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The Effect of Oral Care Intervention on the Occurrence of Ventilator-associated Pneumonia

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Abstract

Aim: Oral care is too forgotten in the physiological crises of critical illness, but problems developing from their time in ICU can cause long-term oral and nosocomial disease. Maintaining oral health in the critically ill patient is an essential nursing activity and the state of a patient's mouth can be an index of nursing care received. Critical care nurses can contribute a lot in the prevention of VAP, and thereby helps to reduce healthcare costs. Understanding VAP and its risk factors can make nurses more prepared in handling the problem. Preventive measures should be widely applied to daily nursing care. 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 evaluate the effect of oral care intervention on the occurrence of ventilator-associated pneumonia

Methods: The sixty patients were assigned in two groups (control and study) thirty in each. The control group involved patients receiving the routine nursing oral care while the study group involved patients who utilized oral care intervention using toothbrush and chlorhexidine

Results: A Statistical significant difference was found between both groups as regard to occurrence of Ventilator associated pneumonia VAP (p=0.001). Regarding, days of ICU stay. It was found that only 33.3% of patients in the study group stayed more than 7 days in the ICU compared to73.3% of patients the control group. There was a significant difference between the two groups (p=0.002). There were no statistically significant differences between the two groups (on day1) among the oral assessment. There were highly statistically significant differences among both groups in relation to oral assessment after completion of oral care intervention (p<0.001). Regarding the sixth day of intervention, it can be observed that more than half of patients in the control group suffered from severe oral alteration (11+) compared to patients in the study group. There was a highly statistically significant difference between the study and control groups at the end of intervention (p<0.001). Following up these patients and occurrence of VAP at the end of oral care intervention, it can be noted that There was a highly significantly difference among patients in the control group and patients in the study group (p=0.006).

Conclusions: The findings indicate that comprehensive oral care intervention appears to be effective in improving oral health status and reducing Ventilator associated pneumonia occurrence.

Keywords: Ventilator-associated pneumonia; Oral care; Pneumonia

Introduction

Maintaining oral care in critically ill patients is an essential nursing activity. In the ICU, the mouth often facilitates entry for life sustaining interventions, such as endotracheal intubation for ventilation and orogastric tubes for enteral nutrition. Unfortunately, these interventions require patients to maintain an open mouth, and impair the natural airway defence's. This vulnerable position, in combination with other treatments, can contribute to a rapidly deteriorating oral state and dependence on nursing to alleviate tube-related discomfort, thirst, oral lesions and the accumulation of saliva, sputum and oral bacteria. Therefore, the state of a patient's mouth can be an index of nursing care received [1].

Ventilator-associated pneumonia (VAP) is now the major justification for frequent oral hygiene. Increasing concerns about the morbidity and mortality associated with nosocomial pneumonia prompted research to try to identify precursors to this often-lethal infection. Evidence suggested that inadequate mouth care for intubated patients may contribute to the aspiration of bacteria in oropharyngeal secretions, which can cause VAP [2].

In Egypt, the most recent study that is concerned with an analysis of VAP studies done in Egyptian University Hospitals in the last 10 years revealed that incidence of VAP ranged from 16% to 75%, with the lowest ratio in Alexandria and the highest one in Ain Shams University, while the incidence in Mansoura University Hospitals was 22.6% [3]. Comparison with incidence of VAP World Wide, 10-28% and in the United States 9-27%, it means that incidence of VAP in our ICUs is about 2.5 times more [4].

Many nurses are unaware of the link between oral health and VAP, because the topic is inadequately covered in nursing education. Despite a number of strategies that have been proposed for preventing VAP, it was found that only a few have been demonstrated to be effective, and

many others still need evaluation in large randomized clinical trials before definitive recommendations can be made [5].

Oral assessment is very important in assessing patient's oral status. The majority of nurses have not been formally trained in assessing the oral status of patients in ICUs. Such assessment aims to identify needs to maintain a good standard of oral hygiene, provide baseline information to evaluate oral care interventions and has the potential to reduce the incidence or severity of oral complications [6].

Finally, oral hygiene for intubated and mechanically ventilated patients has evolved from a focus on patient comfort to the prevention of VAP. If the benefits of oral care outweigh the risks, precise oral care procedures and adequate evidence to support these processes are needed. If providing systematic oral care using tooth brushing and CHX can maintain oral health, decrease the incidence of VAP and other outcome measures, the care should be considered an important and critical component of critical care nursing. Therefore, this study was carried out to determine the effect of oral care intervention on the occurrence of VAP.

