Effect of Oral Hygiene for Patients on Mechanical Ventilator in Intensive Care Unit

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Abstract

Oral care for patients on the mechanical ventilator is extremely vital in intensive care units, as the problems developing from its negligence can cause long-term oral and nosocomial diseases such as ventilator-associated pneumonia. Maintaining oral health in critically ill patients is an essential nursing activity, and the state of a patient's mouth can be an index of nursing care received. Each critical nurse can play a functional role in reducing and preventing the occurrence of VAP, subsequently improving the patients' recovery rate and consequently reducing healthcare costs. This study **aimed** to assess the effect of oral hygiene for patients on a mechanical ventilator in the intensive care unit and the nurses' knowledge and practice. **Setting** at the intensive care units of Mansoura University Hospital. **The Subjects** included a convenient sample of all available nursing staff working in the ICU, including 40 nurses, and a convenient sample of 60 orally intubated patients admitted to the ICU who underwent mechanical ventilators. **Tools of data collection** were used for data collection are nurses' knowledge questionnaire, nurses' observational checklist, and oral assessment scale. **Results** more than three-quarters of the studied nurses had an unsatisfactory level of knowledge, and about three-quarters of them had an incompetent level of practice regarding oral hygiene for patients on a mechanical ventilator. Meanwhile, regarding the patients' total oral score, it was found that about half of the ventilated patients had average oral alteration, and there was a highly significant relationship between oral alteration and frequency of oral care. **Conclusion** the studied nurses' knowledge and practice were unsatisfactory and there was a highly statistically significant relationship between low frequency of oral care and oral alteration. Also, there was a highly statistically significant relationship between ventilator-associated pneumonia occurrence and poor alteration. **Recommendations** health care settings should provide in-service educational programs and upgrading courses based on evidence-based guidelines.

Keywords: Nurses' Knowledge, Practice, Oral hygiene, Ventilator-associated pneumonia

Introduction

Oral care is the condition or practice of preserving the tissues and structures of the mouth in a healthy state. The primary goal of oral hygiene is to decrease the colonization of the oropharynx and dental plaque by bacteria also to reduce the aspiration of the accumulated colonized saliva that happens as a result of inadequate oral care for critically ill patients in most Intensive care units (ICUs). **(Potter and Perry, 2010)**

Oral care helps to stimulate the flow of saliva, which prevents the mouth from becoming inflamed and sore and maintaining the patient's mouth clean, moist, and free of infection. The aim of oral care also is to keep the mucosa and the lips clean, soft, moist, and intact **(Coker et al., 2017).**

Critical care nurses are the one who decides when and how often oral care is provided starting with the oral assessment to identify the need to maintain a good standard of oral hygiene and to provide baseline information to evaluate oral care interventions resulting in reduced incidence of the complications **(Andersson et al., 2018)**

Many nurses are not aware of the link between the oral health of mechanically ventilated patients and ventilator-associated pneumonia (VAP), which is considered to be the most common complication that mechanical ventilator carries because this topic is insufficiently covered in nursing education. However, cumulative evidence found that insufficient mouth care for intubated patients may contribute to the aspiration of the contaminated secretions into the lungs **(Coppadoro et al., 2012).**

The Institute for health improvement (IHI) recommended a bundle of care for mechanically ventilated patients to decrease the incidence of VAP to zero. This bundle includes 5 strategies: elevating the head of the bed to at least 30 degrees, daily interruption of sedation and regular assessment of the readiness to extubate, peptic ulcer prophylaxis, deep venous thrombosis prophylaxis, and daily oral care with chlorhexidine (CHX) **(Morton and Fontaine, 2013)**

Lack of adequate oral care using chlorhexidine gluconate and widespread tooth brushing is a serious problem because it is considered more effective than sponge swabs at removing the dental plaque that can be a major

reservoir of the respiratory pathogens which may be aspirated and contribute to VAP. **(Dale et al., 2013).**

Finally, oral hygiene for intubated and mechanically ventilated patients has developed from being a matter of patient comfort to be a matter of VAP prevention. If the benefits of oral care outweigh the risks, accurate oral care procedures should be considered an essential and crucial component of critical care nursing. Hence, this study was carried out to determine the effect of oral care on mechanically ventilated patients in the intensive care unit.

