

## Clinical Evaluation of Comprehensive versus Routine Oral Care among Critically Ill Patients

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**Abstract:** Oral care is an essential nursing management for critically ill patients who cannot carry out his activity by themselves in critical care units. Oral care of the critically ill patients affect the incidence of periodontal illness. **The study aimed to** evaluate the effect of comprehensive versus routine oral care on oral health of critically ill patients at intensive care unit. To achieve this aim, a quasi experimental research design was utilized. **The study was carried out** at the Intensive Care Unit at Tanta Emergency Hospital. A convenience sample of 40 adult patients were selected and randomly divided into two equal groups, 20 patients in each group (control and study group). **Two tools were** used for data collection. **Tool I:** Critically Ill Patient's Assessment Sheet and **Tool II:** Oral Assessment guide Scale. **Hypotheses:** The comprehensive oral care is more effective than routine oral care in minimizing oral problems for critically ill patients at intensive care unit. **The results showed** that there was no significance difference between study and control group in the first day of admission. However at third and seventh day of admission, there was significant improvement of condition of swallow, lips, tongue, mucus membrane, teeth, and Oder in study group compared to control group. While the difference was significant on seven day only in gingival and saliva with  $P = 0.00$ . **The study concluded** that oral comprehensive care was more effective than oral routine care in improving oral health status of critically ill patients. **Based on findings of the study it is recommended** to use comprehensive oral care for ICU patients as well as the non-intubated patient with self-care deficits. Also assessment of oral health status should be incorporated as part of routine care of critically ill patients.

**Key words:** Comprehensive oral care, Routine Oral Care, critical ill patient.

### INTRODUCTION

Oral care is an essential nursing management for critically ill patients who cannot carry out his activity by themselves in critical care units. Oral care provides sense of wellbeing for critically ill patients (1). Many studies suggested that good oral care of the critically ill affect the incidence of periodontal illness (2). In healthy persons, saliva acts to keep oral cavity in a healthy condition by lubricating, antibacterial and buffering actions, however patients on ventilators have deficiency in saliva secretions, and the stimulus for saliva production are not present (3). Also patient who had an endo-tracheal tube have an easy entry of bacteria into the respiratory tract, defect in the cough reflex, low activities of mucociliary escalator and large amount of mucus secretion which increase risk of respiratory system infection (4,5).

There are many obstacles affect oral care of critically ill patients include; having oral endotracheal tube (ETT), barriers to communication, gastric tubes inserted through mouth, biting tube, using of adhesive tape for securing the tube, excessive workload, time obstacle, decreasing in staffing number, other ICU bundles of care, no oral care protocols applied in the hospital and deficiency of supplies. All of these obstacles lead to inappropriate oral care and bad pathogenic condition (6,7). Mouth care associated with lubrication and preventive dental care are needed for dependent patients to relief symptoms, decreasing pulmonary colonization and translocation, keep oral

comfort, prevent deterioration of oral health and is essential to remove debris and plaque during mouth care (8,9).

Comprehensive oral care including using of mouth rinses in the form of antiseptics, water, saline, application of tooth paste and tooth brushing is very important to get rid of debris and plaque of teeth and improving oral health. Suction is also needed to get rid of excessive secretion and tooth paste (10).

Using tap water for oral care among critically ill patient considers a source of infection for those patients because this water contains bacteria which affect the patient's health especially the low immunity patients (11, 12). In some cases hydrogen peroxide may be used to rinse the mouth but it can cause irritation especially in sensitive gum (13, 14).

Manual toothbrush is recommended by some studies to be the most appropriate method for oral care for intubated critically ill patient (14). However many other studies recommended electrical toothbrush using as a good measure to manage dental plaque and keep gingival healthy (15, 16). Using an electric toothbrush for 2 minutes twice daily was effective in removing of food debris, bacterial plaque, reducing stain accumulation and keep gingival healthy. The electric toothbrushes have an oscillating head that easily rotate, this type of movement may decrease the effort needed for cleaning gingival edges and teeth. The overall smaller surface area of the electric brush head and lower profile may make the movement easier from one area to

another in the mouth during oral care compare to manual toothbrush (17-20).

The oral health among the critically ill patients may be affected by the toothpaste used for oral care. Many hospitals used toothpaste contain fluoride substance as it affect the teeth enamel ability to face decay (20). Oral cavity should be rinsed promptly from the toothpaste because if the amount of the toothpaste still present in the oral cavity after rinsing, it causes dryness of oral mucosa, deterioration in the xerostomic state and desquamation of the oral mucosa (21). Ordinary toothpastes may not be indicated for the critically intubated ill patients. Many researchers recommended that alcohol and sodium free toothpastes such as natural toothpaste with moisturizing polymers are effective in xerostomia patients and maintain oral health of critically ill patients (19- 21).

A daily assessment of oral health status should be performed to evaluate the level of oral dysfunction and maintaining patients comfort and minimize the incidence of complications (22). Oral health assessment scales used to evaluate all aspect of oral health items such as condition of teeth, gums, mucous membranes, lips, and the tongue (23-25). Finally, comprehensive oral care with electrical tooth brushing and appropriate toothpaste may be an effective oral care for critically ill and mechanically ventilated patients for maintaining moist, healthy oral mucosa, tongue and gums and decreasing problems affect patient's well-being (7). Therefore, the aim of this study is to evaluate the effect of comprehensive versus routine oral care on oral health of critically ill patients at Intensive Care Unit.

## SIGNIFICANCE OF THE STUDY

It was observed that most of the oral care procedure is not done properly in ICUs. This attributed to the inappropriate methodological application and many barriers as limited mouth opening which increase risk of oral infection. Oral care is a basic nursing care procedure that improves patient comfort and prevents oral infection (26). Attention to comprehensive oral care is recognized as an important component of care. So there is a need for a study to promote oral care and contribute a successful patient care.

## MATERIAL AND METHOD

**Aim of the study:** To evaluate the effect of comprehensive versus routine oral care on oral health of critically ill patients at intensive care unit.

**Research hypothesis:** comprehensive oral care is more effective than routine oral care in minimizing oral problems for critically ill patients at intensive care unit.