Aim of the Study

The aim of the present study is to determine the effect of oral care intervention on the occurrence of ventilator-associated pneumonia.

Hypothesis of the Study

Oral care intervention will be expected to

- Improve oral health status
- Reduce incidence of ventilator-associated pneumonia

Subjects and Methods

Research design

A quasi-experimental design was used in the conduction of this study.

Setting

This study was conducted at the General Intensive Care Unit (GICU), Mansoura International Hospital.

Subjects

Sixty patients orally intubated critically ill patients of both sex, and fulfilling the inclusion criteria. The patients were divided into two groups (control and study groups) 30 patients in each. The control group involved patients who received routine hospital nursing care by critical care nurses while the study group involved patients who received oral care intervention (using tooth brushing and 0.12% CHX solution) by the researcher. Patients remained in the study for a maximum of 6 days.

Patients were excluded from the study if they had a clinical diagnosis of pneumonia at the time of admission and/or a modified Clinical Pulmonary Infection Score (CPIS) of 6 or greater. Patients had a previous endotracheal intubation during the current hospital admission, patients who had contraindication to oral care intervention such as severe oral trauma, oral ulcerations, facial fractures or unstable cervical fractures. Patients known of allergic to chlorhexidine were also excluded from the study.

Tools

Two tools were developed to collect data of the study

Tool one "VAP Assessment Sheet"

This tool was adopted from Singh et al. [7] and was used to assess the subjects for clinical diagnosis of VAP. It consists of two parts:

Part I: "Vap diagnostic criteria sheet": This part includes Modified Clinical Pulmonary Infection Score (modified CPIS) data and diagnostic criteria of based on 6 clinical assessments, each worth 0-2 points, including: body temperature, number of white blood cell count, quantity and purulence of tracheal secretions (rare secretion, abundant and abundant purulent secretion), oxygenation (calculated as PaO_2 divided by the fraction of inspired oxygen), chest radiography finding (no infiltrate, diffuse infiltrate and localized infiltrate) and results of sputum culture and Gram stain. A CPIS>6 as a clinical definition of VAP was associated with a high likelihood of pneumonia with a sensitivity of 93% and specificity of 100% for diagnosis of VAP comparing quantitative BAL culture. Due to the drawback of the CPIS because it is associated with a delay of 24-48 h for the results of tracheal aspirate culture.

Points for each variable of the modified CPIS were summed, yielding a total CPIS. The score was varying from 0 to 10 for data analysis. CPIS culture was calculated from the CPIS baseline score by adding two more points when gram stains or culture was positive. A score of more than six at baseline or after incorporating the gram stains was considered suggestive of pneumonia (defining CPIS>6 as a diagnosis of pneumonia and CPIS<6 as absence of pneumonia).

Part II: "Ventilation data": It includes intubation process (urgent, elective), duration of mechanical ventilation, tube size and mode of ventilator (controlled, assisted or spontaneous).

Part III: "Demographic and health relevant data": This part were obtained from the patients' medical record such as patient's age, sex, level of education, smoking, date of admission and date of discharge, reason for admission to the ICU, diagnosis, current drugs intake, and methods of nutrition provided to the patients to assess risk factors associated with VAP occurrence.

Tool two " Oral assessment sheet"

This part was adopted from the oral assessment guide, which had been developed by Eiler's and Barnason et al. [8]. It used to assess the oral health status of intubated patients. The original oral assessment guide composed of 8 items. It includes voice, swallow, lips, tongue, saliva, mucous membranes, gingiva, and teeth.

Each item of the oral assessment grade was rated on a 3-point scale: score of 1 was normal finding; a score of 2 was mild alteration without compromise of either mucosal integrity or loss of function; and a score 3 was severe abnormality with marked compromise of either mucosal integrity or loss of function. Each category is treated as a subscale, and the total score is a sum of 8 subscales. Content validity for the tool has been established, and it has a high reported interrater reliability (r=0.91).

Consequently, the total scores range from 6 to 18. The score was ranked as follows [6-10] denotes mild alteration of mouth, and [11-18] denotes severe alteration.