Significance of the study

Providing oral hygiene to patients on a mechanical ventilator is expected by hospitals to be routine nursing treatment, but there is no consistent or standardized oral care provided, as most nurses do not know how to provide proper oral care to patients on a mechanical ventilator when they begin their practice. This leads to the worsening of the condition of intubated patients over time. Ventilator-Associated Pneumonia is the most common infection related to oral care in ICUs. Therefore, nurses must be aware of the effect of oral hygiene care for patients on a mechanical ventilator for early identification of oral hygiene problems then proper intervention to prevent complications and set treatment strategies.

In Egypt, the most recent eight studies that are concerned with an analysis of VAP revealed that the incidence of VAP ranged from 16% to 75%, with the lowest ratio in Alexandria and the highest one in Ain Shams University. Compared with the VAP worldwide, 10-28%, and in the United States, 9-28%, the incidence of VAP in our ICUs is about 2.5 times more **(Fathy et al., 2013).**

Aim of the study:

The study aims to assess the effect of oral hygiene care for patients on a mechanical ventilator in the intensive care unit by:

1. Assessing nurses' level of knowledge regarding oral care of patients under a mechanical ventilation.
2. Assessing nurses' level of practice regarding oral care of patients under mechanical ventilation.
3. Assessing the effect of oral hygiene on patients on a mechanical ventilator.

Research questions:

1. What is the nurses' level of knowledge regarding oral care of patients on mechanical ventilation?
2. What is the nurses' level of practice regarding oral care of patients on mechanical ventilation?
3. What is the effect of oral hygiene care for patients on mechanical ventilation in the intensive care unit?

The study was portrayed under the four designs as follows: -

I. Technical design
II. Operational design
III. Administrative design
IV. Statistical design

I-The technical design

The technical design included research design, setting, subjects, and tools of data collections

Research design:

A descriptive exploratory design was used to achieve the aim of this study.

Setting:

This study was conducted at the Intensive Care Units at Mansoura University Hospital. It is located at the second floor ,it had 2 sections, each section had 8 beds ;the total unit beds were 16 beds

Subjects:

The subjects of the present study included:

- A convenience sample of 40 nurses after obtaining oral consent to participate in the study, the nurses had different qualifications and years of experience.
- A convenience sample of 60 orally intubated patients admitted to ICU and underwent a mechanical ventilator.

Tools of data collection:

Data collection was obtained using major two tools which were reviewed by a panel of experts in critical care nursing; they consisted of the following:

I) Administrated questionnaire for nurses:

It is divided into three parts:

Part 1: It was concerned with the assessment of the demographic characteristics of the nurses, such as age, educational level, years of experience, and previous training courses.

Part 2: It was concerned with the assessment of nurses' knowledge developed by the researcher to assess nurses' level of knowledge regarding oral hygiene routines. It included 16 questions in the form of multiple-choice questions (MCQs).

Scoring system: A total score for the questionnaire was 16 grades. A score less than 80% was considered unsatisfactory and a score equal to or more than 80 % was considered satisfactory

Part 3: It was developed by the researcher based on a comprehensive review of the related literature to assess the actual nurses' level of practice regarding oral hygiene routines for patients under mechanical

ventilation in the intensive care unit. It is composed of 14 items; two of them were included 11 subitems.

Scoring system: The total score for the checklist was 23 grades. A score of less than 80% was considered an incompetent level of practice, and a score equal to or more than 80 % was considered a competent level of practice.

Administrated questionnaire for patients which included three parts:

Part 1: It was concerned with the assessment of the demographic characteristics of the patients involved in the following items: Age, gender, history of smoking, the reason for admission, and total ICU length of stay.

Part 2: It was concerned with patients' data related to a mechanical ventilator, which includes the Intubation process (emergent, elective), the reason for intubation, intubation duration, frequency of oral care, and ventilator-associated pneumonia if documented.

Part 3: Oral assessment Score: This part is adopted from the oral assessment guide, which has been developed by **Eiler's et al. (1988)**. It is used to assess the oral health status of intubated patients. It includes six subscales (lips, tongue, saliva, mucous membranes, gums, and teeth; each one has three subscales, So the total score ranged from 6 to 18. The score is ranking as follows: (6) good, (7-12) average, (13-18) poor.

II-Operational design

The operational design included a preparatory phase, content validity, and reliability, the pilot study, and fieldwork.

