Effect of Implementing an Oral Care Protocol on Minimizing Rate of Ventilator Associated Pneumonia among Mechanically Ventilated Patients at Mansoura Emergency Hospital

Hala Zaiton[1], Karima Elshamy[2] Fatma Elesawy[3], Mohammed Sultan[4]

[1.] Department of Medical Surgical Nursing, Faculty of Nursing, Zagazig University.
[2.] Department of Adult Nursing, Faculty of Nursing, Mansoura University
[3.] B.SC.N Faculty of Nursing Mansoura University
[4.] Department of Anesthesia and Intensive Care, Faculty of Medicine, Mansoura University
Karima_elshamy2002@yahoo.com

Abstract: Introduction: Oral hygiene has been proposed as a key study for reducing ventilator-associated pneumonia .It considered basic and potentially essential nursing care, bad oral hygiene increase oropharyngeal colonization with pathogenic organisms contributes to the development of ventilator-associated pneumonia in intensive care units. **Aim of the Study:** This study was conducted to assess the effect of implementing an oral care protocol on Minimizing ventilator associated pneumonia among mechanically ventilated patients at Mansoura Emergency Hospital. **Materials and Methods**: A quasi- experimental design was used in this study. The study subjects includes two groups Group I, consisted of 40 patients received routine oral care (control group)Group II, includes 40 patients received oral care protocol (study group). Tools of the study consist of two tools, the first tool was Patients' assessment sheet of VAP, and the second tool was oral assessment form for assessment of oral health condition . **Conclusion** The protocol of oral care used reduces ventilator-associated pneumonia among mechanically ventilated patients than the hospital routine mouth care. **Recommendations:** 1- Replication of the study using a large probability samples acquired from different geographic areas. 2- A longitudinal study should be designed to determine the long term effect of the developed oral care protocol over a large period of time. 3- An educational program should be established for nurses caring for mechanically ventilated patients in the ICUs. 4- Written oral care should be initiated in the ICU.

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1. Introduction :

Ventilator-associated pneumonia (VAP) was defined as an inflammation of the lung parenchyma occurring 48-72 hours or more after intubation of the trachea, due to organisms not present or incubating at the time mechanical ventilation was commenced (Chastre and Fagon, 2002).

Ventilator Associated Pneumonia is the most common infectious complication among all critically ill patients and accounts for up to 47% of all infections. It was reported that 63% of patients admitted to an ICU already have oral colonization with a pathogen associated with VAP Microbial colonization of the oropharynx is an important risk factor for Ventilator-Associated Pneumonia (Cutler and Davis, 2005and Center Disease Control (CDC) , 2007; .

Grap (2003) have substantiated the need to standardize oral care for a variety of reasons, the most compelling of which is to prevent or lower VAP rates in mechanically ventilated patients. Oral care interventions have great potential to improve oral health, reduce the occurrence of VAP, and influence other systemic complications such as bacteremia. VAP is attributed as a leading cause of morbidity and mortality in patients receiving mechanical ventilation and increase costs of treatment (Chan *et al.,* 2007). Recent evidence indicates that colonization of the mouth with respiratory pathogens may contribute to ventilator-associated pneumonia (VAP) for this reasons oral care is an important component of intensive care nursing (Cason *et al.,* 2007).

The prevalence of hospital acquired infection is a significant concern in acutely and critically ill patients. VAP contributes to mortality in these patients. Oral hygiene is considered to be an important intervention, in combination with other strategies, for the prevention of ventilator-associated pneumonia. No evidence-based oral care protocol for mechanically ventilated patients has been reported. In addition, the absence of a consistent evidence base method for mouth care leads to difference in the application of mouth care from nurse to another and from one patient to another. So, a specific oral care protocol could provide the necessary information and

skills for fulfilling this principal nursing responsibility.

Aim of the Study:

This study was conducted to assess the effect of implementing an oral care protocol on minimizing rate of ventilator associated pneumonia among mechanically ventilated patients at Mansoura Emergency Hospital

Research Hypothesis:

Oral care protocol will minimize rate of ventilator-associated pneumonia among ventilated patients compared to routine oral care.

2. Subjects and Methods

Research Design: Quasi-experimental study was conducted during 6 months from March 2010 - August 2010.

Research Setting: The study was conducted in adult Surgical Intensive Care Unit (SICU) at Emergency Hospital, of Mansoura University, Dakahilia governorate, Egypt.

Subject of the Study:

The sample consisted of eighty (80) mechanically ventilated patients, with oral endotracheal intubations; patients' aged were18 years and above, with no previous diagnosis or signs and symptoms of pneumonia and intubated for more than three day. Patients with nasal intubations, tracheotomies, ulceration or trauma in oral cavity, bleeding tendency and documented history of hematological disorders, oral surgeries, patients who can not place in semi – fowler position, history of allergy to chlorhexidine mouth wash, patients who receive therapy for infection in the oral cavity ,and reintubated patients were excluded from the study.