Method

Permission to conduct the study was obtained from the hospital administrative authority after explanation of the aim of the study. Tools were developed after reviewing the related literatures and were tested for its content related validity by six experts in the field (two critical care nursing educators, two anaesthesiologists, one bacteriologist and one statistician); any necessary modifications were done prior to data collection.

Informed consent was taken from the patient's significant others to perform the present study. A pilot study was carried out in order to assess the clarity, feasibility and the applicability of the data collection tools. It was conducted on 6 patients who met the predetermined selection criteria. Based on the results of the pilot study, needed modifications were done in the data collection sheets and the six patients who shared in the pilot study were not included in the actual study sample.

Ethical consideration was done through anonymity of the collected data and confidentiality was maintained and the patients are expected to benefit from oral care intervention for either improving oral health status or a method for VAP reduction. In addition, care with unconscious patients was taken because of the risk of chocking by the fluid used. Data collection was conducted approximately six months from September to march through three phases (assessment and preparation phase, implementation phase, and evaluation phase).

Phase one: Assessment and preparation

During this phase, an initial assessment was carried out on the first day for all mechanically ventilated patients to confirm that they did not have pneumonia on admission (the score of modified CPIS>6), and free from exclusion criteria. VAP was scored using modified CPIS by the researcher from five commonly used clinical parameters: body temperature, number of white blood cell count, tracheal secretions, and chest radiographic infiltration.

A baseline oral cavity was assessed for any abnormalities or loss of function in lips, mucous, teeth, tongue and gingiva.

Assessment was repeated on day three and then at the end of the study on day six thereafter to determine the changes in the oral health status. All Patients were seated in semi-recumbent position as possible all time, because supine positioning predisposes to aspiration and the development of VAP. Tube cuff pressure and position of the endotracheal tube were checked twice per day. Deep oral suction was provided, as needed.

Phase two: Implementation phase

Technique used for oral care intervention: For the study group. Mechanical cleansing of the teeth, tongue and gums were done twice daily (at 8 AM and 8 PM) for six days. The tooth brushing intervention was based on recommendations of the American Dental Association. Each patient's mouth was divided into 4 dental quadrants (right upper, right lower, left upper, left lower) and each quadrant was brushed in a defined pattern.

In each quadrant, every tooth was brushed for 5 strokes on lingual, buccal, and biting surfaces. Teeth were brushed for 1 to 2 minutes. Soft paediatric toothbrush was placed at 45 angles. Then the brush dipped in water and put a small amount of toothpaste. The mouth then was rinsed with tap water with an irrigating syringe. A suction catheter was used as needed; gently the ventral surface of the tongue and palate was brushed and rinsed. The endotracheal tube was included in the oral care, gently brushed the tube with the toothbrush and gauze to remove debris. It was replaced from side to side.

15 mL of 0.12% chlorhexidine (CHX) gluconate were applied to all oral surfaces using a foam sponge. Brush teeth at least 1/2 an hour before using chlorhexidine solution.

During oral care process, excess fluids and secretions were suctioned from the mouth, applying thin layer of mouth moisturizer to mucous membranes, buccal cavity and lips.

The control group received oral care during the routine hospital care once daily during morning bath through quickly swabbing of the mouth using normal saline 0.9% on tongue depressor wrapped in gauze. Mouth jells was applied to lips when available. The control group did not use tooth brushing or CHX during routine oral care.

Phase three: Evaluation phase

The oral health status of both groups were evaluated on day 1 using oral assessment tool, repeated on day three and then at the end of the study on day six, thereafter to determine the changes in the oral health status. Evaluation of the condition of the studied patients regarding VAP occurrence were also done on the first day, on the third day and at the end of oral care intervention.

Statistical Design

The collected data were organized, tabulated and statistically analyzed using SPSS (Statistical Package for Social Sciences) software version 15. A descriptive analysis of the collected data was done in the form of frequencies and percent. The Chi Square was used for testing significance of discrete and categorical data. $P<0.05$ was considered to be statistically significant.

Results

Table 1, illustrates distribution of the studied samples according to the socio-demographic data. The mean age of the patients in the study group was 41.0-12.5 years compared to 41.1-13.4 years for patients in the control group. In relation to Sex, it was noted that more than two thirds of patients in both groups were males. It represents (66.7%) for the study compared with (73.3%) for the control group. The differences between the two groups among socio-demographic data were not statistically significant.

