



Original Article

## Effect of education related to oral care practices on nurses' knowledge, practice and clinical outcomes of mechanically ventilated patients in Dubai

### Abstract:

**Introduction:** There has been a growing rate of Ventilator Associated Pneumonia (VAP) despite the successful implementation of VAP bundles.

**Objectives:** Objectives were to assess the knowledge and oral care practices of nurses and the clinical outcomes related to poor oral care practices on ventilated patients before and after education on 'oral care practices'; to identify the effect of educational program for nurses' knowledge, oral care practices and clinical outcomes on mechanically ventilated patients and to find the relationship between nurses' knowledge and their selected demographic variables. The clinical outcomes included oral hygienic status and incidence of VAP among ventilated patients.

**Methods and Materials:** The study used a pre-experimental pretest and posttest design on a sample of 30 critical care nurses of a hospital in Dubai. An educational session was taken and an Oral Care Protocol was implemented.

**Results:** Although most of them (46.7%) had an experience of 10 to 20 years in critical care, 40% of the nurses never had any form of education on oral hygiene in ICU. The results of the study on knowledge, practice of nurses & oral hygiene assessment were markedly significant; their knowledge and oral care practices obtained good scores and the oral hygiene improved to 96.7% (P=0.0001). The VAP incidence was zero during and after the study.

**Conclusion:** It was concluded that education of nurses on oral care practices resulted in significant improvement of their practices and on the clinical outcomes among the ventilated patients.

**Key Words:** Education, oral care practices, knowledge, oral hygiene assessment, mechanically ventilated patients

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### Introduction

Oral care is a key component of nursing care; however, it is considered, by many, to be a "comfort intervention" to the patient instead of an intervention to prevent pathogens from accumulating in the oral cavity. As a result, oral care is not considered a priority by many nurses, thereby decreasing its frequency and increasing the possibility of contaminated secretion in the patient's oral cavity<sup>1</sup>. A mechanically ventilated patient's swallowing and salivating mechanisms are weakened due to sedations, muscle relaxants and the presence of an endotracheal tube (ETT); thus there are a diminished capacity to rid the oral cavity of accumulating pathogens. These organisms found in the oral cavity, have the possibility of getting transferred to the lungs thereby causing Ventilator Associated Pneumonia

VAP). Grap<sup>2</sup> states that the bacteria can easily travel from the mouth to the lungs in compromised patients because the endotracheal tube removes the natural protective barrier for the lungs.

The monthly VAP rates in SICU have been rising from 8.54 in February 2012 to 14.1 in March 2012 as per records from hospital Infection Control department. When investigated, the doctors and nurses noticed that although the VAP bundles were implemented much earlier (from 2010 onwards), the VAP rates continued to be high. This was supported by the good ventilator bundle compliance rates, i.e.; the ratio of number of patients with VAP compliance to the number of ventilator days. One area that was not included in the bundles but seemed to influence the incidence of VAP was the oral hygiene of these ventilated

patients. It was found that the oral care practices needed to be improved as a step towards preventing VAP. Grap, Munro, Ashtiani, & Bryant<sup>1</sup> suggested that the frequency of providing oral care to the intubated patients, the supplies used and duration of time oral care is provided varies among staffs and institutions. The SICU has a variety of supplies to provide oral care to the mechanically ventilated patients. In spite of knowing that bacteria was found on the cuff of the endotracheal tube can move to the lungs, it was noticed that the nurses in SICU had no standard pattern, had variety of oral care routines and oral suctioning. Often the subglottal region was not suctioned, because the nurses were not aware of the importance of subglottic suctioning.<sup>3</sup>

The focus of this study was to provide education for SICU nurses on proper oral care practices, oral and subglottic suctioning and the time and frequency of these practices. Internationally, the mean VAP rate for burn patients in the US is 12.3. Neurosurgical patients have the highest rate at around 20 and pediatrics the lowest at 5.9.<sup>4</sup>

Nationally, in Mafreq Hospital, Abu Dhabi showed a VAP rate of 12.1 per 1000 device days in 2010 and their ventilator utilization ratio was 0.35 i.e.; 5411 ventilator days per year. (Best Practice Protocols – Mafreq hospital). The SEHA (Abu Dhabi Health Services) set their target as 5.1 per 1000 ventilator days for their ventilated patients in medical-surgical ICU, cardiac ICU and burns ICU. Locally, in SICU, Dubai Hospital, Dubai VAP rates were ranging between zero and fourteen in 2012, while the set benchmark for SICU was 4.4 as per Hospital infection control records.