Tools of the study:

To achieve the purposes of the study, three tools were used for data collection:

I: VAP devolvement assessment form

II: Oral health assessment form

Tool I: VAP devolvement assessment form

This form was developed by the researchers based on criteria for diagnosis of VAP to assess the patient's status regarding diagnosis of VAP, it includes two main parts:

Part I: demographic and medical condition ,e.g. gender, age, clinical diagnosis, underling illness, admission and discharge date , history of smoking, using of antibiotic prior to intubations ,using of certain drug ,duration of intubations, indication of mechanical ventilation, and using of other invasive medical device (Folly catheter ,nasogatric tube ,central venous catheter)

Part II: assessment of VAP development, based on criteria for diagnosis of VAP, which included the presence of new or progressive radiographic infiltrate associated with two of the three following criteria:

(1) Temperature >38.5 ^{0}C or <36.5 ^{0}C

(2) Leukocyte count > 12.000 cells/uL or < 3,000 cells/uL

(3) Purulent tracheal aspirate; and a positive tracheal aspirate culture.

Tool II: Oral health assessment form

It was developed by (Chalmers, *et al*., 2005) to assessment the oral cavity patients during the study period. It compromised 5 categories or area of assessment (lips, tongue, gums, teeth, and saliva).The score of assessment ranged from 5-20, as follow:

1. Score (5) Functional limit, but at possible risk for alteration in integrity, function or comfort of oral cavity,
2. Score (6 - 10) mild dysfunction of integrity, function or comfort of oral cavity.
3. Score (11 - 20) moderate /sever dysfunction of integrity, function or comfort of oral cavity.

Oral care protocol

The Oral care protocol was developed by the researchers based on relevant recent recommendations and literature reviews, it includes:

1. Wash hands and use of gloves.
2. Explain the procedure and seek consent or permission for conscious patients.
3. Examine the mouth, tongue, teeth, mucous membrane, saliva, lips, initially and every 12 hours
4. Position patient's head to the side or place in semi-fowlers.
5. Suction the oral cavity
6. Brush teeth using toothbrush and tooth past every 12 hrs for approximately one to two minutes.
7. Rinse with tap water with an irrigating syringe and suction with an oral suction catheter
8. Dilute15 mL chlorhexidine gluconate CHX in 50 ml water and apply it immediately after raising to oral cavity using sponge, then suction any excess solution from the mouth and pharynx every 12 hrs.
9. Apply a moisturizing ointment to the patient's lips every 4 hours, and Hand hygiene.

Method of data collection

1. An official permission for conducting the study was obtained from administrative

and responsible personnel after explaining the aim and nature of the study and submission of a formal letter from the Faculty of Nursing.

2. Development of tool I & II after reviewing recent relevant literatures.
3. Validity of tools were established for content validity by a panel of five expertise in this field who revised for clarity, relevance, applicability, comprehensiveness, understanding, and ease for implementation and according to their opinions, minor modifications were done accordingly.
4. Meeting and discussion were held between the researchers and the nursing administrative personnel to explain the objectives and the nature of the study to gain their cooperation during the implementation phase of the study.
5. Formal consents were obtained from conscious patients, whereas the consents of unconsciousness patients were obtained from their significant, then, patients were recruited based on the above mentioned criteria.
6. Patients were randomly assigned to control group or study group, 40 in control group and 40 in intervention group. The control group received routine oral care, where as the intervention group received the oral care protocol based on CDC guidelines, (2003).
7. The oral care protocol was applied to 5 patients before starting data collection to evaluate the tentative effect on decreasing VAP.
8. Patients in the intervention group received the oral care protocol by the researcher in first 8 hours after intubations in the morning shift and continue for five successive days. While intern ship provides oral care in evening shift.
9. Patients in the control group received routine oral care using cotton swabs with normal saline 0.9% to clean the oral cavity in the morning shift by ICU nurses.
10. Other general routine care for VAP prevention was applied to both groups in accordance with the hospital policy and procedure to control other confounding factors.
11. Demographic data of participants, assessment and reassessment of the oral hygiene status of each participants before and after applying the oral care for each group using oral assessment form, follow up of patients in both groups by the researcher and the attending ICU physician on a daily basis based on clinical and microbiological laboratory data was conducted.
12. A base line oral assessment was done for all patients in control and study groups on admission before providing oral care. The patients' lips, tongue, gums, teeth and saliva were assessed and checked using the oral health assessment form. A pen torch was used during oral assessment for more visualization of the oral cavity. Assessment was done once at the morning shift and repeated every day for five days.
13. Endotracheal aspirates were collected with a sterile catheter for all patients in the two groups in fifth day of intubations.
14. Chest X-ray was done for all patients in the two groups in the first and fifth day of intubations to observe the shadow of pneumonia.
15. Axillary's body temperature, sputum, and WBCs were recorded for all patients in control and study groups at the morning shift and repeated every day for five days.
16. All data collected from the medical records were used only for research study only.
17. The anonymity, privacy and confidentiality of patients, voluntary participation and right to withdraw from the study at any time were emphasized.