Table 2 presents oral health assessment of the control and study groups on (day one). It can be seen that (93.3%) of patients in the control group had smooth, pink and moist lips compared with (83.3%) of the study group. Regarding tongue, it was found that (26.7%) of the study group had pink and moist tongue compared with (13.3%) of the control group. About (66.7%) of the study group had coated & loss of papillae with a shiny appearance compared with (76.7%) of patients in the control one. Moreover, about (6.7%) had blistered or cracked tongue. As regards saliva, it can be noted that more than two thirds of both groups (control and study) had thick saliva (83.3% and70.0%

respectively). There were no statistically significant differences between the two groups among the oral health assessment.

Socio demographic data	Group Study (n=30)		Control (n=30)		X^2 Test	p-value
	No.	%	No.	%		
Age (years)						
<40	13	43.3	14	46.7		
>40	17	56.7	16	53.3	0.07	0.8
Range	19.0-65.0		19.0-62.0			
Mean ± SD	41.0 -12.5		41.1-13.4		0.01	0.94
Sex						
Male	20	66.7	22	73.3		
Female	10	33.3	8	26.7	0.32	0.57
Job						
Working	24	80	26	86.7		
Unemployed	6	20	4	13.3	0.48	0.49
Education						
University	10	33.3	11	36.7		
Less	20	66.7	19	63.3	0.07	0.79
Smoking	7	23.3	10	33.3	0.73	0.39

Table 1: Socio demographic data of the study and control groups.

Oral assessment (Day 1)		Group Study (n=30)		Control (n=30)		X^2 Test	p- value
		No.	%	No.	%		
Lips	Smooth, pink	25	83.3	28	93.3		
	Dry or cracked	5	16.7	2	6.6	0.3	0.8
	Pink, moist	8	26.7	4	13.3		
Tongue	Coated, loss of papillae	20	66.7	23	76.7	1.74	0.41
	Blistered or cracked	2	6.7	3	10		
	Watery	8	26.7	4	13.3		
Saliva	Thick	21	70	25	83.3	1.68	0.43
	Absent	1	3.3	1	3.3		
	Pink and Moist	8	26.7	4	13.3		
Mucous membranes	Reddened or coated without ulceration	18	60	24	80	2.85	0.24
	Ulceration with or without bleeding	4	13.3	2	6.7		
	Pink, stippled firm	21	70	25	83.3		

Gums	Spontaneous bleeding	8	26.7	4	13.3	1.68	0.43
	Edematous	1	3.3	1	3.3		
	Clean	22	73.3	25	83.3		
Teeth	Gum line	8	26.7	4	13.3	2.52	0.28
	Generalized plaque debris	0	0	1	3.3		

Table 2: Oral assessment of the control and study groups on (Day 1).

Table 3 presents oral health assessment of the study and control groups on (day 6). It was observed from this table that the majority of patients in the study group (73.3%) had smooth, pink and moist lips compared to (3.3%) only of patients in control group. About (20.0%) of the study group had dry or cracked lips compared to (53.3%) of the control one. Moreover, (6.7%) of the study group had ulcerated or bleeding lips compared to (43.3%) of the control group with significant difference ($p < 0.001$).

Oral assessment Day 6		**Group Study (n=30)**		**Control (n=30)**		**X^2 Test**	**p-value**
		No.	**%**	**No.**	**%**		
Lips	Smooth, pink and moist	22	73.3	1	3.3		
	Dry or cracked	6	20	16	53.3	31.79	<0.001*
	Ulcerated or bleeding	2	6.7	13	43.3		
Tongue	Pink, moist and papillae present	18	60	5	16.7		
	Coated and loss of papillae	12	40	22	73.3	13.28	0.001*
	Blistered or cracked	0	0	3	10		
Saliva	Watery	21	70	9	30		
	Thick	9	30	18	60	10.8	0.005*
	Absent	0	0	3	10		
Mucous membranes	Pink and Moist	22	73.3	4	13.3		
	Reddened or coated	8	26.7	22	73.3	22.99	<0.001*
	Ulceration with or without bleeding	0	0	4	13.3		
Gums	Pink, stippled and firm	20	66.7	10	33.3		
	Spontaneous bleeding or with pressure	10	33.3	16	53.3	8.71	0.013*
	Edematous with or without redness	0	0	4	13.3		
Teeth	Clean and no debris	28	93.3	8	26.7		
	Gum line or	1	3.3	6	20	27.92	<0.001*
	Generalized plaque debris along	1	3.3	16	53.3		

Table 3: Oral health assessment of the study and control groups on (Day 6).