**Setting:** The study was conducted at the Intensive Care Unit at Tanta Emergency Hospital.

**Research Design:** Quasi experimental design was used.

**Sample:** A convenience sample of 40 adult patients was selected based on the sample size calculation and randomly divided into two equal groups, 20 patients in each group:

- *Control group*, who are undergoing the routine oral care of the unit.
- *Study group* was managed by comprehensive oral care which was implemented by the researchers

The subject of this study was selected according to following inclusion criteria:

- All patients aged 21 years and older
- Newly admission

### **Exclusion criteria were:**

- an edentulous state
- unstable cervical fractures,

**Tools of the Study:** Two tools were used in this study.

### **Tool 1: Critically Ill Patient's Assessment Sheet (7, 9,10).**

This tool was developed by the researcher after reviewing the related literature. This tool consisted of three parts:

- **Part A: patient's Bio- Sociodemographic data:** It included patient code, age, sex and marital status, level of education, smoking and coffee intake.
- **Part B: patient's clinical data:** It included patient diagnosis, medical history, narcotics and antibiotic medications, intubation, admission GCS and type of feeding.
- **Part C: Patients response during oral care:** It included assessment of patient response during oral care as bleeding, agitation, uncooperative, biting endotracheal tube, Patient bites toothbrush, mechanical problem with toothbrush and Patient do not open the mouth during mouth care.

**Tool II: Oral Assessment Guide Scale (23, 25).** Modified version of the OAG developed by (Eilers *et al*. 1988) to assess the oral cavity. It is most widely used and its validity has been verified. This scale consisted of 8 subscales that included voice quality and ability to swallow, assessment of lips, mucosa and gingival, tongue, teeth, and saliva. The item category of 'voice' in the OAG was omitted in the cohort and RCT as all patients were intubated. The 'voice' item was replaced with the category of 'odor' (Rosenberg & McCulloch 1992)

### **Scoring system for Oral Assessment Guide Scale:**

Total OAG scores range between 8 (excellent oral health) and 24 representing the worst in all categories. 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 oral dysfunction; and a score 3 was severe oral dysfunction. The total OAG scores is divided to subscale as follow; from 1 to 8 with denotes normal condition, 9 to 16 representing mild oral dysfunction, 17 to 20 representing moderate oral dysfunction and 21 to 24 representing severe oral dysfunction.

## METHODS

### **Tools validity and reliability:**

The tools were revised by 9 jury for content applicability and clarity and modifications were done. The reliability testing of modified version of the OAG has been reported as 91% using Cronbach's Alpha test (27).

**Pilot Study:** A pilot study was carried out on 5 critically ill patients to test the feasibility and applicability of the developed tools, accordingly needed modifications were done. The five patients of the pilot study were excluded.

**Procedure:**

- Official permission to carry out the study was obtained from the responsible authorities.
- Informed consent was obtained from the patient or their guardian after explaining the purpose of the study.
- Confidentiality of critically ill patients was ascertained.
- Data were collected over a 5 month period, starting from April 2015 to August 2015.
- The current study was conducted on three phases: preparation, implementation and evaluative phase.

**Assessment Phase:** was done for all patients in control and study group to collect baseline data using tool I part a, b and c.

- **Tool II (Modified version of the OAG tool)** was used by the researchers for each patient in the control and study groups to assess oral cavity on admission and during the period of the study. The bedside light source, mirrors, tongue blades, cotton-tipped applicators and gloves were used during the evaluation.

**Implementation Phase:**

- In this phase, the comprehensive oral care was carried out for each patient in the study group starting from the first day till the 7th day of admission. Oral care was performed once during the day and the evening shift

**The comprehensive oral care includes 2 main items:**

**Preparation of patient and equipment which include:**

- Prepare oral and suction equipments.
- Fill Toomey syringe with normal saline solution
- Attach suction catheter with suction device.
- Provide ETT and oropharyngeal suction as needed before oral care.
- Place the patient in side-lying Position with chin flexed forward and Place kidney basin under chin
- Wash hands and don gloves.
- Gently insert catheter suction inside mouth, toward back of teeth on dependent side.

**Oral care includes:-**

- Rinse the mouth with 30 to 40 cc of normal saline
- Patient's mouth was divided into 4 quadrants (right upper, right lower, left upper, left lower) and each quadrant was brushed in a defined pattern.
- Wet electrical toothbrush with normal saline
- Apply small amount of Dabur herbal toothpaste (natural toothpaste free from fluoride and harm chemicals).
- Insert toothbrush along upper tooth surface and gum line and turn brush on.
- Hold brush in contact with surface, and brush teeth at a time
- Insert brush to include lower tooth and gum line surface where possible.

- Brush tongue from back to front then suction, and rinse as needed
- Brush around ETT with caution.
- During oral care process, excess fluids and secretions were suctioned from the mouth
- Rinse mouth with 30- 50 cc of normal saline solution and suction it.
- Apply oral moisturizer to lips with gloved finger or sponge-tipped applicator.
- Rinse toothbrush in warm water and place in clean container to dry.
- Discard gloves and document care and response of patients.
- Reassess patient every 24 hours

**Critically ill patients in control group** received routine oral care of the intensive care unit once daily, which includes cleansing teeth with tongue depressor wrapped in gauze and water and every patient was assessed individually by the researchers starting from 1st day to 7th day of admission.

**Evaluation phase:** In this phase, each critically ill patient in both study and control group was reassessed and evaluated every day for seven days by using tool II (Modified version of the OAG)

**Limitation of the study:** the electrical toothbrush cost was high because the researcher must buy a toothbrush for each patient in the study group. Also many cases died after beginning of the study and the researcher excluded them from the study

**Statistical analysis:** For quantitative data, the range, mean and standard deviation were calculated. For qualitative data, a comparison between the two groups and more was done using Chi-square test ( $\chi^2$ ). For a comparison between more than two means, the F-value of ANOVA was calculated. A significance was adopted at  $P < 0.05$  for interpretation of results of tests of significance.

**RESULTS**

**Table (1) shows distribution of the studied groups according to their sociodemographic data.** It was observed that more than one third of the study group (40%) ranged in age between 21-<30 years old while in the control group the same percentage were in age between 41-50 years. Three quarters and more of the study and control group were male. The majority of the control (85%) and the study group (60%) were married. More than half of the study and control group read and write. More than two thirds of the control group (70%) were smokers compared to (55%) in study group. Regarding coffee intake, the majority of the control and study group (75% and 90%) didn't drink coffee respectively.