A. Preparatory phase

It included reviewing the current and past local and international related literature and the theoretical knowledge of various aspects of the study using books, articles, the internet, periodicals, and magazines to develop tools of data collection.

B. Content validity and reliability

After the construction of data collection tools, the content validity of the tools was assessed by a jury group consisting of 6 experts in the medical-surgical nursing department, at Ain Shams University,who review the tools to insure its validity for comprehensiveness, clarity, and accuracy. The tools were rephrased based on jury opinions, recommendation, addition and correction. Modifications of some items were done.

Internal consistency reliability was assessed in the present study tools via Cronbach's Alpha reliability analysis to indicate how well the items in an instrument fit together conceptually, (Alpha Cronbach's test scores were 0.72 for nurses' knowledge questionnaire, 0.73 for nurses' observational checklist and 0.92 for the Oral assessment score).

C. Ethical consideration

Approval was obtained from the scientific research ethical committee of the faculty of Nursing, at Ain Shams University. Participation in this study was voluntary; nurses were informed about the purpose, procedure, benefits, and nature of the study. Nurses were informed about their rights to withdraw from the study without any cause. The confidentiality and anonymity of each nurse were assured through the coding of all data.

Pilot study

A pilot study was carried out on four nurses and six patients (10%) to test the feasibility, objectivity, and applicability of the study tools. Based on the results of the pilot study, needed refinements and modifications were done, and the pilot study subjects were excluded from the actual study subjects.

D. Fieldwork

The researcher informed nurses who agreed to participate in the study about the nature and purpose of the study. The actual work of this study started and was completed within six months from august (2018) until the end of January (2019). Data were collected by the researcher ,three days per week, in morning and afternoon shifts in the previously mentioned settings.

The self-administered questionnaire tool was distributed to the studied nurses in their workplace; each questionnaire took about 15 minutes to fill it.

Nurses' practice was assessed using an observational checklist by the researcher. Maximum of three nurses were observed per day during their administration of oral care for patients.

The studied nurses were assured that the information collected would be treated confidentially and that it would be used only for the study.

III-Administrative design

The necessary approval was obtained from the hospital director. A letter was issued to them from the faculty of nursing, at Ain Shams University explaining the purpose of the study to obtain permission for conducting this study.

IV-Statistical design

All data were collected, tabulated, and subjected to statistical analysis. Statistical analysis was performed by Statistical Package for the Social Sciences (SPSS) in general (version 22); also, Microsoft Office Excel was used for data handling and graphical presentation. Quantitative variables were described by the Mean, Standard Deviation (SD). Proportions and percentages described qualitative categorical variables.

The chi-squared test is applied for categorical variables and Pearson's correlation coefficient for quantitative variables. Significance level is considered at P 0.05; while for P > 0.001 is considered highly significant.

Results:

Table (1) revealed that 62.5 % of the studied nurses' age ranged between 20 - < 30 years with a mean age of 35.7 ± 12.6, 72.5 of them had a Bachelor of nursing as well 35.0 % had <1 year of experience in intensive care unit with a mean number of years 1.97± 0.83 and 60.0 % had no training course regarding oral care.

Figure (1) illustrated that 10 % of the studied nurses had satisfactory level of knowledge regarding the oral care of patients under mechanical ventilation, while 90% of them had an unsatisfactory level of knowledge regarding the oral care of patients under mechanical ventilation.

Figure (2) illustrated that 30% of the studied nurses have a competent level of practice regarding oral care of patients under mechanical ventilation, while an incompetent level of practice regarding oral care of patients under mechanical ventilation was, 70 %

Table (2) This table showed that there is no significant relationship between nurses' knowledge, and nurses' practice regarding the oral care of patients under mechanical ventilation.

Table (3) showed that the mean score of patients, age was 46.88±17.63, and males studied subjects 58.3 %, while 41.7 % were females. 55.0 % of the studied subjects have a history of smoking. 33.3 % of the studied subjects were admitted to ICU because of loss of consciousness and 71.7 % had a total length of stay in theICU of more than 7 days.

Table (4) explained, as regards to intubation process, about 71.7 % had emergent intubation compared to 28.3 % had elective intubation. 28.3% had respiratory failure as a reason for intubation, and 31.7% were intubated to protect the airway. Also, 68.3% of their intubation duration was more than 7 days. Also, 21.7% were diagnosed with VAP. 46.7% of the studied patients underwent oral care once or twice per day.