Statistical analysis

Up on completion of data collection each sheet was manually scored. The back ground data sheet was coded and listed into numbers for calculation. Data were checked, entered and analyzed by using SPSS (version 14) soft ware computer packed (special package for social science).

Data were express as number and percentage for categorical variables, range and mean ± stander deviation for continuous variables. Student t- test, Chi square (X2), Mann-Whitney test, Fisher test are used for comparison between quantitative and qualitative variables at *P*-value= <0.05 was considered statistically significant.

3. Results

The study included 80 patients, 40 in the study and 40 in the control group, 60 % of study and 65% of control group were more than 40 years old. More than half of the sample (65%) were males in study group and (70%) in control group. The

differences were not proved to be statistically significant (Table 1).

Table (2) shows that, regarding patient medical diagnosis, multi injury trauma account for 50% and 42.5% in the study group control group. Patients with postoperative accounts for 25% and 37.5% in study and control group consequently. While cerebral stoke account (25%) in study group and (20%) in control group. Concerning indications of ventilated patients, in study group it was found that (77.5%) of patients ventilated due to Neurological problem followed by (7.5%) Post-operative while (15%) due to respiratory failure, cardiac arrest and hypoxia as compared to control group it was found that (60%) due to Neurological problem followed by (20%) due to hypoxia while cardiac arrest were (7.5%) as indication of mechanical ventilation among control group. Moreover respiratory failure and Post-operative were constituted (10%) and only (2.5%) due to chronic obstructive pulmonary disease. More than half of study group (55%) intubated for more than 7 days compared to (65%) of the control group. Mean day on mechanical ventilation was (7.2±2.6) days in study group and (8.6±3.3) days in control group.

The difference between study and control groups as regards to smoking habits, diagnosis, indication of mechanical ventilation, and duration of mechanical ventilation were statistically non significant .

Figure (1) illustrates that about (67.5%) account negative chest x-ray, while new progressive infiltration accounts (30%) and only (2.5%) had consolidation in study group. As compared with control group it was found that negative chest x-ray account (40%), while new /progressive infiltration account (55%) and only (5 %) had Pleural effusion.

There was statistically significant difference in chest x-ray regarding free and new /progressive infiltration between the study and control groups (p = 0.01* 0.02* respectively).

Figure (2) shows that, *Pseudomonas aeruginosa* account (17.5%) followed by *Staphylococcus aureus* and *E-coli* account (20%). while *Klebsiella pneumonia* accounts (7.5%) and only (2.5%) had *Candida albicans* and Streptococcus group B completely disappeared in the study group. As compared with control group it was found that *Pseudomonas aeruginosa* account (35 %) followed by *Staphylococcus aureus* (22.5%) *Klebsiella pneumonia* account (15%) followed by *E-coli* account (12.5%) while both *Candida albicans* and Streptococcus group B account (5 %). Also noted that (52.5%) were negative from any bacterial species in study group compared to (10%) in control group. There was significant difference in the isolated organisms (*Pseudomonas aeruginosa*,) from sputum culture in the study and control groups (p =0.03*). Figure (3) shows that There was significant difference in total positive sputum culture between the study and control groups (p =0.001*).

Table (3) shows that, on 1st day of observation there were no significant difference in sputum color among study and control groups as (85%) had clear white sputum of study group and (82.5%) in control group (p = 0.60). On 2nd day of observation there was also no significant difference in sputum color among study and control as (85%) had clear white sputum of study group and (75%) in control group (p = 0.19). On 3rd, 4th and 5th day of observation it was found that significant difference in sputum color among study and control groups (p = <0.001*, 0.01*, 0.02*) respectively.

Table (4) shows that, there was no significant difference in the mean (WBCs) count on 1st, 2nd, 3rd, 4th and 5th day between study and control groups. It can also noted that, on 1st day the mean (WBCs) count was 9.6±3.0, 2nd was 10.7±3.0, 3rd day was 11.4±3.0, 4th day was 12.5±5.0 and on 5th day was 12.8±5 compared to control group on 1st day was 10.0±4.8, 2nd was 11.2±5.9, 3rd day was 12.2±5.9, 4th day was 14.3±5.2 and on 5th day was 15.7±5.5.

Figure (4) illustrated that, there was no significant difference regarding to body temperature on 1st, 2nd, 3rd, 4th and 5th day among study and control group. It can also noted that, on 1st day the mean of body temperature was 37.3±0.5, 2nd was 37.5±0.2, 3rd day was 37.6±0.5, 4th day was 37.8±0.2, 5th day was 38.0±0.5 respectively among study compared to control group on 1st day was 37.5±0.6, 2nd was 37.5±0.8, 3rd day was 38 ±0.3, 4th day was 38.5±0.5, 5th day was 39.0±0.8 respectively. There was no significant difference in the mean of body temperature on 1st, 2nd, 3rd, 4th and 5th day among study and control group.