**Table (2) shows distribution of the studied groups according to their clinical data.** It was observed that the mean score of the Glasgow coma scale among the study and control group were  $8.20 \pm 3.071$  and  $7.45 \pm 3.591$  respectively. Regarding diagnosis, head trauma was the common diagnosis among control group (50%) and study

group (55%). Nearly half (45%) of the control and 50% of the study group had no past medical history. The majority (85%) of the control group and nearly two thirds of the study group (60%) was intubated. All the patients were NPO for more than 3 days and the majority of both groups had tubal feeding except 10% in the control group and 5% in the study group was not having tube feeding. About two thirds of the study and control group (65%, 70%) respectively are not take corticosteroids while all of them take antibiotics. Regarding narcotics medication, majority (60%) of the control and the study group (75%) received it.

**Table (3) shows distribution of studied groups according to items of oral assessment guide throughout 1st, 3th and 7th day of admission.** It was observed that there was no significance difference between study and control group on the first day of study. However at third and seventh day of admission, there was significant improvement of condition of swallow, lips, tongue, mucus membrane, teeth, and Oder in study group compared to control group. While the difference was significant on seven day regarding gingival and saliva with  $P = 0.00$

Regarding scale item of swallowing, there was no significant change in study and control groups throughout periods of study, where majority (60, 60 and 70% respectively) of patient in control group and more than half (55%) of study group was unable to swallow on 1st, 3rd and seventh day of the study.

Concerning scale item of lip and Oder of mouth, it was found that nearly all patients in the study group (95% and 100% respectively) had Smooth, pink and moist lip and normal oder of mouth while majority (85% and 75%) of patients in control group had dry or cracked lip respectively and more than half (65% and 50% respectively) of them had slightly to moderate foul on fifth and seventh day of the study. Majority of the patients in the study group (65% and 75%) had pink, moist and papillae tongue while 70% and 45% of patients in control group had coated tongue with loss of papillae on fifth and seventh day of study respectively.

Furthermore, the same proportion (80%) of the patients in the study group had Pink and moist mucous membrane. On the other hand more than two third (70% and 60% respectively ) of patients in control group had reddened or coated mucous membrane on fifth and seventh day of study respectively. The majority of the patients in the study group (60% and 100%) had clean and no debris teeth, while nearly (45% and 50%) of patient in control group had Plaque / debris in localized area between teeth on fifth and seventh day of study respectively.

Also it was found that half and majority of patient in study group (50% and 70% respectively) had watery saliva and Pink gingiva while 70% and 50% of control group had thick saliva and edematous gingiva on seventh day of study, respectively.

**Table (4): shows distribution of studied groups in relation to total oral assessment guide (OAG) at 1st, 3th and 7th day of admission.** It was observed that there is a

significant difference between study and control group regarding oral assessment guide on the third and seventh day of the study, while the difference was not significant in the first day. None of the patient in the study group had moderate or severe oral dysfunction on third and seventh day of admission, while nearly two thirds and more (65%, and 70% respectively) of control group had moderate oral dysfunction on third and seventh day of admission with a highly significant difference was observed between two groups ( $P= 0.00$ ).

**Table (5): shows distribution of the studied groups according to their responses during oral care.** It was observed that all of the patients (100%) of the study group that used electrical toothbrush did not biting end tracheal tube, not biting toothbrush and they open the mouth during oral care. on the other hand more than half of the control group bite the end tracheal tube (55%), bites toothbrush (60%) and didn't open the mouth (80%) during oral care with a highly significant difference was observed between them, where  $P= 0.00^*$ . Also this table shows that there is no significant difference between the study and control group regarding bleeding, Agitation and uncooperative during oral care.

**Table (6): shows relation between total oral assessment guide of studied groups and their age.** All patient in the study group who had age between 21-40 year had mild oral dysfunction through 1st, 3<sup>rd</sup> and 7th day of study and more than half (55.6%) of patient who had age between 41-60 years had moderate oral dysfunction on first day of study . However the majority (71.4%) of patient in control group who had age between 41-60 years had mild oral dysfunction on first day of study. A significant difference was found between total oral assessment guide of study group and their age on the first day. The percentage not change significantly on 3rd and 7 the day of study regarding moderate or severe oral dysfunction this indicate that patient age not affect on oral health condition.

**Table (7): illustrates relation between total oral assessment guide of studied groups and gender.** It was observed that more than three quarters (80%) of male patients in control group had moderate oral dysfunction on 3rd and 7th day while low percent (40% and 20% respectively) of female had moderate oral dysfunction on 3rd and 7th day of study. On the other hand neither male nor female in the study group had moderate or severe oral dysfunction on 3rd and 7th day. Also it was found a significant difference between control group total oral assessment guide and gender in the seventh day, while on the first and third day the difference was not significant.

**Table (8): illustrates relation between total oral assessment guide of studied groups and medical diagnosis.** It was observed that there was no significance difference between study and control group on the first, third and seventh days of study where  $P$  more than 0.05

**Table (9) illustrates relation between total oral assessment guide of studied groups and cigarette smoking.** It was observed that more than three quarters (78.6%) of smoker patients in control group had mild oral

dysfunction on 1st day of study and the same proportion had moderate oral dysfunction on the 3rd and 7th day of admission. However, more than half (54.5%) of smoker patients in study group had mild oral dysfunction on the 1st day of admission and no patients who were smoker in study group had moderate or severe oral dysfunction on 3rd and 7th day of the study. only a significant difference was found between control group total oral assessment guide and cigarette smoking on the first day, while on the third and seventh day of the study the difference was not significant.

**Table (10): shows relation between total oral assessment guide and coffee intake among studied groups.** It was observed that there was no significant difference between control and study group regarding coffee intake and total oral assessment guide on the first, third and seventh days of the study.

**Table (11): shows relation between total oral assessment guide and receiving tube feeding among studied groups.** It was observed that majority (94.7% ) of patients in study group who was received tube feeding had mild oral dysfunction on seventh day compared to low percentage (16.7%) of patient in control group . on the other hand,

nearly two thirds (61.1%) of control group who was received tube feeding had moderate oral dysfunction on the seventh day of the study versus to no patient in study group had moderate oral dysfunction .Also this table shows that, there was no significant difference between control and study group regarding receiving tube feeding and total oral assessment guide on the first and third days. However the difference was significant on the seventh day among the study group.