Table (5) presents an oral health assessment, which showed that 60.0 % of patients have Dry or Cracked lips. Regarding Tongue, it was found that 45.0 % had Coated & loss of papillae tongue. As regards, saliva noted that 51.7 % had sick saliva.

Concerning the mucous membrane, 43.3 % of patients had Reddened or coated (whiteness) without alteration of the mucous membrane. Regarding gum assessment, 45.0 % had spontaneous bleeding or bleeding with pressure. Also, 60.0 % had Gum lines or local debris. Regarding the total score, it was found that 53.3 % had average oral alteration.

Table (6) revealed that there was a highly significant relationship between gender and oral alteration, also a highly significance between the history of smoking and oral alteration at p. value≤ 0.001, also there was a highly significant relationship between ICU length of stay and oral alteration at p. value ≤ 0.001.

The relationship between loss of conciseness as a reason for admission and oral alteration showed a highly significance at p. value ≤ 0.001.

Table (7) revealed that there was a highly significant relationship between oral alteration and intubation duration at p. value <0.001. And also between oral alteration and ventilator-associated pneumonia there was a highly significant relationship at p. value <0.001. Also there was a highly significant relationship between oral alteration and frequency of oral care at p. value <0.001.

Table (1): Frequency and percentage distribution of the studied nurses as regards their demographic characteristics (n= 40)

Items		No	%
Age	<20	6	15.0
	20 - <30	25	62.5
	30 - < 40	9	22.5
Mean± SD	35.7 ± 12.6		
Education	Nursing diploma	2	5.0
	Technical institute	9	22.5
	Bachelor of nursing	29	72.5
Years of Experience in the intensive care unit	<1	14	35.0
	1-5	13	32.5
	> 5	13	32.5
Mean± SD	1.97 ± 0.83		
Training course regarding oral care	Yes	16	40.0
	No	24	60.0

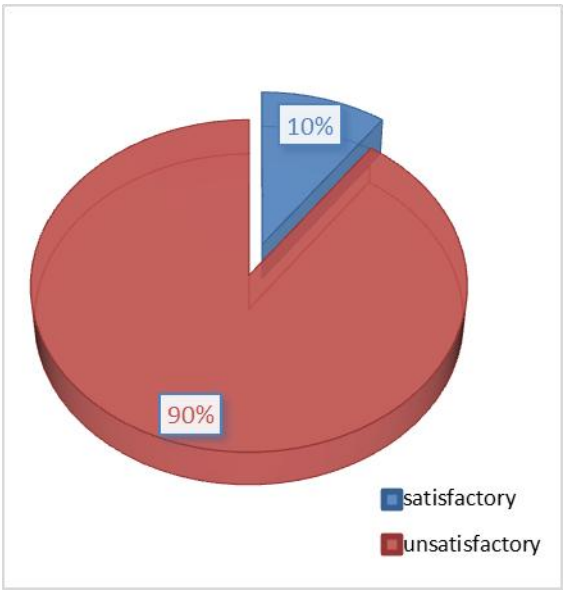

Figure (1): Frequency and percentage distribution of the studied nurses' level of knowledge regarding oral care of patients under mechanical ventilation. (n= 40)

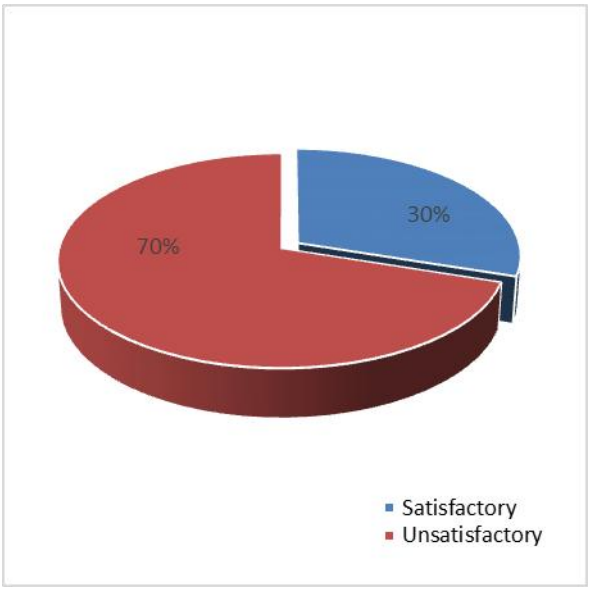

Figure (2): Frequency and percentage distribution of the studied nurses' level of practice regarding oral care of patients under mechanical ventilation. (n= 40).

