitals and connected to a ventilator can be a life or death situation. Mechanical ventilation assists patients with their breathing. There are risks involved being on ventilator support that may lead to complications, or ventilator-associated events, such as blood clots, lung damage or ventilator-associated pneumonia-believed to

be one of the most common and deadly hospital-acquired infections in the ICU. [1]

Ventilator associated pneumonia (VAP) is defined as pneumonia occurring in a patient within 48 hours or more after intubation with an endotracheal tube or tracheostomy tube which was not present before. Early onset VAP occurs within 48 hours and late onset VAP beyond 48 hours of tracheal intubation. It is the most common and fatal infection of ICU. [2] Ventilator-associated pneumonia (VAP) continues to remain as the most common infectious complication among patients on mechanical ventilation in intensive care units, thus increasing morbidity and mortality.[2] Prevalence estimates varied between 6 and 52 cases per 100 patients, depending on the population studied. On any given day in the ICU, an average of 10% of patients will have pneumonia-VAP in the overwhelming majority of cases. [3]

The mean incidence of VAP was calculated and found to be 5.0 per 1000 ventilator-days. VAP was noted to be predominant among younger age group (<60 years), male patients (80.2%), and in trauma ICU admissions (49.0%). [4] The proportion rates of hospital-acquired infections (HAIs) (device related) were compared with that of CDC-NHSN and INICC database which are the bench mark of hospital infection. The pooled mean HAI rates were highest for VAP (6.47/1000 ventilator days). The Indian ICUs data revealed VAP rate of 6.74/1000 ventilator days, in contrast to CDC-NHSN of 1.43 and INICC of 19.5, which depicted that VAP rate was close to 75th percentile for CDC-NHSN data and 50th percentile for INICC data. [5]

An increase in the duration of mechanical ventilation resulted in direct proportionate increase in VAP. The estimated incidence of VAP was at 10.20% and the mortality rate at 15%-50% respectively. [6,7] The length of stay and duration of ventilation were 26 (14-42) and 12 (4-21) days, respectively. The pre- and post- infection hospital stays were 8 (3-13)

and 14 (8-30) days, respectively. Data on outcomes were available in 214 cases (86.6%), and 75 (35.0%) cases died during hospitalization. The top 3 pathogens identified were methicillin-resistant *Staphylococcus aureus* (MRSA; $n = 70$, 27.9%), *Pseudomonas* species ($n = 40$, 16.3%), and *Klebsiella* species ($n = 34$, 13.3%). [8]

Studies have proved that the patients developing VAP experienced notably longer hospital stay, incurred higher costs [9,10] and significant resource utilization burden. The total costs for VAP patients were about three-fold higher than for non-VAP patients. [9] However, VAP is preventable and guidelines have been available. Evidence based guidelines have incorporated a series of interventions that need to be implemented to prevent VAP. Treatment of a patient requires holistic approach with the involvement of a multidisciplinary team, but the role of an intensive care nurse is crucial. Many nursing interventions are planned as daily care procedures and are the responsibilities of the assigned nurse. Nurses awareness of the evidence-based guidelines is of importance as the adherence to these in their practice can bring about positive outcomes in patient's health and recovery process. Several recent studies have identified a gap in the knowledge and practice of nurses related to VAP prevention. The aim of this study was to assess the knowledge of intensive care unit nurses working in multispecialty hospitals, in Mumbai and to determine if there is any association between the knowledge scores and their demographic characteristics.

METHODS

A descriptive study was carried out to evaluate the knowledge of nurses working in ICU's of multispecialty hospitals. The sample size was 150 registered nurses with minimum 6 months of ICU experience. Nurses working in ICU but are not involved in care of ventilated patients were excluded from the study.

The data was collected using a structured knowledge questionnaire was divided into 2 categories. The first category consisted of information about the demographic profile which included, age, gender, level of education, years of experience, any ICU trainings attended, the department presently working and the name of the hospital. The second part of the questionnaire consisted of 32 items directed at exploring the nurse's knowledge on definition, risk factors; pathogenesis of VAP and prevention strategies identified based on CDC guidelines and evidenced based practices. The validity and reliability of the questionnaire was reviewed by an expert panel and changes in the tool were made as suggested. Reliability was tested using test retest method wherein the research tool was found to be reliable (r=0.77) Every correct answer was scored as one and wrong answers zero some questions had multiple correct answers and were given a score of one for each option answered correctly.