**Table (12) shows relation between total oral assessment guide and NPO for more than 3 days among studied groups.** It was found that the majority (70% and 75%) of control and study group who was NPO for more than 3 days had mild oral dysfunction on the 1st day of admission.

Also majority (70% and 100% respectively) of control and study group had moderate oral dysfunction on 3<sup>rd</sup> day of admission. However, no patients in the study group who was NPO for more than 3 days had moderate or severe oral dysfunction on seventh day compared to (65% and 20%) of patients in control group respectively.

**Table (1): Distribution of the studied groups according to their sociodemographic data.**

Characteristics		Control group (n=20)		Study group (n=20)	
		N	%	N	%
Age	From 21-<31	4	20	8	40
	From 31-<41	2	10	3	15
	From 41-<51	8	40	3	15
	From 51-60	6	30	6	30
Gender	Male	15	75	16	80
	Female	5	25	4	20
Marital status	Married	17	85	12	60
	Single	3	15	8	40
Level of education	Read and write	12	60	13	65
	Professional/University	8	40	7	35
Smoking	Non-smoker	6	30	9	45
	Smoker	14	70	11	55
Coffee intake	No	15	75	18	90
	Yes	5	25	2	10

Table (2): Distribution of the studied groups according to their Clinical data.

Characteristics		Control group (n=20)		Study group (n=20)	
		N	%	N	%
Admission GCS	Mean±SD Range	8.20±3.071 13-5		7.45±3.591 13-3	
Diagnosis	Strok/Neuro involvement	0	0	3	15
	Compromised Immune System	2	10	0	0
	Head trauma	10	50	11	55
	Respiratory disease	8	40	6	30
Medical history	No	9	45	10	50
	DM	4	20	1	5
	Hypertension	2	10	5	25
	Heart disease	2	10	3	15
Intubation	DM and hypertension	3	15	1	5
	No	3	15	8	40
Tracheostomy	Yes	17	85	12	60
	No	16	80	12	60
Oral feeding	Yes	3	15	8	40
	No	20	100	20	100
Receiving tube feeding	Yes	2	10	1	5
	No	18	90	19	95
NPO for more than 3 days	Yes	20	100	20	100
Corticosteroids	No	14	70	13	65
	Yes	6	30	7	35
Antibiotics	Yes	20	100	20	100
	No	12	60	15	75
narcotics	Yes	8	40	5	25

Table (3) shows distribution of studied groups according to items of oral assessment guide throughout 1st, 3rd and 7th day of admission

OAG items	Control group (n=20)						Study group (n=20)						χ <sup>2</sup> P		
	1 <sup>st</sup> day		3 <sup>rd</sup> day		7 <sup>th</sup> day		1 <sup>st</sup> day		3 <sup>rd</sup> day		7 <sup>th</sup> day		1 <sup>st</sup> day	3 <sup>rd</sup> day	7 <sup>th</sup> day
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
<b>1. Swallow</b>															
normal swallow	0	0	0	0	0	0	2	10	5	25	6	30	2.110	6.377	7.36
Some pain on swallow	8	40	8	40	6	30	7	35	4	20	3	15	0.348	0.04*	0.025*
Unable to swallow	12	60	12	60	14	70	11	55	11	55	11	55			
<b>2. Lips</b>															
Smooth, pink and moist	6	30	1	5	0	0	7	35	19	95	20	100	0.117	32.42	40.00
Dry or cracked	13	65	17	85	15	75	12	60	1	5	0	0	0.943	0.00*	0.00*
Ulcerated or bleeding	1	5	2	10	5	25	1	5	0	0	0	0			
<b>3. Tongue</b>															
pink, moist and papillae present	14	70	4	20	3	15	11	55	13	65	15	75	0.960	9.098	17.14
Coated and loss of papillae	6	30	14	70	9	45	9	45	7	35	5	25	0.327	0.01*	0.00*
Blistered or cracked	0	0	2	10	8	40	0	0	0	0	0	0			
<b>4. Saliva</b>															
Watery	6	30	2	10	2	10	4	20	7	35	10	50	2.400	4.397	8.22
Thick	14	70	17	85	14	70	14	70	11	55	9	45	0.301	0.111	0.016*
Absent	0	0	1	5	4	20	2	10	2	10	1	5			
<b>5. Mucous membrane</b>															
Pink and moist	13	65	4	20	3	15	14	70	16	80	16	80			
Reddened or coated (whiteness) without ulceration	6	30	14	70	12	60	5	25	3	15	4	20	0.128	17.85	17.895
Ulceration with or without bleeding	1	5	2	10	5	25	1	5	1	5	0	0	0.938	0.00*	0.00*
<b>6. Gingiva</b>															
Pink, stippled and firm	9	45	4	20	3	15	9	45	9	45	14	70			
Edematous with or without redness	11	55	12	60	10	50	10	50	11	55	6	30	1.048	5.967	15.118
Spontaneous bleeding or bleeding with pressure	0	0	4	20	7	35	1	5	0	0	0	0	0.592	0.051	0.001*
<b>7. Teeth or denture</b>															
Clean and no debris	7	35	2	10	1	5	2	10	12	60	20	100			
Plaque / debris in localized area (between teeth if present)	11	55	13	65	10	50	14	70	8	40	0	0	3.804	13.33	36.19
Generalized plaque/debris along gum line or denture bearing area	2	10	5	25	9	45	4	20	0	0	0	0	0.149	0.00*	0.00*
<b>8. Odor</b>															
Normal	11	55	4	20	3	15	8	40	19	95	20	100	2.274	23.07	29.565
Slightly to moderate foul	8	40	13	65	10	50	12	60	1	5	0	0	0.321	0.00*	0.00*
Strong foul odor	1	5	3	15	7	35	0	0	0	0	0	0			

\* Significance at level P<0.05.



Table (4): Distribution of studied groups in relation to total oral assessment guide (OAG) at 1st, 3th and 7th day of admission.