Grap<sup>1</sup> states that nurses may have a decreased comfort level in providing oral care to the mechanically ventilated patient because the endotracheal tube may be moved or dislodged during oral care and cause the patient harm. Siela<sup>5</sup> suggested that the practice of oral hygiene for patients with artificial airways is an area that requires more clinical research. The implementation of an education program and the development of oral care routines could enable the nursing staff to provide more consistent care to the ventilated patients.<sup>6</sup>

Chan The purpose of the study was to assess the effect of education related to oral care practices on nurses' knowledge, oral care practices and clinical outcomes of mechanically ventilated patients in intensive care.

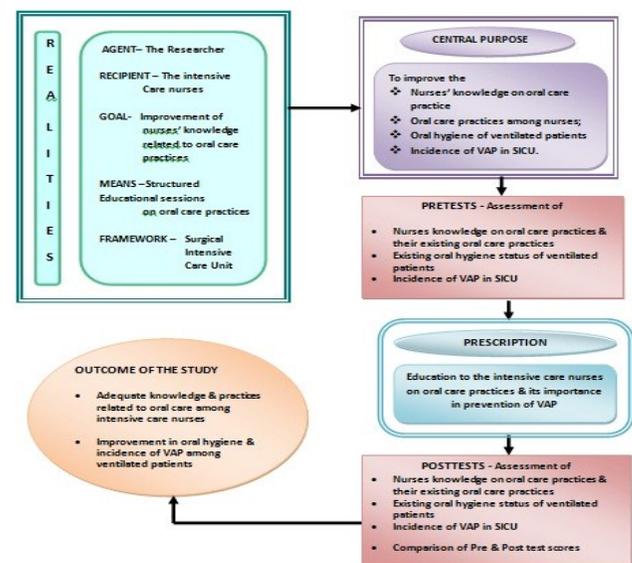
The objectives of the study were to assess the knowledge of

nurses before and after education on Oral care practice, evaluate the oral care practices performed by the nurses before and after education on 'oral care practices', identify the clinical outcomes related to poor oral care practices on mechanically ventilated patients before and after education on 'oral care practices', identify the effect of educational program on nurses' knowledge, oral care practices & clinical outcomes on mechanically ventilated patients and find the relationship between nurses' knowledge and their selected demographic variables.

## Conceptual framework

This study used Ernestine Wiedenbach's prescriptive theory as the basis for its conceptual framework. (also called "The helping art of clinical nursing"). This theory focuses on three main factors: The central purpose, the prescription & the realities.

**Fig 1: Conceptual Framework based on Wiedenbach's Prescriptive Theory (1990)**



## Hypothesis

H1: Nurses' knowledge after education related to oral care practices will be higher than their knowledge before education;

H2: Education related to oral care practices will have a positive effect on the oral care practices of nurses on mechanically ventilated patients;

H3: Clinical outcomes of mechanically ventilated patients will improve after education related to oral care practices;

H4: There will be a relationship between nurses' knowledge and their selected demographic variables.

## Methodology

The design of this study was pre-experimental. A pretest and a posttest design was used to test the effect of education on oral care practices and the clinical outcomes like oral hygiene & the incidence of ventilator associated pneumonia. The study was conducted in a nine bedded surgical intensive care unit in Dubai Hospital. The sample included 30 staff nurses in the Surgical Intensive Care Unit. Convenient sampling technique was used to select 30 staff nurses from 50 nurses of the Surgical Intensive Care Unit. The tools developed for the data collection were Demographic proforma, Knowledge questionnaire, Oral hygiene assessment audit tool and Oral practice audit. A taskforce was explained about the significance, the method of the study & on the knowledge and practices related to oral care.

Demographic proforma were completed, data were collected on the nurses' views on oral care practices, their knowledge and skills of staff nurses on oral care practices as well as oral hygiene assessment of intubated and ventilated patients. The monthly SICU VAP incidence rates were procured. An educational session (a power point presentation) and an 'Oral Care Protocol' (created and tested by Cutler and Davis<sup>7</sup>) were given. This was followed by bedside reinforcements. Post tests were done on day 30, and the VAP incidence was monitored for the next two months.