There was a significant difference regarding the tongue (p=0.001). There were a significant difference regarding saliva and mucous membranes conditions (p=0.005 and <0.001 respectively). Finally, there were highly statistically significant differences among both groups in all items of oral assessment after completion of oral care intervention on the sixth day.

Table 4 present a comparison between the control and study groups throughout intervention as regards occurrence of oral alteration. It can be observed from this table that all patients in both groups (study and control) had mild oral alteration (<11) on the first day. The table also presents that on the third day of oral intervention, there were (16.7%) of patients in the control group suffered from severe oral alteration

compared to none of patients in the study group. Regarding the sixth day of intervention, it can be observed that (76.7%) of patients in the control group suffered from severe oral alteration (11+) compared to (10.0%) only of patients in the study group. There was a highly statistically significant difference between the study and control groups at the end of intervention on day six (p<0.001).

Oral alteration	Group Study (n=30)		Control (n=30)		X^2 Test	p-value
	No.	%	No.	%		
(Day 1)						
Severe (11+)	0	0	0	0		
Mild (<11)	30	100	30	100	0	1
(Day 3)						
Severe (11+)	0	0	5	16.7		
Mild (<11)	30	100	25	83.3	Fisher	0.05
(Day 6)						
Severe (11+)	3	10	23	76.7		
Mild (<11)	27	90	7	23.3	27.15	<0.001*

Table 4: Comparison between the control and study groups throughout intervention according to the oral alteration.

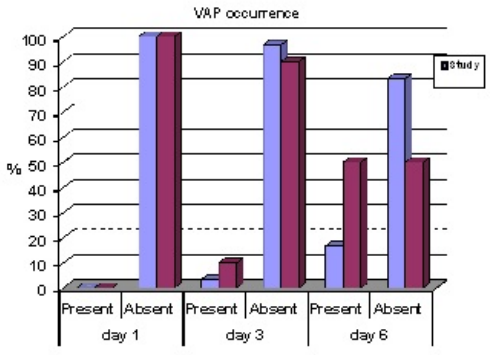

Figure 1: Distribution of the studied groups in relation to the occurrence of VAP

Figure 1 present a comparison between the control and study groups throughout intervention as regards the occurrence of VAP. It can be noted that all patients in both groups were free from pneumonia on the first day.

On day three of oral intervention, taking into consideration the time of occurrence of early VAP, it was found that (10.0%) of patients in the control group acquired VAP (modified CPIS>6) compared to (3.3%) of patient in the study. Following up these patients and occurrence of VAP at the end of oral care intervention on day 6(late VAP), it can be noted that (50.0%) of patients in the control group acquired VAP compared to (16.7%) of patients in the study one. There was a highly significantly difference among patients in the control group and patients in the study group (p=0.006). There was a highly significantly difference among patients in the control group and patients in the study group (p=0.006).

Figure 2 describe the relationship between oral alteration and occurrence of VAP in both groups. It can be noted that (25.0%) of patients who had VAP in day three were suffering from severe oral alteration, while (5.4%) of them had mild oral alteration. Following these patients on day six, it was found that (61.5%) of them were suffering from severe oral alteration, about (11.8%) of them had mild oral alteration. There was a highly statistically significant relationship between oral alteration and occurrence of VAP.

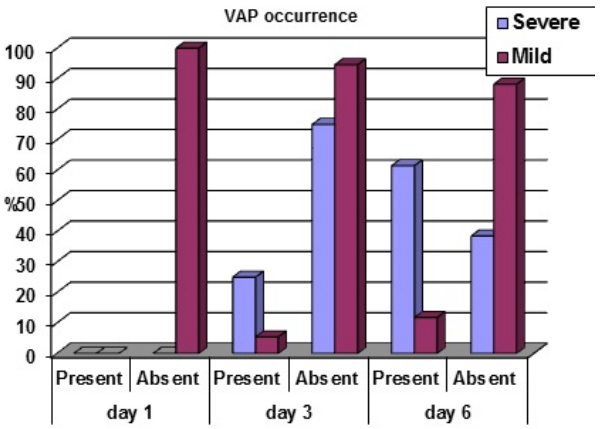

Figure 2: describe the relationship between oral alteration and occurrence of VAP in both groups