Table (5) shows that, on 1st, 2nd and 3rd day of admission there were no significant difference among study and control groups regarding oral assessment (p= 0.75, 0.47and 0.12) respectively. On 4th and 5th day of observation there was a significant difference regarding sever abnormality of the oral cavity between study and control groups (42.5%-37.5%) and (67.5%- 72.5%) respectively (P = 0.01*, 0.02*)

Table (6) shows that, there was no significant difference of ICU length of stay among the study and control group (p= 0.12). Mean length of stay in ICU was 9.8±1.5 days in study group and 10.8±3.6 days in control group.

Table (7) shows that the percentage of patients acquired VAP was 32.5% in the study group compared to 60% among control group. There was a significant difference of VAP development between the study and control group (P= 0.01*).

4. Discussion

Ventilator associated pneumonia is the most common hospital –acquired infection among patient requiring mechanical ventilation, resulting in excess mortality, prolonged length of hospitalization, and increase medical care cost (Ibrahim et al., 2001). Kollef (2005), found that colonization of the aerodigestive tract with pathogenic bacteria and subsequent aspiration of contaminated secretion in to the lower air ways appear to be the most important mechanisms for the development of ventilator associated pneumonia

In the same line ***El-Solh et al., (2004***) stated that, the poor dental hygiene has been linked to respiratory pathogen colonization in residents of long-term care facilities, and dental plaque may serve as the reservoir for these virulent pathogens, especially in high-risk patients with poor oral hygiene.

Table (1) Demographic Characteristics among Study and Control group (n=80)

Demographic Characteristics	Study Group (n=40)		Control Group (n=40)		X^2	*P*-value
	No	%	No	%		
Age (years):						
40 <	16	40.0	14	35.0		
40+	24	60.0	26	65.0	0.05	0.82
Rang	18.0-79.0		18.0-80.0			
Mean ±SD	45.9 ±18.3		44.5±18.2		t=0.38	0.61
Sex :						
Male	26	65.0	28	70.0		
Female	14	35.0	12	30.0	0.23	0.63

(*) statistically significant<0.05

Table (2) Clinical and Medical Characteristics among Study and Control group (n=80)

Clinical and Medical Characteristics	Study Group (n=40)		Control Group (n=40)		X^2 Test	*P*-value
	No	%	No	%		
Smoking habits	18	45.0	14	35.0	1.07	0.35
Diagnosis:						
Trauma	20	50.0	17	42.5		
Post–operative	10	25.0	15	37.5	2.11	0.35
Stroke	10	25.0	8	20.0		
Indication for MV:						
Neurological problem	31	77.5	24	60.0	2.19	0.33
Respiratory failure	2	5.0	2	5.0	Fisher	1.00
Post-operative	3	7.5	2	5.0	Fisher	1.00
Cardiac arrest	2	5.0	3	7.5	Fisher	1.00
COPD	0	0.0	1	2.5	Fisher	1.00
Other (hypoxia)	2	5.0	8	20.0	1.34	0.51
Duration on MV(days):						
7 <	18	45.0	14	35.0		
7>	22	55.0	26	65.0	0.83	0.36
Range	5.0-18.0		5.0-15.0			
Mean± SD	7.2±2.6		8.6±3.3		U=3.18	0.07

(*) statistically significant<0.05 (U) Mann-Whitney test

> More than < less than MV: mechanical ventilation

COPD: chronic obstructive pulmonary disease

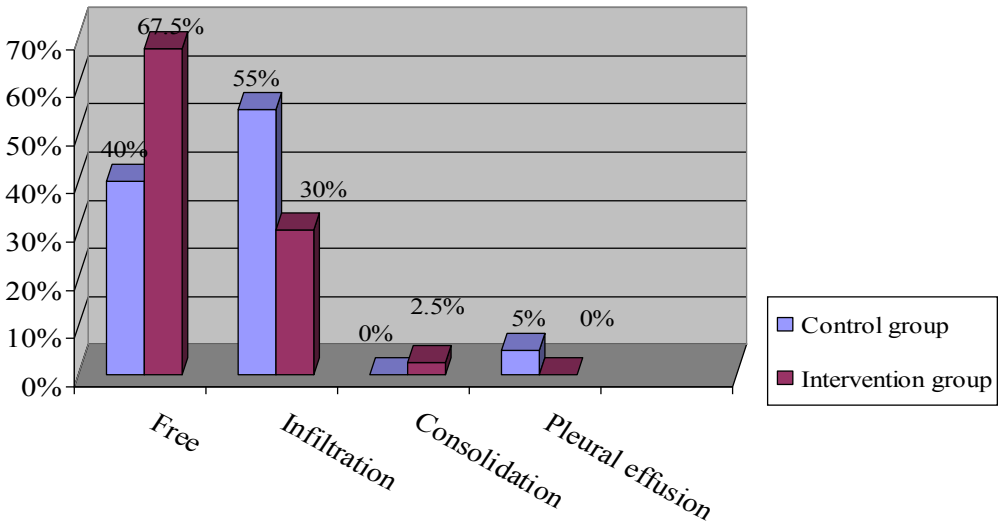

Figure (1) Percentage Distribution of Chest X-ray among the study and Control Group

