

Effect of Oral Care Intervention and Safe-Swallowing Education on Dysphagia among ICU Patients Post Endotracheal Extubation

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Abstract:

Background: Post Extubation Dysphagia (PED) can potentially cause life-threatening consequences, early detection of PED is essential to reduce complications. Understanding the treatment modalities of PED is essential to minimize complications and improve quality of treatment. Oral care intervention and safe-swallowing education are valuable to improve and prevent dysphagia in vulnerable patients' post-extubation. **The aim** of this study is to assess the effect of oral care intervention and safe-swallowing education on dysphagia among ICU patients post endotracheal extubation. **Subjects and Method: Design:** A quasi-experimental design was utilized. **Setting;** Medical intensive care units (ICUs) in Emergency hospital affiliated to Tanta University hospitals. **Sample:** A purposive sample of 40 adult patients, who underwent emergency oral endotracheal intubation for at least 48 hours. **Tool 1:** Bio socio-demographic data questionnaire; **Tool 2:** Modified Standardized Swallow Assessment (MSSA). Data was collected through three phases; assessment, implementation and evaluation through 10 months. **Results:** there is a dramatic improvement in in MSSA score and in the satisfactory level of MSSA post intervention in the study group which are highly statistically significant, compared to a slight gradual improvement in MSSA score post intervention in addition; there are no significant differences in the satisfactory level of MSSA scores throughout the study period in the control group. **Conclusion:** oral care intervention along with safe-swallowing education for the patients and their family care giver reduces dysphagia of ICU patients post endotracheal extubation. **Recommendation:** Nurses can play an important role in reducing dysphagia among ICU patients post endotracheal extubation by include the oral care intervention and safe-swallowing education in the daily routine care provided for patients post endotracheal intubation.

Key words: Oral Care Intervention, Safe Swallowing Education, Post Extubation Dysphagia

Introduction:

Patients admitted in critical condition and suffering from respiratory insufficiencies are frequently subjects to mechanical ventilation, which then assists the lungs to be ventilated properly. Mechanical ventilation is used as a supportive treatment of several disorders, such as those derived from tracheal intubation. Orotracheal intubation, for life to be sustained, may result in post-extubation swallowing dysfunction, delaying oral feeding, specifically patients experiencing long period intubation, (≥ 48 hours) have more hazard for dysphagia⁽¹⁾. Dysphagia after extubation affects up to 62% of intensive care unit (ICU) patients, and when dysphagia continues, resumption of oral intake is delayed, necessitating patients to tube feeding⁽²⁾.

Post-extubation dysphagia (PED) is the inability or difficulty to safely and efficiently swallow food and fluid after extubation of endotracheal tubes; it has been documented in 3% to 62% of persons who experienced intubation causes that lead to post-extubation swallowing dysfunction are multifactorial and include oropharyngeal muscle inactivity, glottis injury, mucosal inflammation leading to the loss of tissue architecture, and vocal cord ulcerations^(3,4). PED undesirably disturbs patient outcomes resulting in

delayed resumption of oral intake, poor quality of life, aspiration pneumonia, prolonged ICU and hospital stays, and high mortality^(5,6).

Since PED can potentially cause life-threatening consequences, early detection of PED is essential to reduce complications. Understanding the treatment modalities of PED is essential to minimize complications, improve quality of treatment⁽⁷⁾.

The evidence for dysphagia treatment, however, is limited as few intervention studies have been designed to reduce dysphagia or the time needed to resume total oral intake after extubation. The improving of oral lubrication, oral sensation, and strength in the lips, tongue, jaw, and cheeks by applying tooth brushing/salivary gland massage, oral range of motion (ROM) exercises for the lips, tongue, jaw, and cheeks, and safe-swallowing education, would decrease time to restart oral intake and improve salivary flow for patients who underwent prolonged endotracheal intubation^(6,8). Also, oral lubrication either by endogenous saliva or exogenous by oral care preparations or food particles lubricate; tooth-tooth, tongue-palate, and tongue mucosal surfaces plays an important role in effective swallowing, mastication, and tactile perception⁽⁹⁾. Additionally, oral

sensation is important as the oral cavity has a rich somatosensory innervation and stimulating these sensory receptors in the tongue and parts of the mouth cavity may enhance proprioception and oral sensorimotor regulation in swallowing⁽¹⁰⁾. Dysphagia treatment modalities -still- have been relatively not well established and the recent publications of literature reviews delineating the need for future researches of dysphagia treatment⁽¹¹⁾. Oral Care intervention and Safe-Swallowing education are valuable to improve and prevent of further harm in vulnerable patients post-extubation⁽¹²⁾. Therefore, the aim of this study is to assess the effect of oral care intervention and safe-swallowing education on dysphagia among ICU patients post endotracheal extubation.