The ethical clearance was obtained from the Ethical Review Committee, MGM Institute of Health Sciences, Navi Mumbai. Permissions were requested from the hospital management where the study was conducted. The need of the study and objectives were explained to the participants and written consent was obtained. The questionnaire was distributed to the staff after the shift and was collected after the questionnaire was completed.

The data gathered was analysed and calculated by descriptive statistics including frequencies and percentage. One mark was given for each correct answer and zero to every wrong answer. Continuous variables were described as means+/- SD and independent -samples t-test, were used to determine whether knowledge score was associated with participants demographic characteristics. The statistical package of version 17 was used for statistical analysis. Statistical significance was set at p<0.05 and 95% confidence intervals.

The demographic characteristics of the study sample are being demonstrated in table 1. The majority of the participants (72%) were females, aged between 25-29 years (49.3%). The years of experience varied with majority (36%) having more than 5 years (26%) had 1-3 years and (20.7%) had 3-5 years of experience. Majority (51.3%) had completed diploma in nursing, followed by (43.3%) who were graduates. Although (43.3%) had attended ICU trainings conducted in the hospital, more than half (56.7%) did not attend any trainings pertaining to ICU. Most of the nurses worked in non-teaching hospitals and general ICU.

Table 1: Demographic characteristics of ICU nurses.

Characteristics	f	%
Gender		
Female	108	72
Male	42	28
Age in Years		
20-24	35	23.3
25-29	74	49.3
30-34	20	13.3
35-39	13	8.7
40& above	8	5.3
Educational Level		
General Nursing & Midwifery	77	51.3
B.Sc nursing	65	43.3
Post Basic B.Sc Nursing	4	2.7
M.Sc Nursing	4	2.7
ICU Experience		
6months-1year	26	17.3
1-3 years	39	26.0
3-5 years	31	20.7
5 years and above	54	36.0
ICU TRAINING		
Attended	65	43.3
Not attended	85	56.7

WORK PLACE CHARACTERISTICS:

TYPE OF ICU		
MICU	34	22.7
SICU	42	28.0
CCU	20	13.3
CVTS	7	4.7
GICU	47	29.3
University affiliation of the Hospital		
Teaching hospital	41	27.33
Non- teaching hospital.	109	72.66

TABLE 2: Overall knowledge scores of ICU nurses related to VAP prevention

Overall knowledge scores	f	%
Poor(<25%)	2	1.3
Inadequate (26-50%)	43	28.66
Moderate (51-75)%	86	57.33
Adequate (75%)	19	12.66

RESULTS

The table 2 indicates that only 12.66% nurses had adequate knowledge on VAP Prevention guidelines.

Table 3, regarding the item wise knowledge on VAP prevention guidelines, show most nurses knew about the VAP protocol components (5.56+3.887). Similarly, nurses were aware about the pathogenesis (4.32+1.837) and hand hygiene measures to be followed (4.10+5.373) nurses lacked knowledge on some aspects such as VAP definition, oral care, Preferred route for intubation, ventilator care measures, suctioning, weaning - sedation and patient's positioning. The general overall knowledge score of nurses regarding VAP prevention was (mean=24.75+21.35)

Table 3: Correct responses of nurses for each of the 32 item questionnaire

Items	Mean	Std. Deviation
VAP Definition	1.03	0.893
Risk Factors	2.61	0.969
Organism	2.41	0.971
Pathogenesis& diagnosis	4.32	1.837
VAP Protocol	5.56	3.887
Oral Care	1.05	1.455
Hand Hygiene	4.10	5.373
Intubation route preferred	0.33	1.251
Ventilator care measures	0.42	1.025
Weaning& sedation	1.03	0.999
Suctioning	1.44	1.926
Positioning	0.45	0.764

Total mean number (n) of correct answers+SD= (mean=24.75+21.35)

Table 4: Association of knowledge scores of nurses with demographic characteristics.