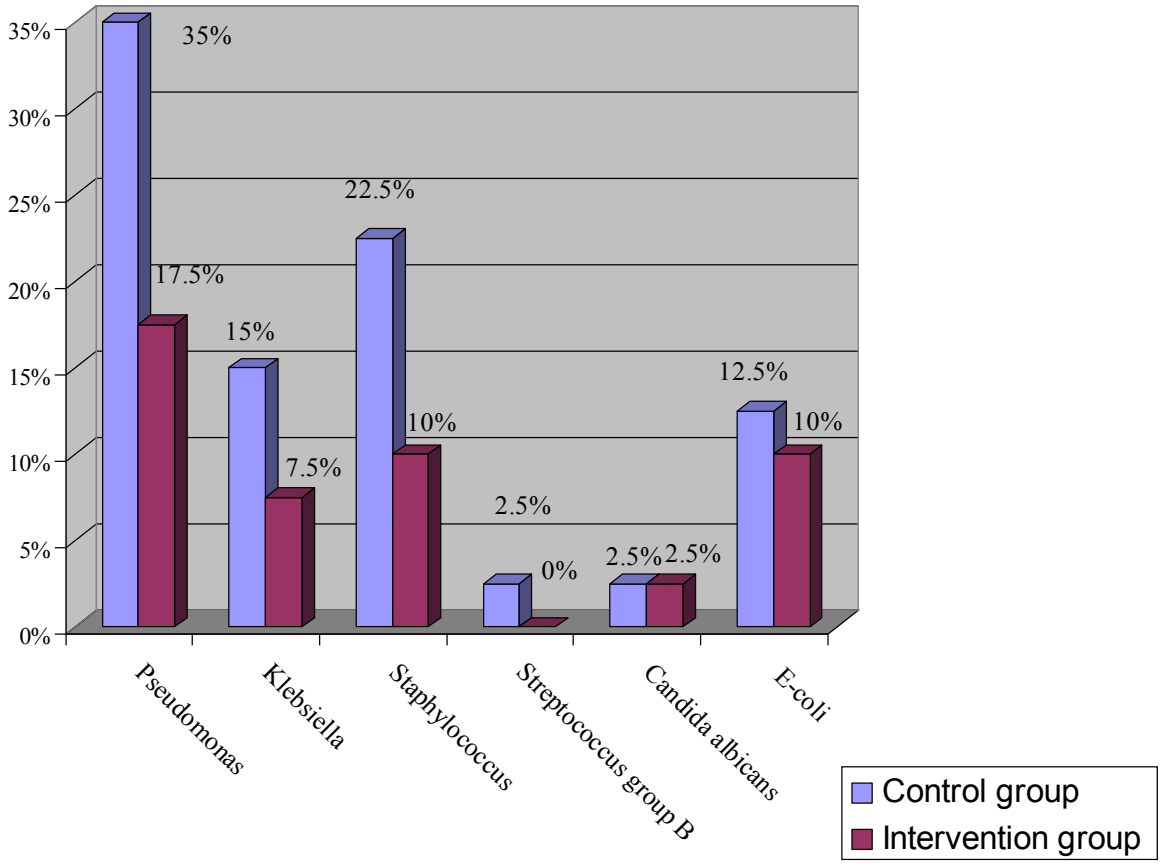

Figure (2) Percentage Distribution of Isolated Organisms from Sputum Culture among Study and Control Group

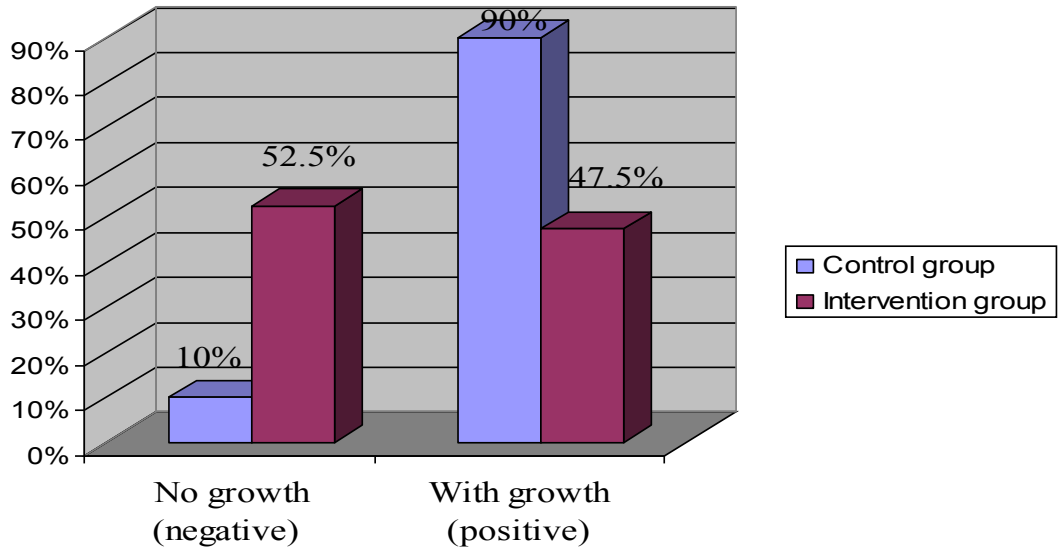

Figure (3) Percentage Distribution of Endotracheal Aspirate Culture among Patients in Study and Control Group