Aim of the study:

To assess the effect of oral care intervention and safe-swallowing education on dysphagia among ICU patients post endotracheal extubation.

Research hypothesis

H₁: The study group who receives oral care intervention and safe-swallowing education will exhibit higher Modified Standardised Swallow Assessment (MSSA) score than control group.

H₂: Participants' sociodemographic characteristics and clinical data will be correlated to the SSA score.

Materials and method

Design:

A quasi-experimental design was utilized for the aim of this study.

Setting:

The study was conducted at the Medical intensive care units (ICUs) in Emergency hospital affiliated to Tanta University hospitals.

Subjects:

A purposive sample of 40 adult patients, who are alert and able to communicate, able to sit up, and underwent emergency oral endotracheal intubation for at least 48 hours.

Exclusion criteria:

History of neuromuscular disease, head and neck deformities, preexisting swallowing difficulty, and agitated patients.

The sample size calculation based on the number of patients who are admitted to medical ICUs at Emergency hospital, Tanta University hospitals and expected improvement of patients post endotracheal extubation outcomes among the studied groups. The power analysis calculation was based on software program for the studied subjects at 95% confidence.

The 40 subjects were divided into 2 equal groups; control and study as follows:

The control group; comprises 20 patients

after successfully extubated and were maintained on routine hospital care provided by ICU staff.

The study group; after successfully extubated, and received Oral Care Intervention on the next day daily for 7 days post-extubation. In addition; a brief safe-swallowing education was provided to the participants and their family care giver.

Tools: Two tools were developed by the researchers for the purpose of the study as follows:

Tool 1: Bio sociodemographic data questionnaire:

Which includes two parts as follow; **Part A:** Socio-demographic characteristics such as age, gender, educational level. **Part B:** Health relevant data; that include; weight, height, BMI, admission diagnosis, past medical history, smoking habit and oxygen therapy device.

Tool 2: Modified Standardized Swallow Assessment (MSSA) Tool:

The tool was devolved by (Perry, 2001)⁽¹³⁾. Was modified by the researcher; it was validated and found to have high levels of internal consistency, inter-examiner reliability, and test-retest reliability. It includes two sections, **section one (Assessment):** first assess the conscious level, postural control in order to ensure the patient is physically capable of undertaking screening, then 5 criteria are

assessed: ability to cough, to control saliva, to move the tounge , to breath, and voice quality (absence of signs of pooling of secretion around the laryngeal opening) with a response of Yes scored 1 and No scored 0, except the fifth cirterion its score is reversed , if the patient fulfilled the above mentioned criteria, the researcher proceeds to the next section. **Section Two: Water Swallow Test I:** this part to assess patient' for absence of swallow when given three teaspoon of water by the following criteria; dribbling of water out of mouth, coughing, choking, breathless, and wet or gurgle voice with a response of Yes scored 0 and No scored 1. **Water Swallow Test II:** this part to assess patient' absence of swallow when given 50 ml water in a glass using the same criteria of water swallow test I.

Scoring system: The total score of the scale was summed up and categorized as follows;

Satisfactory Level of (SSA)	Percentage %
Unsatisfactory	< 60%
Moderate	60-75%
Satisfactory	> 75%

Methods:

Data collection:

Permission to carry out the study was obtained from the authorized person from both Emergency hospital and medical

ICUs in Tanta University hospitals. The researchers meet the eligible participants and explained the purpose of the study and the participants were informed that they have the right to participate in the study, and to withdraw at any time without any effect on their care given and assured that there is no harm from the study. Subjects who agreed to take a part were asked to provide written consent. **The control group**; after successful extubation, were maintained on usual care consisted of routine hospital care provided by ICU staff.

The Study group; after successful extubation, they were received oral care intervention starting from the next day after extubation and daily for 7 consecutive days. In addition; a brief safe-swallowing education was provided to the participants and their family care giver. Ethical consideration for privacy and confidentiality of the data and results was concluded. Confidentiality and anonymity were maintained. Oral care intervention and safe-swallowing education were conducted in three phases.

A- Assessment phase: Baseline data was collected from patients in both control and study group by using tool I part A and B and tool 2 sections; I and II.

MSSA tool section I was used for the initial assessment of the patient, if the

patient fulfilled the criteria; the researcher proceeded to the next section, and if the patient didn't fulfill the criteria, it indicated that the patient is not eligible to proceed for section 2 and the screening procedure was terminated. Regarding section II: Water Swallow Test I; the patient was given three teaspoon of water and was assessed for absence of swallow, if the patient failed any item of the swallow test I, the procedure was terminated and he was put on nil by mouth, if the patient screening procedure indicates ability to swallow, the researcher proceeded to Water Swallow Test 2; the patient was given 50 ml water in a glass and again was assessed for absence of swallow using the same criteria of swallow test I.