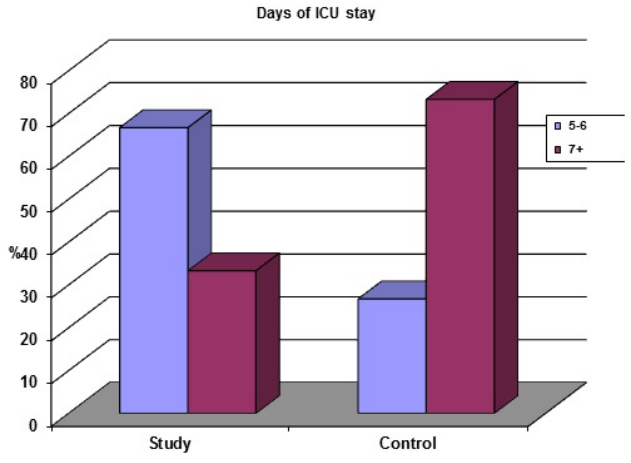

Figure 3: Distribution of the studied groups in relation to the length of ICU stay

Figure 3 represents a comparison between the control and study groups throughout intervention as regards the length of stay in ICU. It can be found that only (10 patients) about (33.3%) in the study group stayed more than 7 days in the ICU compared to (73.3%) of the control

group. There was a significant difference between the two groups as regards length of stay in the ICU (p=0.002).

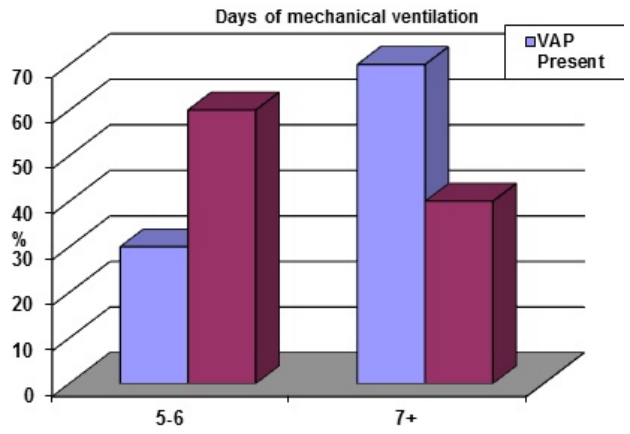

Figure 4: Relationship between VAP occurrences in both groups and days of mechanical ventilation

Figure 4 relationships between VAP occurrences in both groups and days of mechanical ventilation.

Discussion

Provision of oral care is far more than a matter of personal grooming. Unclean mouth can lead to serious morbidity and mortality. Since mechanically ventilated patients have artificial airway, cannot be fed orally, their salivary secretions decrease, and self-cleaning of the oral cavity is markedly reduced. As a result, oral cavity hygiene worsens and the number of bacteria increases excessively, leading to bacterial colonization of the oropharynx and VAP [8].

On comparing the study and control group regarding oral alteration, it was noted that a degree of similarity between the initial average scores of the oral assessment and those obtained on the third day for both groups. This supports the idea that the antiseptic solution has no effect before several days of its use [9]. Moreover, Claydon et al. stated that antiseptic oral rinses should be used for 7 to 14 days to provide their optimal antibacterial and veridical effect [10].

The current study reveal that scores on items (lips, tongue, teeth) reflected worsening conditions among the control group compared to the study group on the third day of oral care intervention. As the duration of intubation increased, the condition of the oral status became worse among the control group.

The current study revealed that at the end of oral care intervention (on day six), there was a highly significant lower scores or mild oral alteration (<11) among the study group who had oral care intervention done by the researcher compared to the control group who had routine oral care delivered by ICU nurses (90% and 23.3% respectively). This can be attributed to the fact that oral care intervention improves the condition of the mouth and improves the oral environment that includes lips, tongue, saliva, mucous membranes, gums and teeth. This finding is in line with Chan et al. [11] who reported that promoting and maintaining the oral health of scritically ill patients can be accomplished through a comprehensive oral care protocol using a bedside assessment tool.

The improvement of oral health status among the study group compared to the control group may be due to the combination of using tooth brushing, CHX gluconate and frequency of oral care intervention provided to the study group. As regards tooth brushing, it was done by using a small soft pediatric brush compared to gauze swabs by tongue depressors used in the control group. Using of soft pediatric toothbrush has several advantages: easy handling, good access inside a partially closed mouth, and minimal discomfort to friable tissue in addition to removes plaque without disturbing oral tubes. This method was supported by Pearson and Hutton [12], Rawlins and Kite who suggested that tooth brushing has been demonstrated to be effective than cotton/gauze swabs in removing debris and plaque [13,14].