Table (3): Distribution of Sputum Color throughout 5 Days of Follow-up among Patients in the Study and Control Group (n=80).

Sputum Color	Study Group (n=40)		Control Group (n=40))		X^2 Test	*P*-value
	No.	%	No.	%		
First day of admission:						
White/clear	34	85.0	33	82.5		
Tan	0	0.0	1	2.5	1.01	0.60
Blood	6	15.0	6	15.0		
2nd day:						
White/clear	34	85.0	30	75.0		
Tan	0	0.0	3	7.5	3.33	0.19
Blood	6	15.0	7	17.5		
3rd day:						
White/clear	32	80.0	16	40.0		
Yellow	1	2.5	13	32.5	22.44	0.001*<
Green	0	0.0	5	2.5		
Blood	7	17.5	6	15.0		
4th day:						
White/clear	27	67.5	8	20.0		
Yellow	13	32.5	25	62.5	6.08	0.01*
Green	0	0.0	7	17.5		
5th day:						
White/clear	25	62.5	8	20.0		
Yellow	9	22.5	17	42.5	11.9	0.02*
Green	6	15.0	15	37.5		

(*) statistically significant <0.05

Table (4): White Blood Cells (WBC) Count throughout 5 Days of Follow-up among Patients in the Study and Control Group (n=80)

(WBC) Count	Study Group (n=40)		Control Group (n=40)		X^2 Test	*P*-value
	No.	%	No.	%		
First day of admission :						
<10	30	75.0	23	57.5		
10>	10	25.0	17	42.5	2.37	0.10
Range	5.0-19.0		3.0-21.0			
Mean ±SD	9.6±3.0		10.0±4.8		U=1.95	0.19
2nd day :						
<10	28	70	22	55.0		
10>	12	30	18	45.0	1.92	0.42
Range	6.0-19.0		2.0-24.0			
Mean ±SD	10.7±3.0		11.2±5.9		U=0.56	0.26
3rd day:						
<10	26	65.0	19	47.5		
10>	14	35.0	21	52.5	0.08	0.72
Range	6.0-19.0		2.0-24.0			
Mean ±SD	11.4±3.0		12.2±5.9		U=0.89	0.34
4th day:						
<10	18	45.0	10	25.0		
10>	22	55.0	30	75.0	2.65	0.08
Range	4.0-26.0		1.0-33.0			
Mean ±SD	12.5±5.0		14.3±5.2		U=1.76	54
5th day:						
<10	16	40.0	8	20.0		
10>	24	60.0	32	80.0	2.05	0.12
Range	4.0-32.0		1.0-41.0			
Mean ±SD	12.8±5		15.7±5.5		U=2.67	0.16

(*) statistically significant <0.05 *(U) Mann-Whitney test*
> More than *< less than*

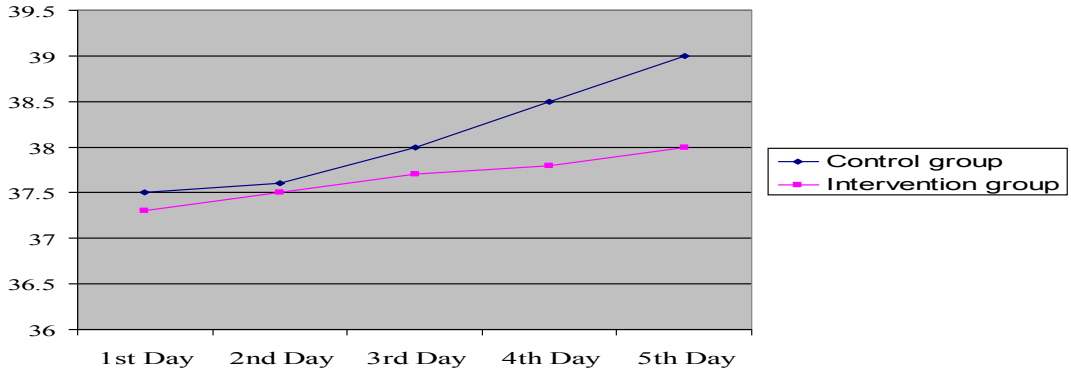

Figure (4) Mean of Body Temperature throughout the 5 Days of Follow-up among Patients in the Study and Control Group

Table (5) Oral assessment throughout 5 days of follow-up among Patients in the Study and Control Group (n=80).