To avoid data transmission from study to control group, data were collected first from control group over a period of 4 months. After reaching 20 subjects for the control group, data collection from the study group was started. Data collection for the study group lasts for 6 months to be completed.

B- Implementation phase: This phase was implemented to the study group only where the researchers meet the participants after collecting the baseline data and the researcher implement the program as follows:

Brushing participants' oral cavity including teeth, gum, tongue, and palate with a soft toothbrush, using distilled water to remove the coated plaque, mechanically stimulate tissues, and rinse the oral cavity. Moisturizing participants' lips with Vaseline 4 times daily. Placing fingers on participants' cheeks and gently massaging and pressing the surface overlying the parotid, sublingual, and submandibular salivary glands. Participants were asked to purse the lips, move the tongue, open the mouth widely, and inflate the cheeks each with 3, 5, or 10 repetitions with or without resistance, as tolerated by the patient, cheek retractor, and tongue holder was used when needed to help in the oral care. A brief safe-swallowing education was provided for the patients and their family care giver.

C- Evaluation phase: This phase was implemented for both groups using tool 2 pre interventions and daily for subsequent 7 days.

Results

Table (1): Revealed that; the majority of the control group was in age group of 50-60 years, while half of the study group was in the same age group. Regarding the gender; more than half of them were male in the control and study group.

In relation to the level of education same table represents that; less than half and

same percentage of the control and study group have primary and preparatory education respectively.

For the Body Mass Index (BMI); more than half of the control group compared to near to one third of the study group have ideal body weight. While one quarter of the control group, compared to more than half of the study group were overweight.

In addition; mean and standard deviation of BMI is 24.55 ± 2.39 and 26.29 ± 2.19 for the control and study group respectively.

Table (2): Illustrated percent distribution of the studied patients according to their admission diagnosis; less than one third of the control group were admitted with pulmonary edema, while fifth of them were admitted with stroke.

For the study group, small and same percent of the participants were admitted with lung cancer and meningitis, moreover, tenth and same percent of them were admitted with diagnoses of head injury and chronic obstructive pulmonary disease.

Table (3): As illustrated in this table; the majority of the control group and more than half of them has a past medical history of cerebrovascular (CVS) and respiratory disorder respectively, while tenth of them have a past history of cancer. Regarding to the study group; same table illustrated that less than half and about third of them has a past history of

cerebrovascular (CVS) and respiratory disorders respectively. In addition more than tenth and same percent of control and study group have past medical history of hepatic and renal disease.

As regard to the smoking habit; tenth compared to fifth of the subjects were smokers with a mean \pm SD of (20.00 \pm 0.00) and (27.50 \pm 2.58) for control and study group respectively. In relation to the number of cigarettes/day it is ranging from 2-3 and 1-3 for the control and study group respectively.

Regarding to the oxygen therapy device; more than half of the control group and one fifth of them were on simple O₂ mask and nasal cannula respectively. While in the study group; about third and same percent were on nasal cannula and Bi-level positive airway pressure.

The same table revealed that there are no statistical significant differences between the studied groups in relation to their medical history.

Table (4): Presents total mean scores of items of the Modified Standardized Swallow Assessment (MSSA) among the studied groups throughout periods of the study. For the control group, the table shows that there was a slight improvement in the mean of the assessment score (0-2) and (0-4) in pre-intervention and day 7

respectively, and that improvement was statistically significant, with p value = 0.005, while, the improvement was the same throughout the periods of the study with a mean score of; (0-3), (0-3), (0-3) and (0-4) in the pre intervention, day 1, 4, and 7 respectively for both water swallow test1 and test 2. Although there were no statistically significant differences for both test since p value = > 0.05, but there was a statistical significance in the total score of MSSA where p value = 0.006. As regard to the study group; the results showed that the mean of the total score of MSSA has been increased dramatically (0-6), (0-8) (4-14), (5-15) in the pre, day 1, 4, and 7 post intervention respectively, moreover; the same table revealed that; there were a highly statistical significant differences in the mean score of; Assessment; Water swallow test 1, Water swallow test 2 and Total score of MSSA where P value equal 0.000 each.

Table (5): Demonstrated the distribution of the studied groups according to their level of Modified standardized swallow assessment (MSSA) throughout periods of study. As illustrated in table 5; all patient of the control group have unsatisfactory level of standardized swallow assessment score pre the intervention which has been decreased to majority of them in day 7, while only small percent of them have

satisfactory level in day 7 with no statistical significant differences in the level of MSSA scores throughout the study period.

As related to the study group; the same table reveals that all patient have unsatisfactory level of standardized swallow assessment score pre intervention and day 1 post intervention which has been decreased dramatically to tenth of them in day 7 post intervention; in contrast none of the patient have satisfactory level of standardized swallow assessment score pre intervention and day 1 post intervention which has been increased dramatically to majority of them in day 7 post intervention with high significant difference of MSSA level throughout the study period.