## Results

**Table 1: Demographic variables and details of In-Service Education of critical care nurses (N=30)**

Variables	Categories	f	%
Age(in years)	Below 36	15	50
	36 – 45	11	36.7
	Above 45	4	13.3
Gender	Male	3	10
	Female	27	90
Educational Qualification in Nursing	Diploma	3	10
	Bachelors	26	86.7
	Specialization	1	3.3
Experience in Nursing(in yrs)	Below 10	10	33.3
	10 – 20	16	53.3
	Above 20	4	13.3
Experience in ICU(in yrs)	Below 10	12	40
	10 – 20	14	46.7
	Above 20	4	13.3
Education on oral hygiene in ICU	Yes	13	43.3
	No	12	40
	Read literature/research related to oral hygiene	2	6.7
	Never read literature/research related to oral hygiene	3	10
Difference in the way of providing Oral Hygiene in intubated and non intubated patients	Yes	29	96.7
	No Comments	1	3.3
Barriers that prevent adequate oral hygiene	Oral ETT (Risky)	7	23.3
	Lack of education	7	23.3
	Unstable/Critically ill	10	33.3
	Less Time/Workload	5	16.7
	Lack of Equipment	1	3.3
Keen to learn about techniques & trends on oral hygiene	Yes	28	93.3
	No Comments	2	6.7

Table 1 reveals that although 29 (96.7%) out of 30 nurses felt that the ways of providing oral care to intubated and non intubated patients varied, only 13 (43.3%) nurses have had formal education on oral hygiene of ventilated patients. Most of the nurses (93.3%) were keen to learn about the techniques and trends on oral hygiene of ventilated patients.

**Table 2: Pre and Post-test results of Nurses' Knowledge (N=30)**

Nurses' Knowledge	Pre-test		Post-test	
	f	%	f	%
Good (Above score of 11)	14	46.7	30	100
Average (scores 8 – 11)	12	40	0	0
Poor (Below score of 8)	4	13.3	0	0

Table 2 supports that there was an improvement of knowledge of nurses (from 46.7% to 100%) during post educational sessions on oral care practices. All nurses scored above 11 in the post-test.

**Table 3: Pre and Post-test results of Oral Care Practices (N=30)**

Oral care Practices	Pre-test		Post-test	
	f	%	f	%
Good (Above score of 4)	7	23.3	30	100
Average (scores 3 – 4)	17	56.7	0	0
Poor (Below score of 3)	6	20	0	0

Table 3 shows that in contrast to 56.7% of nurses who scored an average during the pretest, the post-test revealed a 100% improvement in oral care practices, showing that the education of nurses was effective.

**Table 4: Pre and post-test results of clinical outcomes (Oral hygiene assessment) (N=30)**

Clinical Outcomes (Oral Hygiene Assessment)	Pre-test		Post-test	
	f	%	f	%
Good (Above score of 5)	4	13.3	29	96.7
Average (scores 4 – 5)	13	43.3	0	0
Poor (Below 4)	13	43.3	1	3.3

Table 4 revealed a peak rise of good scores from 13.3% to a striking 96.7% in the oral hygienic status of mechanically ventilated patients. However, the oral hygiene of one of the patients continued to remain poor, in spite of 100% improvement in nurses' knowledge and oral care practices.

Fig 3: VAP Data for the months January 2012 to January 2013

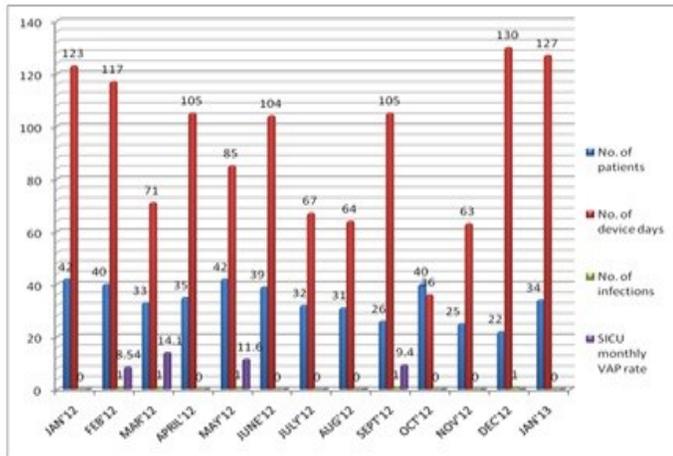


Figure 3 gives a monthly illustration of VAP data. The month of March 2012 showed the highest VAP rate of 14. No cases of VAP were identified during and after the educational session, in the months of October, November, December 2012 and January 2013.