	Study Group (n=40)		Control Group (n=40)		X^2 Test	*P*-value
	No.	%	No.	%		
First day of admission:						
Mild abnormality	16	40.0	18	45.0		
Sever abnormality	24	60.0	22	55.0	0.1	0.75
2nd day :						
Mild abnormality	21	52.5	16	40.0		
Sever abnormality	19	47.5	24	60.0	1.51	0.47
3rd day:						
Mild abnormality	22	55.0	15	37.5		
Sever abnormality	18	45.0	25	62.5	2.64	0.12
4th day:						
Mild abnormality	23	57.5	13	32.5		
Sever abnormality	17	42.5	27	67.5	5.05	0.01*
5th day:						
Mild abnormality	25	62.5	11	27.5		
Sever abnormality	15	37.5	29	72.5	9.89	0.02*

(*) statistically significant <0.05

Table (6) Length of ICU Stay among Patients in the Study and Control Group (n=80).

ICU Length of stay	Study Group (n=40)		Control Group (n=40)		X^2 Test	*P*-value
	No.	%	No.	%		
<10	28	70.0	23	57.5		
10>	12	30.0	17	42.5	2.37	0.10
Range	5.0-19.0		5.0-21.0			
Mean ±SD	9.8±1.5		10.8±3.6		t=2.13	0.16

(*) statistically significant <0.05

Table (7) Frequency of Ventilator Associated Pneumonia (VAP) among Patients in the Study and Control Group (n=80)

Frequency of VAP	Study Group (n=40)		Control group (n=40)		X^2 Test	*P*-value
	No	%	No	%		
Developed (VAP)	13	32.5	24	60.0		
Not developed (VAP)	27	67.5	16	40.0	6.08	0.01*

(*) statistically significant <0.05

In the present study, it was found that on admission there no significant difference between the study and control groups as regards to, age, gender, clinical diagnosis, smoking habits, , indication of mechanical ventilation, prescribed medication. As regards to age, more than half of study and control groups aged more than 40 years old, these observations could attribute to variety of changes in the oral cavity related to aging process; in the form of a reduction of the function of salivary glands, and wastage of the oral muscle, along with atrophy and loss of oral mucosa, all of these changes predispose to oropharyngeal colonization, ***Fitzpatric (2000).***

This result agree with, ***Galil and Zalenik (2002),*** Who stated that age above 60 years was one of the risk factors of nosocomial pneumonia . The study

found that 54% of patients with severe pneumonia were above 65 years this could be due to fact that elderly people have diminished cough and gage reflexes, impaired immune system and increased frequency of serious comorbidities. In addition, ***Sharma and Anthonisen (2005),*** stated that the prevalence of VAP is common in individual aged 40-69 years.

As regards to gender, the majority of the patients were males among study and control groups. This finding agreed with, ***Beers and Berkow (2003),*** Who stated that VAP was common in males than females this may due to the higher incidence of cigarette smoking in males than females, and exposure of males to some occupational hazards.

The finding contradicted with ***Awad (2003)***, who studied the prevalence of typical versus atypical lower respiratory tract infection, the study reported that incidence of pneumonia in females was higher than that male.

As regards to medical diagnosis the most frequent admission diagnosis was multiple injury trauma that represent of study and control groups. This finding was supported by ***Apostolopoulou et al. (2003)***, who studied the Incidence and Risk Factors for Ventilator- Associated Pneumonia in 4 Multidisciplinary Intensive Care Units in Athens. The study emphasized that underlying disease is risk factor for respiratory tract infection in ventilated patient. Also this finding agree with ***Baraibar et al. (2002*)**, who found that head trauma and presence of increases in intracranial pressure were associated with increased risk of pneumonia in ventilated patient. Regarding to duration of mechanical ventilation the majority of the patients in both study and control groups stay on mechanical ventilation more than 7 day. This finding was supported by ***Cook et al. (2004),*** who identified that the duration of ventilation as an important determinant for the development of VAP.

In relation to ICU length of stay, no significant difference was elicited between oral care and length of ICU stay. This result was in agreement with, ***De Rosa et al. (2003),*** who found no significant difference in the length of stay for patients treated with chlorhexidine versus control group.

In this study the presence of VAP was established based on a clinical diagnosis of VAP. This agreement with ***Shorr et al. (2005),*** who reported that the combination of infiltrates on the chest radiographs and at least 2 of 3 clinical criteria (fever, leukocytosis, purulent secretions) had a sensitivity of 69% and a specificity of 75% for diagnosing VAP.

As regarding to body temperature there was no significant difference observed among patients in study and control groups on the first, second, third, fourth and fifth day. Presence of fever in patients that were not having pneumonia might be related to another body infection. This finding in the same line with Mentec et a**l. (2004**), who studied the blind and bronchoscopic sampling methods in suspected ventilator-associated pneumonia a multicentre prospective study. The study stated that the mechanically ventilated patient, fever may be caused by a drug reaction, extrapulmonary infection, blood transfusion, or extrapulmonary inflammation.