Table (2): Relations between nurses' knowledge and nurses' practice regarding oral care of patients under mechanical ventilation. (n=40)

Nurse's Practice	Knowledge						Test of significant	
	Satisfactory		Unsatisfactory		Total			
	No	%	No	%	No	%	X2	P-value
Competent	1	25.0	11	30.6	12	30.0%		
Incompetent	3	75.0	25	69.4	28	70.0%	.053	.818
Total	4	10	36	90	40	100.0%		

*p. >0.05 insignificant, ≤ 0.05 significant difference, P ≤ 0.001 highly significant difference

Table (3): Number and distribution of the studied subjects according to their demographic characteristics (n=60)

Demographic characteristics	No	%
Age		
≤40y	25	41.7
>40y	35	58.3
Mean± SD	46.88±17.63	
Gender		
Male	35	58.3
Female	25	41.7
History of Smoking		
Yes	33	55.0
No	27	45.0
Reason for admission		
Loss of consciousness	20	33.3
Trauma	3	5.0
Respiratory problems	21	35.0
Post-operative	10	16.7
Others	6	10.0
Total ICU Length of stay		
≤7 days	17	28.3
>7 days	43	71.7
Mean± SD	13.91 ± 7.89	

Table (4): Number and distribution of the studied subjects according to the ventilator related data (n=60)

Ventilator related data		N	%
Intubation Process	Emergent	43	71.7
	Elective	17	28.3
Reasons for intubation	respiratory failure	17	28.3
	Glasco Coma Scale 5	9	15.0
	hemoptysis	2	3.3
	protect airway	19	31.7
	hypercapnia	10	16.7
	epileptic seizure	2	3.3
	CPR	1	1.7
Intubation duration	≤7dayas	19	31.7
	>7days	41	68.3
	Mean± SD	12.9 ± 9.51	
VAP if documented	Yes	13	21.7%
	No	47	78.3%
Frequency of oral care	1-2 per day	28	46.7
	3-4 per day	22	36.7
	5-6 per day	10	16.6

Table (5): The distribution of patients' score regarding oral assessment scale(n=60)

Oral Assessment		N	%
Lips	Smooth, Pink and Moist	11	18.3
	Dry or Cracked	36	60
	Ulceration or bleeding	13	21.7
Tongue	Pink, Moist & papillae present	19	31.7
	Coated & loss of papillae with shiny appearance with or without redness	27	45.0
	Blistered or cracked	14	23.3
Saliva	Watery	21	35.0
	Sick	31	51.7
	Absent	8	13.3
Mucous Membrane	Pink & Moist	24	40.0
	Reddened or coated(whiteness) Without alteration	26	43.3
	Ulceration with or without bleeding	10	16.7
Gums	Pink, Stippled & firm	22	36.7
	Spontaneous bleeding or bleeding with pressure	27	45.0
	Edematous with or without redness	11	18.3
Teeth	Clean & no debris	15	25.0
	Gumline or local debris	36	60.0
	Generalized plaque debris along	9	15.0
Total	Poor	17	28.3
	Average	32	53.3
	Good	11	18.3

Table (6): Relationship between oral alteration and patients' demographic data(n=60)

Demographic data	Oral alteration						χ^2	P
	Poor		Average		Good			
	No	%	No	%	No	%		
Age								
<40y	5	29.4%	14	43.8%	6	54.5%	1.858	0.395
>40y	12	70.6%	18	56.3%	5	45.5%		
Gender								
male	11	64.7%	23	71.9%	1	9.1%	13.672	0.001*
female	6	35.3%	9	28.1%	10	90.9%		
History of smoking								
No	7	41.2%	9	28.1%	11	100%	17.227	<0.001*
yes	10	58.8%	23	71.9%	0	0%		
ICU length of stay								
<7d	0	0%	9	28.1%	8	72.7%	17.398	<0.001*
>7d	17	100%	23	71.9%	3	27.3%		
Reasons of admission								
Loss of consciousness	7	41.2%	5	15.6%	8	72.7%	12.668	<0.001*
Trauma	1	5.9%	2	6.3%	0	0%	0.712	0.700
Respiratory problems	6	35.3%	13	40.6%	2	18.2%	1.813	0.404
Post-operative	2	11.8%	7	21.9%	1	9.1%	1.374	0.503
Others	1	5.9%	5	15.6%	0	0%	2.667	0.263

*p. >0.05 insignificant, ≤ 0.05 significant difference, P ≤ 0.001 highly significant difference.