Table 5: Comparison of the mean scores and standard deviation of pre-test & post-test knowledge scores, oral care practice scores and oral hygiene assessment scores (N=30)

		Mean	Mean deviation	SD	t test	df	p value
KNOWLEDGE	Pre-Test Knowledge	9.93	8.56	2.45	18.86	29	0.0001
	Post-test Knowledge	18.5		1.48			
PRACTICE	Pre-Test Practice	4.033	2.33	0.668	15.93	29	0.0001
	Post-test Practice	6.366		0.556			
ASSESSMENT	Pre-Test Assessment	4.63	2.53	0.808	6.56	29	0.0001
	Post-test Assessment	7.16		2.018			

Table 5 demonstrates that the mean scores for knowledge have doubled between pre-test and post-test. The results of the study on all three aspects (knowledge and practice of nurses and Oral hygiene assessment) were significant (p<0.0001).The results infer that teaching was effective in improving the knowledge, practice and oral hygiene assessment

Table 6 - Association of demographic variables of nurses and their knowledge (N=30)

Demographic Variables		Knowledge			χ <sup>2</sup>	df	p value
		Good	Average	Poor			
Age (in yrs)	Less than 36	8	5	2	3.052	4	0.549
	36 – 45	5	4	2			
	More than 45	1	3	0			
Experience in Nursing (in yrs)	Less than 10	4	4	2	3.547	4	0.471
	10 – 20	9	5	2			
	More than 20	1	3	0			
Experience in ICU (in yrs)	Less than 10	4	4	2	3.515	4	0.476
	10 – 20	9	5	2			
	More than 20	1	3	0			
Gender	Male	1	1	1	0.917	2	0.632
	Female	13	11	3			
	Diploma	2	1	0			
Educational Qualifications	Bachelors Degree	11	11	4	2.808	4	0.590
	Specialization	1	0	0			

Finally, the association of demographic variables of nurses and their details on in-service education with their knowledge was analyzed with Chi square test. Table 6 shows that there is no association between knowledge levels and demographic variables (p >0.05). This infers that nurses' knowledge was independent of their demographic variables.

### Discussion

Present study findings revealed that the improvement in knowledge was highly significant during the post educational sessions. All 30 nurses secured good scores (above 11) in the post test.

Similar findings were noted in a randomized control study by Frenkel<sup>8</sup> that assessed the effect of an oral health care education programme upon knowledge and attitudes of nursing home caregivers. This was further supported by Gathece<sup>9</sup> in their study that used a quasi experimental design; found that oral health education resulted in improved oral health knowledge among those persons living with HIV/AIDS.

All 30 nurses obtained good scores (above a score of four) during the post tests after the prescriptive educational session.

These results were similar to the findings of Tolentino-DelosReyes<sup>10</sup> who had found that after the use of thirty minute education sessions to educate critical care nurses on VAP and techniques for reducing the incidence of VAP by using oral care products and hand hygiene by using a pre-test, post-test design, the nurses performed more oral care on their intubated patients and performed better hand hygiene (p <.05). A quasi-experimental design with pretests and posttests used by Salahuddin ET al.<sup>11</sup> with an educational program about prevention of VAP resulted in better oral care and a decrease in VAP (p=0.02).

The oral hygiene of the mechanically ventilated patients showed a peak rise during the post tests, with 96.7% of patients (29 out of 30 patients) with good oral hygiene (with a score above five). Only 3.3% of patients (1 out 30 patients) continued to have poor oral hygiene status during the post tests. This was explained by other factors like the existing medical condition of the patient himself, effect of antibiotics and steroids, coagulation status, poor nutrition etc. which have not been included in this study.

Although the researcher had completed the intervention in November, there were no changes in VAP rates during this period. The number of VAP infections and hence the VAP rates remained zero during the period between October 2012 to

January 2013.