Regarding to leucocytosis, there was no significant difference between patients in study and control groups on the first, second, third, fourth and fifth day. Presence of leucocytosis in patients that were not having pneumonia might be related to another body infection.

Regarding to the presence of purulent sputum among control and study groups, all subject of them had no purulent sputum in the first and second day. There was a significant reduction in purulent sputum among study group when compared with control group on third, forth, fifth day of intubation. This may be related to impact of oral care protocol on patient out come.

Mondi et al. (2005), who stated that the sputum sample is checked for blood as well as color and consistency. If the sputum is green, yellow or brown it reflects the existence of an infection. However **El-Solh et al. (2004**) described that the culture was positive if any of the following organisms were cultured: Staphylococcus aureus, Streptococcus pneumoniae, Haemophilus influenzas, Moraxella catarrhalis, Klebsiella pneumonia, Serratia marcescens, Proteus mirabilir, Escherichia coli, Enterobacter cloacae, or Pseudomonas aeruginosa.

As regards to the types of bacterial species isolated by endotracheal aspirates from both study and control groups, it can be noted that the most frequent isolated microorganisms were Gram negative bacteria such as Psedomonas aeruginosa and Klebsiella pneumonia. Staphylococcu aureus as Gram positive was also isolated in considerable percentage.

In accordance with the current study, **El-Kousy (2001)** who studied the surveillance of psodomonas aeruginosa and kleebsiella in Critical Care Unit of Alexandria Main University Hospital .The study showed that the main types of organisms isolated from the tracheal secrations were Klebsiella species, Pseudomonas aeruginosa followed byStaphylococcus aureus. Isolation of organisms from tracheal secrations in the current study may be attributed to the presence of several routes by which microorganisms enter the lower airway in intubeted patients.

In agreement with this statement, **Garnacho et al. (2003)** found that Gram positive bacteria including Staphylococcus aureus were isolated from the tracheal secretions within first 48 hours of intubation and related that to the translocation of bacteria during intubation.

In relation to positive endotreacheal aspirated sputum culture (PEASC). The current study revealed that the number of patients with negative endotracheal culture was significantly increased after chlorhexidine use. Moreover, there was a significant reduction in the number of patients with endotreacheal Gram negative organisms after chlorhexidine using. It was found that there were more frequently isolated in the control group than study groups. Also, there was significant reduction of patients with Gram negative organisms after chlorhexidine use.

This finding is in line with **De Rosa et al. (2003),** who stated that there was a significance reduction in the incidence of Gram negative bacteria as a causative organism of ventilator associated pneumonia in patient treated with chlorhexidine. So, chlorhexidine oral rinse appears to have several qualities that may make it ideal agent for oral care of intubated patients.

As regards oral assessment there was no significant difference observed on the 1st, 2nd and 3rd day of intubation between study and control group. The study group had significantly lower scores than control groups. A lower score of lips, tongue, saliva, mucous membrane, gingaiva and teeth can be interpreted to mean that oral hygiene improve condition of the mouth and improve the oral environment. It could be noted that significant difference was elicited between study and control group on 4th and 5th day. Moreover, high percentages of patients who had severed alteration of mouth were in the control group. So it can be said that oral care with use of chlorhexidine oral rinse was best solution that improves oral health status, remove debries, plague, and prevent gingival bleeding.

This finding supported by **Prendergast (2009),** who found that during intubations, total oral assessment grad scores increased from baseline to 12 at day 4.This deterioration in oral health was significant for all time points after the day of enrollment, oral assessment grad scores were available on enrollment.

The researchers found that oral health status deteriorates; score was significantly lower among treatment group after using chlorhexidine than in the control group and that there was obvious improvement in the condition of the mouth and decrease in the rate of ventilator associated pneumonia through using oral care protocolcompare to routine oral care

Conclusion:

The protocol of oral care used reduce VAP among mechanically ventilated patients than the hospital routine mouth care , using of tooth brush and tooth paste had good effective in reducing bacterial load through removal of plaque, mucous, and bacteria from the mouth and teeth, oral care with using chlorhexidine gluconate 15-mL oral rinse with a 0.12% as an oral rinse for orally intubated patients is effective in improving oral health status and in reducing the ventilator associated pneumonia.The duration of ventilation and length of stay in ICU consider an important determinant for the development of VAP.

Recommendations

1. Replication of the study using a large probability samples acquired from different geographic areas.
2. A longitudinal study should be designed to determine the long term effect of the developed oral care protocol over a large period of time.
3. An educational program should be established for nurses caring for mechanically ventilated patients in ICUs.
4. Careful assessment and improved oral care intervention to reduce bacteria colonization of the oropharynex and teeth reduces contamination aspirates and subsequent VAP.
5. Written oral care should be initiated in the ICU.

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