OAG		Control group (n=20)		Study group (n=20)		$\chi^2$ P
		N	%	N	%	
1 <sup>st</sup> day	Mild oral dysfunction	14	70	15	75	0.125
	Moderate oral dysfunction	6	30	5	25	0.723
3 <sup>rd</sup> day	Mild oral dysfunction	5	25	20	100	24.00 0.00*
	Moderate oral dysfunction	14	70	0	0	
	Severe oral dysfunction	1	5	0	0	
7 <sup>th</sup> day	Normal	0	0	2	10	29.714 0.00*
	Mild oral dysfunction	3	15	18	90	
	Moderate oral dysfunction	13	65	0	0	
	Severe oral dysfunction	4	20	0	0	

\* Significant at P<0.05.

Table (5): Distribution of the studied groups according to their responses during oral care.

Characteristics		Control group (n=20)		Study group (n=20)		$\chi^2$ P
		N	%	N	%	
Bleeding	No	14	70	12	60	0.440
	Yes	6	30	8	40	0.507
Agitation	No	14	70	13	65	0.114
	Yes	6	30	7	35	0.736
Uncooperative	No	13	65	18	90	3.584
	Yes	7	35	2	10	0.058
Biting endotracheal tube	No	9	45	20	100	15.172
	Yes	11	55	0	0	0.00*
Patient bites toothbrush	No	8	40	20	100	17.143
	Yes	12	60	0	0	0.00*
Mechanical problem with toothbrush	No	15	75	18	90	1.558
	Yes	5	25	2	10	0.212
Patient do not open the mouth	No	4	20	20	100	26.667
	Yes	16	80	0	0	0.00*

\* Significant at P<0.05.

Table (6): Relation between total oral assessment guide of studied groups and their age Total oral assessment guide

Total oral assessment guide		Control group (n=20)				Study group (n=20)			
		From 21-<41 (n=6)		From 41-60 (n=14)		From 21<41 (n=11)		From 41-60 (n=9)	
		N	%	N	%	N	%	N	%
Normal	1 <sup>st</sup> day	0	0	0	0	0	0	0	0
	3 <sup>th</sup> day	0	0	0	0	0	0	0	0
	7 <sup>th</sup> day	0	0	0	0	0	0	2	22.2
Mild oral dysfunction	1 <sup>st</sup> day	4	66.7	10	71.4	11	100	4	44.4
	3 <sup>th</sup> day	2	33.3	3	21.4	11	100	9	100
	7 <sup>th</sup> day	1	16.7	2	14.3	11	100	7	77.8
Moderate oral dysfunction	1 <sup>st</sup> day	2	33.2	4	28.6	0	0	5	55.6
	3 <sup>th</sup> day	4	66.7	10	71.4	0	0	0	0
	7 <sup>th</sup> day	5	83.3	8	57.1	0	0	0	0
Severe oral dysfunction	3 <sup>th</sup> day	0	0	1	7.1	0	0	0	0
	7 <sup>th</sup> day	0	0	4	28.6	0	0	0	0
$\chi^2$ , P	1 <sup>st</sup> day	7.698 , 0.053				9.333 , 0.025*			
	3 <sup>th</sup> day	5.179 , 0.521				-			
	7 <sup>th</sup> day	8.830 , 0.183				5.185 , 0.159			

\* Significant at P<0.05.

Table (7): Relation between total oral assessment guide of studied groups and their gender Total oral assessment guide

Total oral assessment guide		Control group (n=20)				Study group (n=20)			
		Male (n=15)		Female (n=5)		Male (n=16)		Female (n=4)	
		N	%	N	%	N	%	N	%
Normal	1 <sup>st</sup> day	0	0	0	0	0	0	0	0
	3 <sup>th</sup> day	0	0	0	0	0	0	0	0
	7 <sup>th</sup> day	0	0	0	0	1	6.3	1	25
Mild oral dysfunction	1 <sup>st</sup> day	11	73.3	3	60	11	68.8	4	100
	3 <sup>th</sup> day	3	20	2	40	16	100	4	100
	7 <sup>th</sup> day	2	13.3	1	20	15	93.8	3	75
Moderate oral dysfunction	1 <sup>st</sup> day	4	26.7	2	40	5	31.3	0	0
	3 <sup>th</sup> day	12	80	2	40	0	0	0	0
	7 <sup>th</sup> day	12	80	1	20	0	0	0	0
Severe oral dysfunction	1 <sup>st</sup> day	0	0	0	0	0	0	0	0
	3 <sup>th</sup> day	0	0	1	20	0	0	0	0
	7 <sup>th</sup> day	1	6.7	3	60	0	0	0	0
$\chi^2$ , P	1 <sup>st</sup> day	0.317 , 0.573				1.667 , 0.197			
	3 <sup>th</sup> day	4.457 , 0.108				-			
	7 <sup>th</sup> day	7.521 , 0.023*				1.250 , 0.264			

\* Significant at P<0.05.



**Table (8): Relation between total oral assessment guide of studied groups and medical diagnosis.**

Total oral assessment guide		Control group (n=20)						Study group (n=20)						
		Compromised Immune System (n=2)		Head trauma (n=10)		Respiratory Disease (n=8)		Stroke/Neuro involvement (n=3)		Head trauma (n=11)		Respiratory disease (n=6)		
		N	%	N	%	N	%	N	%	N	%	N	%	
Normal	7 <sup>th</sup> day	0	0	0	0	0	0	0	0	0	0	2	33.3	
	Mild oral dysfunction	1 <sup>st</sup> day	1	50	6	60	7	87.5	2	66.7	8	72.7	5	83.3
		3 <sup>th</sup> day	1	50	0	0	4	50	3	100	11	100	6	100
Moderate oral dysfunction	7 <sup>th</sup> day	1	50	0	0	2	25	3	100	11	100	4	66.7	
	1 <sup>st</sup> day	1	50	4	40	1	12.5	1	33.3	3	27.3	1	16.7	
	3 <sup>th</sup> day	1	50	9	90	4	50	0	0	0	0	0	0	
Severe oral dysfunction	7 <sup>th</sup> day	1	50	7	70	5	62.5	0	0	0	0	0	0	
	3 <sup>th</sup> day	0	0	1	10	0	0	0	0	0	0	0	0	
	7 <sup>th</sup> day	0	0	3	30	1	12.5	0	0	0	0	0	0	
$\chi^2, P$	1 <sup>st</sup> day	2.024 , 0.364						0.364 , 0.834						
	3 <sup>th</sup> day	7.143 , 0.129						-						
	7 <sup>th</sup> day	4.907 , 0.297						5.185 , 0.075						