Similar findings were noted by Fitch et al.<sup>12</sup> in a longitudinal, nonequivalent comparison group quasi-experimental design done in a medical respiratory intensive care unit. The oral cavities of the ICU patients were assessed pre and post education of nursing staff on proper oral care using toothbrush. The oral hygiene had improved in the experimental group ( $p=0.03$ ). Another observational study by Cutler & Davis<sup>7</sup> that examined and found that implementing an oral care protocol had reduced the incidence of VAP in eight randomly picked ICUs in the acute care hospitals of Chicago ( $p=0.001$ ).

The results of the study on all three aspects (knowledge and practice of nurses & Oral hygiene assessment) were statistically significant using t tests. ( $p<0.0001$ ). The results infer that teaching was effective in improving the knowledge, practice and oral hygiene assessment.

These findings were similar to the findings by Kite<sup>6</sup> where the implementation of an education program and the development of oral care routines enabled the nursing staff to provide more consistent care to the ventilated patients. Another study by Salahuddin et al.<sup>11</sup> concluded that education reinforces the importance of oral care and provides opportunities to refine skills and ask questions. The present study findings were in accordance with the previous study findings such as those reported by Tolentino-DelosReyes, Ruppert and Shiao<sup>10</sup> among critical care nurses. The use of thirty minute educational sessions on prevention techniques of VAP had found that the nurses performed more oral care on their intubated patients and performed better hand hygiene ( $p<0.05$ ), and documented in their nursing record more thoroughly ( $p<0.05$ ). Congruent findings were also reported by Salahuddin et al.<sup>11</sup> who developed an educational program on VAP and factors that led to a decrease in its incidence. This had led to better oral care and a decrease in VAP ( $p=0.02$ ). Another study<sup>12</sup> showed the need to have standardized oral care protocols in ICUs to improve quality of oral care provided to ventilated patients.

The study findings revealed that 50% of the participants were below the age of 36 and 13.3% were older than 45. Both the tables VI & VII supported that both the demographic variables and the previous in-service education had no significant association to the knowledge of nurses on oral care practices.

These findings were similar to the study<sup>13</sup> found that 67% the nurses stated oral care education was learned in nursing school

with a focus on non-intubated patients, ( $n = 376$ ) of the respondents; while 48% ( $n = 266$ ) also indicated they were self-taught. Only 21% ( $n = 116$ ) reported receiving training during continuing education courses, and thirty percent ( $n = 165$ ) had learned during in-service sessions. Among them, 96.7% agreed that there was a difference in the ways of providing oral hygiene to intubated and non intubated patients. This study also found that all of the subjects supported the need to develop 'Oral Care Guidelines' in ICU.

In contrary to these results, a study done by Grap, Munro, Ashtiania, and Bryant<sup>1</sup> revealed that oral care is seen many times by nurses as a comfort measure not a way to help extinguish pathogens. Contrary findings were also observed in a study<sup>14</sup> which used a survey method to examine critical care nurses' baseline knowledge regarding VAP and its associated risk factors and the findings showed that the average knowledge level was higher among more experienced nurses (>1 year experience) and those holding a special degree in intensive care. Ninety percent recognized that semi recumbent position is well known to reduce VAP.

However, the researcher found this lack of formal education on oral hygiene among the intensive care nurses and their readiness to learn, to have a positive impact on the study itself.

## Conclusion

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Education of nurses on oral care practices resulted in significant improvement of their practices and on the clinical outcomes among the ventilated patients. Understanding its importance has encouraged the nurses to embrace the new techniques of oral care practices. Continuous and ongoing teaching of nurses is essential in maintaining good oral care practices among mechanically ventilated patients. An oral care protocol along with good oral care practices (like the use of toothbrush, foam swabs, chlorhexidine, lip moisturizer and subglottic suctioning) have a positive influence on reducing the incidence of VAP.

## Recommendations

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Exploring the use of a group of oral care nurses or a group of investigators that perform all oral care on patients could also be considered for increased control over the intervention. Another area to explore is the effect of patient's dental status prior to intubation or the effects of immunodeficiency on the increased risk of VAP. Again, this study could be repeated in a pediatric intensive care.

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## Ethical Clearance

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Consent and approval from the Institutional Review Board of the University and the nursing administration of the involved hospital were obtained prior to the data collection.

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