Table (7): Relationship between oral alteration and Ventilator related data

Ventilator related data	Oral alteration						χ2	P
	Poor		Average		Good			
	No	%	No	%	No	%		
Intubation process								
emergent	9	52.9%	26	81.3%	8	72.7%	4.389	0.111
elective	8	47.1%	6	18.8%	3	27.3%		
Intubation duration								
<7d	0	0%	10	31.3%	9	81.8%	20.666	<0.001*
>7d	17	100.0%	22	68.8%	2	18.2%		
VAP if documented								
no	6	35.3%	30	93.8%	11	100.0%	20.266	<0.001*
yes	11	64.7%	2	6.3%	0	0%		
Frequency of oral care								
1-2	16	94.1%	12	37.5%	0	0%		
3-4	1	5.9%	17	53.1%	4	36.4%	39.085	<0.001*
5-6	0	0%	3	9.4%	7	63.6%		
Reason of intubation								
GCS 5	2	11.8%	4	12.5%	3	27.3%		
hemoptysis	0	0%	2	6.3%	0	0%		
respiratory failure	6	35.3%	9	28.1%	2	18.2%		
protect airway	5	29.4%	9	28.1%	5	45.5%	11.691	0.471
hypercapnia	2	11.8%	7	21.9%	1	9.1%		
Epileptic seizure	2	11.8%	0	0%	0	0%		
CRP	0	0%	1	3.1%	0	0%		

*p. >0.05 insignificant≤ 0.05 significant difference, P ≤ 0.001 highly significant difference
(*) highly statistically significant (p<0.001)

Discussion:

Regarding the demographic characteristics of the nurses in the current study, the results revealed that the majority of the studied nurses' age was between 20 <and30 years. From point of my view that the most of those nurses were newly graduated, young and tolerant of the nature of hard work. This finding is consistent with **Lin et al., (2014),** who stated that more than half of the respondents were aged between 20 to 30 years in the study titled "Critical care nurses' knowledge of measures to prevent ventilator-associated pneumonia."

Regarding education, more than half of the nurses have a bachelor's degree in nursing. This finding goes hand in hand with **Feider et al., (2010)**; Who stated that more than half of the studied nurses reported a baccalaureate degree (BSN) as the highest degree earned in a study entitled "Oral care practices for orally intubated critically ill adults".

Regarding years of experience in the intensive care unit, the present study showed that, nurses' working years in the ICU was 1.97 as average and more than one-third of the studied nurses had experienced less than 1 year. Also about one -third of them had been working as ICU nurses >5 years which is consistent with **Al-Sayaghi, (2014**); who stated that about one third had been working as nurses for >5 years, in a study titled "Prevention of ventilator-associated pneumonia A knowledge survey among intensive care nurses in Yemen".

Regarding training about oral hygiene, the current study showed that about two-thirds of the studied nurses had no training course regarding oral hygiene for patients on mechanical ventilators, which may affect their practice negatively. This finding is consistent with **(Prendergast et al., (2013);** who found that more than two- thirds of the studied nurses' staff reported never received education in providing oral hygiene, in a study entitled " The Bedside Oral Exam and the Barrow Oral Care Protocol: Translating evidence-based oral care into practice".

Regarding total nurses' knowledge, the results of the current study indicated that more than three-quarters of the studied nurses had unsatisfactory knowledge regarding oral hygiene for patients on mechanical ventilators in the intensive care unit. This finding is consistent with the results of the study in Alexandria, Egypt by **El-Soussi, & Asfour, (2017);** who found that nurses' knowledge was unsatisfactory (100%) regarding oral care as their total marks were less than 70% in a study titled with "A return to the basics; nurses' practices and knowledge about interventional patient hygiene in critical care units"

As regards to the total nurses' practice, the present study showed that about three-quarters of the studied nurses had an incompetent level of practice regarding oral hygiene for patients on

mechanical ventilators in the intensive care unit. This result is consistent with **Ibrahim et al., (2015).** who stated that only about one-quarter of the studied nurses were found to apply good practice regarding oral hygiene for patients on mechanical ventilator, in the study titled with "Nurses' Knowledge, Attitude and Practice of Oral Care for Intensive Care Unit Patients". Also, in Egypt, **El-Soussi& Asfour (2017)**; found that more than three quarters of nurses had an improper level of practice regarding oral care in a study entitled "A return to the basics; nurses' practices and knowledge about interventional patient hygiene in critical care units."