\* Significant at P<0.05

**Table (9): Relation between total oral assessment guide of studied groups and cigarette smoking.**

Total oral assessment guide		Control group (n=20)				Study group (n=20)			
		Non-smoker (n=6)		Smoker (n=14)		Non-smoker (n=9)		Smoker (n=11)	
		N	%	N	%	N	%	N	%
Normal	1 <sup>st</sup> day	0	0	0	0	0	0	0	0
	3 <sup>th</sup> day	0	0	0	0	0	0	0	0
	7 <sup>th</sup> day	0	0	0	0	0	0	0	0
Mild oral dysfunction	1 <sup>st</sup> day	3	50	11	78.6	9	100	6	54.5
	3 <sup>th</sup> day	2	33.3	3	21.4	9	100	11	100
	7 <sup>th</sup> day	1	16.7	2	14.3	8	88.9	10	90.9
Moderate oral dysfunction	1 <sup>st</sup> day	3	50	3	21.4	0	0	5	45.5
	3 <sup>th</sup> day	3	50	11	78.6	0	0	0	0
	7 <sup>th</sup> day	2	33.3	11	78.6	0	0	0	0
Severe oral dysfunction	1 <sup>st</sup> day	0	0	0	0	0	0	0	0
	3 <sup>th</sup> day	1	16.7	0	0	0	0	0	0
	7 <sup>th</sup> day	3	50	1	7.1	0	0	0	0
$\chi^2, P$	1 <sup>st</sup> day	1.633 , 0.201				5.455 , 0.020*			
	3 <sup>th</sup> day	3.061 , 0.216				-			
	7 <sup>th</sup> day	5.195 , 0.074				0.022 , 0.881			

\* Significant at P<0.05.

**Table (10): Relation between total oral assessment guide of studied groups and coffee intake.**

Total oral assessment guide		Control group (n=20)				Study group (n=20)			
		No (n=15)		Yes (n=5)		No (n=18)		Yes (n=2)	
		N	%	N	%	N	%	N	%
Normal	1 <sup>st</sup> day	0	0	0	0	0	0	0	0
	3 <sup>th</sup> day	0	0	0	0	0	0	0	0
	7 <sup>th</sup> day	0	0	0	0	2	11.1	0	0
Mild oral dysfunction	1 <sup>st</sup> day	9	60	5	100	13	72.2	2	100
	3 <sup>th</sup> day	4	26.7	1	20	18	100	2	100
	7 <sup>th</sup> day	3	20	0	0	16	88.9	2	100
Moderate oral dysfunction	1 <sup>st</sup> day	6	40	0	0	5	27.8	0	0
	3 <sup>th</sup> day	10	66.7	4	80	0	0	0	0
	7 <sup>th</sup> day	9	60	4	80	0	0	0	0
Severe oral dysfunction	1 <sup>st</sup> day	0	0	0	0	0	0	0	0
	3 <sup>th</sup> day	1	6.7	0	0	0	0	0	0
	7 <sup>th</sup> day	3	20	1	20	0	0	0	0
$\chi^2$ , P	1 <sup>st</sup> day	2.857 , 0.091				0.741 , 0.389			
	3 <sup>th</sup> day	0.495 , 0.781				-			
	7 <sup>th</sup> day	1.231 , 0.540				0.247 , 0.619			

\* Significant at P<0.05.

**Table (11): Relation between total oral assessment guide and receiving tube feeding among studied groups.**

Total oral assessment guide		Control group (n=20)				Study group (n=20)			
		No (n=2)		Yes (n=18)		No (n=1)		Yes (n=19)	
		N	%	N	%	N	%	N	%
Normal	7 <sup>th</sup> day	0	0	0	0	1	100	1	5.3
Mild oral dysfunction	1 <sup>st</sup> day	1	50	13	72.2	1	100	14	73.7
	3 <sup>th</sup> day	0	0	5	27.8	1	100	19	100
	7 <sup>th</sup> day	0	0	3	16.7	0	0	18	94.7
Moderate oral dysfunction	1 <sup>st</sup> day	1	50	5	27.8	0	0	5	26.3
	3 <sup>th</sup> day	2	100	12	66.7	0	0	0	0
	7 <sup>th</sup> day	2	100	11	61.1	0	0	0	0
Severe oral dysfunction	3 <sup>th</sup> day	0	0	1	5.6	0	0	0	0
	7 <sup>th</sup> day	0	0	4	22.2	0	0	0	0
$\chi^2$ , P	1 <sup>st</sup> day	0.423 , 0.515				0.351 , 0.554			
	3 <sup>th</sup> day	0.952 , 0.621				-			
	7 <sup>th</sup> day	1.197 , 0.550				9.474 , 0.002*			

\* Significant at P<0.05.

Table (12): Relation between total oral assessment guide and NPO for more than 3 days among studied groups.

Total oral assessment guide		Control group (n=20)		Study group (n=20)	
		Yes (n=20)		Yes (n=20)	
		N	%	N	%
Normal	7 <sup>th</sup> day	0	0	2	10
Mild oral dysfunction	1 <sup>st</sup> day	14	70	15	75
	3 <sup>th</sup> day	5	25	0	0
	7 <sup>th</sup> day	3	15	18	90
Moderate oral dysfunction	1 <sup>st</sup> day	6	30	5	25
	3 <sup>th</sup> day	14	70	20	100
	7 <sup>th</sup> day	13	65	0	0
Severe oral dysfunction	3 <sup>th</sup> day	1	5	0	0
	7 <sup>th</sup> day	4	20	0	0
$\chi^2$ , P	1 <sup>st</sup> day	-	-	-	-
	3 <sup>th</sup> day	-	-	-	-
	7 <sup>th</sup> day	-	-	-	-

\* Significant at P&lt;0.05.