Demographic variable	Knowledge level				df	χ^2 cal	χ^2 tab	p value
	Poor (n%)	Average (n%)	Good (n%)	Excellent (n%)				
Age(years)								
20-24 years	0%	42.9%	54.3%	2.9%				
25-29 years	1.4%	29.7%	56.8%	12.2%				
30-34 years	5.0%	5.0%	75.0%	15.0%	12	21.274	21.026	0.047*
35-39 years	0%	15.4%	46.2%	38.5%				
40&above	0%	37.5%	50.0%	12.5%				
Gender								
Male	0	16.7%	69.0%	14.3%	3	5.225	7.815	0.16[(N.S)]
Female	1.9%	33.3%	52.8%	12.0%				
Education status								
Diploma	2.6%	32.5%	46.8%	18.2%				
Graduate	0%	27.7%	64.6%	7.7%	9	13.376	16.919	0.15[(N.S)]
P.B.Bsc	0	0	100%	0				
Post graduate	0	0	100%	0				
Years of Experience								
6 months-1year	4.2%	4.1%	54.2%	0%				
1-3 years	0	41.0%	51.3%	7.7%	9			
3-5 years	0	12.9%	77.4%	9.7%		21.670	16.919	0.01*
5+ years	1.9%	22.2%	51.9%	24.1%				
ICU TRAINING								
Not attended	2.4%	40.0%	47.1%	10.6%		14.599	7.815	0.002*
Attended	0%	13.8%	70.8%	15.4%	3			
Dept								
MICU	0	14.7%	64.7%	20.6%				
SICU	0	21.4%	59.5%	19.0%				
CCU	0	15.0%	75.0%	10.0%	12	25.279	21.026	0.014*
CVTS	0	71.4%	28.6%	0%				
GICU	4.5%	40.9%	50.0%	4.5%				

(N.S)= Not significant * significant at p<0.05

The association between the demographic characteristics and the knowledge scores is depicted in table 4. It indicates that nurses in the age, years of experience, ICU training and department were significant at p<0.05 level of significance.

DISCUSSION

The present study aimed to assess the knowledge of intensive care nurses on VAP prevention. The findings revealed that most of the nurses were female in the age group of 25-29 years old and who have completed their diploma in nursing and with years of experience of 5 years and above and also majority of nurses did not attend any ICU trainings. These findings were

similar to the findings of the study done by Al Shameri FA [10] were most of the nurses in the study were females, but graduates and having varied years of experience.

Regarding the nurse's knowledge about VAP prevention, it is found that majority of the nurses lacked knowledge with half the group scoring moderate level of knowledge scores. This finding is also proved in a study by AL-Sayaghi [11] among nurses in Yemen a study done by Jyothi Kapoor [12] also highlights the average knowledge the nurses possess regarding prevention of ventilator associated pneumonia.

In the present study results showed that nurses were aware about the pathogenesis (4.32+1.837) and hand hygiene measures to be followed (4.10+5.373) nurses had lack of knowledge on aspects such as VAP definition, oral care, preferred route for intubation, ventilator care measures, suctioning, weaning - sedation and patient's positioning. This is similar findings to a study done by Masoumeh Bagheri-Nesamil [13] where in the respondents had the least knowledge about the frequency of ventilator circuit changes, the frequency of humidifier changes and the frequency of changes in the suction system.

The current study has found that nurses knowledge on prevention of VAP is statistically not associated with the educational qualification where p>0.05. This finding is similar to a study done by Passang C Sherpa [14] which indicated that there is no association between the educational qualification of critical care providers and knowledge on VAP prevention.

CONCLUSION
The study revealed that nurses in intensive care unit had average level of knowledge on evidence- based guidelines on VAP prevention. These results stress the need of hospitals to organize and mandate in-service education programmes for VAP prevention and other evidenced based protocols, so as to improve the knowledge thus achieve positive patient outcomes.

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