The American Association of Critical Care Nurses (AACN, 2007) produced a "practice alert" based on the current best evidence, describing recommended oral care for the critically ill. However, most of the nurses in this study provided oral care intervention once or twice daily, brushing or antiseptic solution were not used despite the evidence that showed a better scenario among patients undergoing tooth brushing plus 0.12% chlorhexidine gel to lower the incidence of VAP (**de Lacerda Vidal et al.,2017).**

The researcher point of view, this finding may be due to the unavailability of oral care supplies; completion of oral care is often not a priority in nurses' clinical practice and the absence of the oral care protocol in the studied ICU. This is similar to the findings of a study conducted by **Moustafa et al., (2016)** at Mansoura Main University Hospital, who reported the absence of oral care protocol in the studied ICUs. Also consistent with **Alhirish et al.,(2010),** who found that oral care is carried out without the use of tooth brushing or antiseptic solutions in a study entitled " Compliance of Evidence-based Guidelines for Preventing VAP in CCUs." This is explaining the discrepancies in the practice of oral care among the nurses.

In the same line, this study found that there were variation in nursing practice toward oral care, despite the strong evidence which supports the effectiveness of Chlorhexidine in reducing the incidence of VAP, most nurses use saline as a mouthwash solution, and CHX was not used in the studied ICUs. Despite that, normal saline has limited use as a mouth rinse due to its tendency to cause dryness and its ineffectiveness in removing dental plaque or debris from the mouth**(Zhang et al.,2017).**

This result is consistent with **Kandeel and Tantawy (2012)** in Egypt, who stated that the most of the nurses use normal saline with gauze pad on a tongue depressor to do oral care in a study entitled (Current nursing practice for prevention of ventilator-associated pneumonia in ICUs).

The researcher point of view, that the inadequacy of nurses' knowledge and practice reflects the fact that they are not knowledgeable or trained enough to provide oral hygiene for patients on a mechanical ventilator. No standard guidelines for administering oral hygiene for patients on a mechanical ventilator, absence of consistent policies and protocols, and lack of continuous supervision and evaluation during the procedure.

Regarding the demoghraphic characteristics of the studied patients, the mean age of the patients in the current study is 46.88±17.63 years, concerning gender, it was noted that about two-thirds of patients were males. This result is consistent with **(Moustafa et al., 2016)** who stated that the mean age of the patients in the study was 41.0 ±12.5 and more than two-thirds of patients were males in a study titled (The effect of oral care intervention on the occurrence of ventilator-associated pneumonia).

Meanwhile, our study showed that the mean duration of ICU stay was 13.91±7.89 days and more than two-thirds of patients had ICU stay of more than 7 days which is consistent **with de Lacerda Vidal, (2017)** who reported that the mean duration of stay was 13.9 ± 8.6 days in a study "Impact of oral hygiene involving tooth brushing versus chlorhexidine in the prevention of ventilator-associated pneumonia)".

Concerning ventilator data, the result showed that about two-thirds of the patients who have an intubation duration of more than 7 days with a mean duration of intubation days were 12.9±9.51 days, which is congruent with **Moustafa et al., (2016),**and not congruent with **Nicolosi et al.,(2014)**who found that the mean duration of mechanical ventilation was 13.4±10.2 hours in study" Effect of orl hygiene nd 0.12% chlorhexidine gluconate oral rinse in preventing ventilator-associated pneumonia after cardiovascular surgery"

Regarding the frequency of oral care, in the current study, oral care provided to approximately half of the patients once or twice daily.Previous surveys have reported that about three quarters of ICUs provide oral care at least once a day to all receiving mechanical ventilation(**Klompos,2015**).

This goes hand in hand with **Ibrahim et al.,(2015)** who stated that more than half of the nurses reported tht they performed mouth care twice daily.