## DISCUSSION

Critically ill Patients in the intensive care units may be at risk for oral disease than any other patient. Complicated requirements of these patients such as intubation and critical illness reduce oral immunity, associated with mechanical injury of the mouth or respiratory tract leading to increase the likelihood of oral infections (7,8). Providing comprehensive oral care with electrical toothbrush decreasing the limitations of manual toothbrushes and minimize oral health problems that impact the patient's well-being (15, 28). The present study aimed to evaluate the effect of comprehensive versus routine oral care on oral health of critically ill patients at ICU.

Regarding sociodemographic data, more than one third of the study group ranged in age between 21-<30 years old while in the control group the same percentage was in age between 41-50 years. The majority of patients in the study and control group were male. This findings were in agreement with **Ghoneim et al (2012)** (29) and **Faul et al (2010)** (30) who reported that the mean age of all the studied patients were (31.60±8.34 years) and (28.73±9.68) years old and the majority of the sample was male. However this results was disagree with **Garland et al (2013)** (31) in study about epidemiology assessment of patient in intensive care unit who found that the majority of patient admitted to ICU was old with mean age (64.5 ± 16.4) years.

Also the present findings showed that more than half of the control and study group were smokers .This emphasize the importance of oral care as many studies mention that smoking cause gum disease. In this regard, **Warnakulasuriya et al (2010)** (32) reported that smoking

can lead to discoloration of teeth, alteration of taste and coated tongue.

In relation to clinical data, The Glasgow Coma Scale (GCS) was used in this study to assess severity of injury and level of consciousness. In this regard the current results showed that a decrease in the mean score of the Glasgow coma scales among the study and control group. This score indicate that the patient had severe injury and unable to make oral care. This finding was in line with **Schirmer-Mikalsen et al (2007)** (33) who reported that GCS was essential tool used for assessment of neurological status.

As regard medical diagnosis, head trauma was the common diagnosis among both groups with no past medical history was detected. This may be due to that most of the sample was in age between 21-30 and 41-50 years. In Egypt study conducted by **Ghoneim et al (2012)**(29) found that the majority of young adult and male in their study had a traumatic head injury. Similarly **Younis and Sayed Ahmed (2015)** (34) found that more than half of the studied group had head trauma.

Regarding intubations, the present finding revealed that all of the patients in both groups were intubated. This attributed that most of the sample in this study had severe head injury and need ventilator support. This finding was consistent with **Javadinia et al. (2014)** (35) who stated that patients with severe head trauma may require prolonged mechanical ventilation and require oral intubation which increase risk for oral infection and this paying attention to oral hygiene.

In addition **Ibrahim et al (2015)** (36) reported that critically ill patients may be sedated, intubated and have a nasogastric tube, all of these factors may lead to breathing through the

mouth and cause change in oral flora that increase risk of oral infection. In relation to method of feeding, all of the patients in both groups in the present study were nothing per mouth for more than three days and the majority of them had tubal feeding. This may be due to the severity of their disease and altered level of consciousness and these results necessitate the importance of oral care for those patient. The same result was reported by **Shabaan (2008)** (37) who stated that the majority of patients admitted to ICU were given nutrition through nasogastric tube.

As regard medication administration, all of the patients in control and study groups received antibiotics medication and most of them received narcotics medication. This may be due to that most of the patients in ICU were intubated and had invasive procedures that increase risk of infection. In this respect **Munro and Grap (2004)**(38) reported that narcotics, antihypertensive and antibiotics medications may affect on salivary secretions and cause mouth dryness. Similarly **Scannapieco and Genco(1999)**(39) mentioned that administering antibiotics affect the normal flora in the mouth that fights and excludes pathogenic bacteria.

Regarding coffee intake, the majority of the control and study group didn't drink coffee and there is no significant relation between control and study group regarding coffee intake and total oral assessment guide on the first, third and seventh days of the study. This result means that the changes in teeth color may be due to poor oral hygiene as the coffee intake does not consider as an effective variable. This result was supported by **Karadas and Seven (2014)** (40) who examined the effect of different drinks on tooth color, they concluded that there were no significant differences in color change of teeth after coffee intake. Also **Liporoni et al (2010)** (41) emphasized that coffee did not interfere with the change of teeth color.

As regard oral health assessments guide, no significance difference was found between study and control group on the first day of admission. However on third and seventh day of the study, there was significant improvement of condition of swallow, lips, tongue, mucus membrane, teeth and odor of mouth in the study group compared to control group. While the difference was significant on seven day only regarding items of gingiva and saliva. This can be attributed to that the comprehensive oral care improves the condition of the mouth. Similarly, **Kumari et al (2013)** (5) reported that a significant improvement of condition of lips, gingiva, tongue, teeth and saliva of oral health status after administering oral care. Also **McDowell(1996)** (42) and **Paju (2007)**(43) stated that poor oral hygiene are frequently associated with dry mucous membranes, inflammation of gums and periodontal disease.

Regarding scale item of swallowing, there was no significant change in the score of study and control groups throughout periods of study where majority of patient in control and study groups were unable to swallow on 1st, 3rd and seventh day of the study. This may be related to severity of disease and administration of sedation medication which affecting the gag reflex. This result was in line with **Prendergast (2012)** (20) and **Kishimoto et al (2016)** (44) who stated that the swallowing category of most of the

intubated patient in their study did not change significantly after care.

Concerning item of lip and odor of mouth, the majority of the patients in the study group had smooth, pink, moist lip and normal odor of mouth while most of the control group had dry or cracked lip and slightly to moderate foul odor of mouth on fifth and seventh day of study. This may attributed to the effect of oral comprehensive care. This result was agree with others study conducted by **Labeau et al ( 2011)** (3) and **Alhazzani et al (2013)** (45) reported that most of the patient on mechanical ventilation had end tracheal tube that may lead to dryness of mouth due to prolonged mouth opening and the effect of medications that used for treatment of this patient.

Interestingly, the study results revealed that improvement of condition of tongue and mucus membrane of mouth of most of the patients in the study group who had managed by comprehensive care and electrical tooth brush. This improvement is attributed to that electrical tooth brush was used for scraping of tongue during mouth care, on the other hand, most of the patients in control group had coated tongue and mucous membrane with loss of papillae at fifth and seventh day of study. This finding was accordance with **Prendergast et al (2012)** (20) who emphasized that scraping of tongue by electrical toothbrush clean tongue, mucus membrane of mouth and reduce halitosis.