The improvement of oral health status that appeared among the study group may be due to the type of antiseptic solution used for oral care intervention. The product selected for the study group was CHX 0.12% compared to normal saline in the control group. In this respect, Awad denoted that high percentages of patients who had severe alteration of the mouth were in the normal saline group followed by hexetidine then CHX group, and concluded that CHX was the best solution that improves oral health status, removes debris, plaque and prevents gingival bleeding [15].

In the same line, Kandeel and Tantawy [16] found that there were variations in nursing practice toward oral care, most nurses use saline as a mouth wash solution, 6.7% use Hydrogen Peroxide and CHX it was not used in the studied ICUs. Although normal saline is cost effective, but such use has not been thoroughly tested. Normal saline has limited use as a mouth rinse due to its tendency to cause dryness and ineffectiveness in removing hardened mucus, debris or crusts from the mouth [17].

Our results are in agreement with Fourrier et al. [18] who found that the use of CHX in critically ill patients improves their oral health and significantly reduces the incidence of plaque accumulation. Moreover, in a study by Ransier and Epstein, who demonstrated that using a foam brush soaked in CHX reduces plaque and controls gingivitis [19].

The major finding of this study was that the application of oral care intervention on mechanically ventilated patients reduced significantly the occurrence of VAP when compared with routine oral care. The incidence of VAP is statistically significantly higher among the control group compared to the study group (50% and 16.7% respectively).

This can be interpreted to mean that implementation of oral care intervention provided for the study group using toothbrushing and CHX by the researcher was effective in reducing VAP. These findings are in agreement with Mori et al. [20] and Garcia et al. who compared two groups who either received no systematic oral care, or the intervention group, who received oral care. Results showed decreased incidence of VAP in the oral care group [21].

These findings are in agreement with several organizations, including the APIC IHI [22,23] and CDC that developed evidence-based patient-care treatment practices and published best practices examples for reducing the occurrence of VAP. All of them stated that comprehensive oral hygiene has consistently been recognized as critical to the prevention of pneumonia in the hospitalized patients [24].

These findings are also supported by Zurmehly [25], Sona et al. [26] who implemented an oral care protocol that included toothbrushing and CHX solution, the incidence of VAP in the oral care group was

significantly lower than that in the non-oral care group. Results suggested that significant reductions in VAP rates may be achieved through improved education and implementation of oral care protocols with 0.12% CHX solution.

Beside the main objective of the study, the current study illustrates that there was a strong positive association between severe oral alteration and the occurrence of VAP in both groups. This means poor dental hygiene had been linked to respiratory pathogen colonization. Several studies have documented that the oral cavity might be a reservoir for the respiratory pathogens responsible for aspiration pneumonia in high-risk patients. This finding lies in accordance with Garrouste et al. [27] who reported that bacterial colonization of the oropharynx occurred in the majority of patients and organisms isolated from the mouth before diagnosis of pneumonia were identical to the pathogen that cause pneumonia.

The current study shows that a significant positive association between occurrence of VAP in both groups and increased length of stay in ICU. This finding goes hand in hand with Caserta et al. [28] and Bonten, [29] who stated that VAP prolongs ICU length of stay. Moreover, Muscedere et al. reported that the mean standard deviation for ICU length of stay days in patients with VAP was 8 days [30,31].

Conclusion

According to the results of our study, it can be concluded that Oral care intervention using toothbrushing and CHX gluconate reduced significantly the occurrence of VAP on mechanically ventilated patients. The oral health status were improved significantly at the end of oral care intervention by using toothbrushing and CHX . There was a strong positive association between severe oral alteration and the occurrence of VAP. A significant positive association between occurrence of VAP and length of stay in ICU, days of mechanical ventilation and unconsciousness.

Recommendations

The use of 0.12% chlorhexidine gluconate as an oral rinse is recommended for orally intubated patients. Equipments and supplies required for oral care intervention should be available in each intensive care unit. The use of an oral assessment tool is recommended for the immediate identification of oral problems for every patient. Regular update about evidence based guidelines for oral care and its effect on VAP prevention

Conflict of interest

None

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