Regarding oral assessment scale, Eilers et al.,(1988) developed and tested an oral assessment guide for oncology patients,and Barnason et al.,1998 adapted this tool for the assessment of orally intubated patients.Regarding oral status, the study showed that half of the patients had average oral alteration, more than one quarter had poor alteration, and those with good oral status had intubation duration less than 7 days.

Also, the current study revealed that scores of oral assessment guide regarding lips,tongue, teeth reflected worsening conditions as the period of intubation increased, the condition of the oral status become more worsen to include(saliva, mucous membrane, and gingival).Since the two-thirds of the studied patients hd intubation duration more than 7 dys, this explains the deterioration of the patients,

oral condition, and this finding support the hypothesis that oral health condition deteriorates during intubation, if there is no competent early oral care intervention provided **(Bassi et al., 2014).**

The study shows that there was a significant relationship between the history of smoking and oral alteration, this supports the fact that smoking is one of the risk factors that make patients candidates for severe oral alteration **(Moustafa et al., 2016).** The current study shows a significant relationship between the ICU length of stay and oral alteration, also all the patients documented to have VAP had ICU length of stay of more than 7 days while the length of stay in patients without VAP was less than 7 days. This finding goes hand in hand with **Caserta et al. (2012**), who stated that VAP prolongs ICU length of stay. Moreover, **Muscedere et al. (2011)** reported that the mean, standard deviation for ICU length of stay days in patients with VAP was 8 days.

As the duration of the intubation increased, the condition of the oral status become more worsen to include saliva, mucous membrane, and gingival. These findings support the hypothesis that oral health status deteriorates during intubation if there is no competent early oral care intervention provided **(Bassi et al., 2011)**.

The current study illustrates that there was a strong positive relationship between frequency of oral care and the occurrence of VAP.it may be related to the fact that poor oral hygiene had been linked to respiratory pathogen colonization. Many studies have documented that the oral cavity might be a reservoir for the pathogens responsible for aspiration pneumonia in high-risk patients. This finding lies in accordance with **Garrouste et al., (2008)** who reported that the bacterial colonization of the oropharynx which occurred in the majority of patients and microorganisms isolated from the mouth before diagnosis of pneumonia were identical to the pathogens that cause pneumonia in a study titled "Oropharyngeal or gastric colonization and nosocomial pneumonia in adult intensive care unit patients: a prospective study based on genomic DNA analysis".

Conclusion

Based on the findings of the study, the researcher concluded that:

- The study demonstrated that more than three-quarters of the studied nurses had unsatisfactory knowledge, and three-quarters of them had an incompetent level of practice regarding the effect of oral hygiene for patients on a mechanical ventilator in the intensive care units, and generally, they were ill-equipped to apply care for their patient's oral hygiene.
- The study revealed that more than half of the studied patients had average oral alteration. Moreover, there was a high statistically significant relationship between the low frequency of oral care and oral alteration.
- The study demonstrated there was a high statistically significant relationship between ventilator-associated pneumonia occurrence and poor oral alteration.
- The study demonstrated there was a significant association between oral alteration and smoking, ICU lenghth of stays, intubation duration, unconsciousness, low frequency of oral care, and VAP occurrence, and this mean that smoking, unconsciousness, and ICU length of stay were the most risk factors that make patients candidates for oral alteration.
- The results of this study indicate that oral care currently provided in ICUs may be ineffective in removing dental plaque and respiratory pathogens from the oropharynx of ventilated patients, which contributes to the deterioration of oral health and increases the incidence of VAP.

Recommendations

Based on the study findings, the researcher suggested the following recommendation:

- Provide ongoing and regular in-service education and training programs regarding evidence-based guidelines that should include oral hygiene for patients on a mechanical ventilator and VAP prevention.
  - Establishing policy and designated oral care protocol that is revised and updated annually as oral care should be a focused skill.
  - Adding reliable and valid oral assessment tools to ICU care sheets at the bedside to improve and standardize how nurses conduct and document oral care including the condition of the teeth, gums, tongue, mucous membranes, and lips.
  - Equipment and supplies required for oral care intervention should be available in each intensive care unit.
  - Resources and time should be allocated to training in order to ensure patient safety and minimize adverse incidents.
- The study should be replicated in a large sample in different hospital settings to generalize the results and evaluate the ideal frequency of oral care.
- Further research is needed to manage factors and barriers affecting nurses' performance regarding oral hygiene for the patient on a mechanical ventilator.

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