Also the present study showed that the majority of the patients in the study group had clean with no debris in teeth while most of patients in control group had coated mucous membrane and plaque with debris in localized area between teeth on fifth and seventh day of study. This result was consistent with **Deshmukh (2006)** (46) and **Zanatta (2011)** (47) who reported that using of electric toothbrushes is better than manual toothbrushes in reduction teeth plaque and improved gingival health. Other study conducted by **Pearson et al (2002)** (48) who compare between using foam swabs and toothbrushes to remove dental plaque" concluded that gauze swabs moistened with water is not effective for plaque removal.

Concerning saliva and gingival, the majority of patient in study group had watery saliva and pink gingiva. This improvement of oral health status may be due to using of electrical tooth brush, natural toothpaste and frequency of oral care intervention provided to the study group. On the other hand, most of the control group had thick saliva and edematous with or without redness gingival on seventh day of the study. This may be attributed to severity of disease and poor oral hygiene. In this regard **Dennesen et al (2003)** (49) stated that the presence of saliva in normal quantity and composition cleanse the mouth and contributes to the antimicrobial process thereby maintaining integrity of the teeth and soft tissues. Also other studies (50, 51) have reported that using an electric toothbrush twice daily is better than a manual tooth-brush for improving gingival health.

Regarding distribution of studied groups according to total oral assessment guide score (OAG), none of the patient in the study group had moderate or severe oral dysfunction

while the majority of patient in control group had moderate oral dysfunction on third and seventh day of admission. This finding was in agreement with study conducted by **Ames et al** , 2011 who found that the patients who had managed by systematic oral care had decreasing scores on the Beck Scale that indicates improvement of oral health status (52).

Regarding responses of studied groups during oral care, all of the patients that used electrical toothbrush in the study group didn't bit endotracheal tube, not biting toothbrush and they open the mouth during oral care. On the other hand more than half of the control group bite toothbrush and didn't open the mouth during oral care. This may be due that the electrical toothbrush had smaller oscillating rotating head that vibrate and moves at faster rate than any human hand (53). This result was agreement with **Wolden et al (2006)** (54) who pointed that electrical tooth brushes have a smaller head and easier to hold in limited oral space in unconscious patient. In contrast, **Prendergast et al (2012)** (20) founded that patients who received comprehensive care and electrical tooth brush biting the endotracheal tube during oral care.

Furthermore, there was no significant difference between study and control group regarding bleeding, agitation and uncooperation during oral care. This finding was in line with **Prendergast et al(2012)** (20) who concluded that biting the endotracheal tube, agitation and coughing are frequently occurring among intubated patients and not necessarily due to the oral care. Also **Vandana and Vibhute (2012)** (55) emphasized that no significant difference was found between electrical and manual toothbrush regarding bleeding where both of toothbrushes help in reduction of bleeding in higher percentages.

In relation to total oral assessment guide of studied groups and their age, the present study revealed that the patient's age not affect on the progress of oral health condition. This result was in contrast with **Busby et al (2014)**(56) who stated that increasing age can be associated with decline of oral health. Similarly **Puscasu et al (2007)** (57) reported that oral health dysfunction seems to be worldwide health problem influencing the majority of the adult population after the age of 35-40 years.

Regarding relation between total oral assessment guide and gender, there was no significant relations between control and study group total oral assessment guide and gender throughout period of the study. This finding was consistent with **Konradsen et al (2014)** (58) in study about assessment of risk factors for impaired oral health, the study stated that no relation was found among the gender and the need of oral care.

As regard relation between total oral assessment guide and cigarette smoking, there was a relation between total oral assessment guide and cigarette smoking among studied groups. The majority of smoker patients in control group had moderate oral dysfunction on 3rd and 7th day of admission while all the patients of the study group didn't had moderate or severe oral dysfunction on 3rd and 7th day of admission. This may be due to the effect of comprehensive oral care. This result was supported by

**Bergström (2005)** (59) who reported that a significant correlation was found between smoking and sub gingival disease associated with the age and oral cleanliness distraction of the patients. Other studies (60, 61) had demonstrated that tooth loss and caries are more frequently associated with smoking. On the other hand, **Puscasu et al (2007)** (57) concluded that there was no relation between oral health dysfunction and smoking and calculus depositions.

Considering relation between total oral assessment guide and receiving tube feeding, most of the patients in control group who received tube feeding had moderate oral dysfunction on seventh day of study while none of patient in study group had moderate oral dysfunction with no significant difference was observed between control and study group and the difference was significant only at the seventh day among the study group. This result was supported by **Griffiths (2002)** (8) who concluded that patients with nasogastric feeding are more prone to oral health disease than in those who received nutrition orally. Similarly **Takeshita et al (2011)** (62) reported that nasogastric tube feeding and nothing per oral for long periods of time alters the intraoral conditions and decrease saliva secretion and increase risk for oral infection.

As regard relation between total oral assessment guide and NPO for more than 3 days, all of the patients in the study group didn't had moderate or severe oral dysfunction on seventh day while more than half of patients in control group had moderate oral dysfunction on 3rd day of admission. This pay attention to the importance of oral care. This result was in line with **Leibovitz et al (2003)**(63) who stated that nothing pre mouth for long periods lead to a reduction in the salivary secretions and alter oral indigenous microbiota which increase risk for oral health disorders .At the end, intensive care units have been found to negatively impact overall oral health. Therefore comprehensive oral care is very important for promotion and maintenance of oral health (64).

## CONCLUSION AND RECOMMENDATIONS

**Conclusion:** Based on the findings of current study, it can be concluded that, comprehensive oral care with electrical tooth brushing was more effective than oral routine care in improving oral health status of critically ill patients.

## RECOMMENDATIONS

- There should be an assessment tool such as the oral health assessment guide for assessment of oral health status and it should be incorporated as part of routine care of critically ill patients.
- Comprehensive oral care with the electrical toothbrush should be used for ICU patients as well as the non-intubated patient with self-care deficits.
- Presence of dental hygienists or dentists into the hospital intensive care units setting should be explored.
- Replication of the study on a larger sample to validate the findings.
- establishing a written updated protocol about oral care in intensive care unit

- Continued research regarding safety and efficacy of the comprehensive oral care and its effect on hemodynamic parameters

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