Table (6): Presents comparison and correlation between the sociodemographic characteristics of the studied groups and their mean score of the Modified Standardized Swallow Assessment (MSSA) throughout periods of study. The table revealed that; there was a significant correlation between the age and the total MSSA mean score throughout periods of study and in the 7th day for control and study group respectively. Moreover; it was observed that the younger participants of the control group aged from twenty-one to thirty got high MSSA scores throughout the study period 8.00 ± 0.00 , 9.00 ± 0.00 ,

10.00 ± 0.00 and 12.00 ± 0.00 in the pre, day 1,4, and 7 post the intervention respectively, while for the study group the same age category got the highest score in pre day 1 and 4 post the intervention 5.00 ± 1.155 , 5.00 ± 1.155 and 10.75 ± 2.630 respectively and the difference was statistically significant between the age group in day seven since $P = 0.044$. For the gender; the present table illustrated that; there was significant difference between both sex of the study group in day 7 post intervention since $P = 0.044$, where the female got high mean score 14.38 ± 0.744 than male 11.83 ± 3.243 since. Regarding the level of education and body mass index (BMI); there were no any significant correlation between those characteristic and the MSSA in both the control and the study group.

Table (7): Illustrates the comparison and correlation between the clinical data of the studied groups and their mean score of the Modified Standardized Swallow Assessment (MSSA) throughout periods of study. The table shows that; there was no any significant correlation between the admission diagnosis and the MSSA in both in the control and the study group. In relation to the past medical history; there is a significant correlation between the past medical history and the mean scores of MSSA in day 1 and day 7 with P value of

0.024 and 0.006 respectively in the control group, the participants who had past medical history of hepatic, respiratory, neurologic and gastrointestinal disorders got high mean scores of MSSA than the others. For the study group there was no correlation between the past medical history and the MSSA mean scores. In relation to smoking habit; the result illustrated that there is no correlation between the number of cigarettes per day and the MSSA mean scores in the control group since p value = > 0.05 , same table showed that for the study group participant who were nonsmoker got higher MSSA score followed by 1 cigarette smoker participant with a mean of 13.56 ± 1.672 and 13.00 ± 0.00 respectively while the patients who smoke 3 cigarettes got the lowest MSSA with a mean score 7.00 ± 0.00 and difference was statistically significant in day 1 and 7 since $P = 0.046$ and 0.044 respectively.

As regard to the Oxygen therapy device; it is cleared that; there is a high significant correlation between the Oxygen therapy device and the MSSA mean score in the control group, the participant who were connected to Bi-level positive airway pressure device got the higher scores than the participants who were connected to other oxygen therapy devices in the pre, day 1 and 4 of the study period with mean

score of 6.50 ± 2.121 , 7.50 ± 2.121 and 7.50 ± 3.536 respectively. In contrast, there was no significance relation in the study group since p value = > 0.05 .

Table (1): Percent distribution of the studied patients according to their socio-demographic characteristics

Characteristics	The studied patients (n=40)				χ^2 P
	Control group (n=20)		Study group (n=20)		
	N	%	N	%	
Age (in years)					
▪ (21 -< 30)	1	5.0	4	20.0	2.578 0.461
▪ (30 -<40)	1	5.0	1	5.0	
▪ (40< 50)	4	20.0	5	25.0	
▪ (50-60)	14	70.0	10	50.0	
Gender					
▪ Male	13	65.0	12	60.0	FE 1.00
▪ Female	7	35.0	8	40.0	
Level of education					
▪ Primary	7	35.0	5	25.0	1.294 0.730
▪ Preparatory	4	20.0	7	35.0	
▪ Secondary	5	25.0	5	25.0	
▪ High	4	20.0	3	15.0	
Height (in cm)					
Range	(150-180)		(148-178)		t=0.065 P=0.949
Mean \pm SD	163.70 \pm 3.55		163.55 \pm 3.14		
Weight (in kg)					
Range	(48-90)		(52-90)		t=1.196 P=0.239
Mean \pm SD	64.50 \pm 2.79		68.25 \pm 1.96		
Body mass index					
▪ Ideal weight (18.5- 24.9)	12	60.0	6	30.0	5.082 0.079
▪ Over weight (25- 29.9)	5	25.0	12	60.0	
▪ Obese (30- 39.9)	3	15.0	2	10.0	
Range	(19.3-34.1)		(19.2-37.5)		t=1.326 P=0.193
Mean \pm SD	24.55 \pm 2.39		26.29 \pm 2.19		

FE: Fisher' Exact test

Table (2): Percent distribution of the studied patients according to admission diagnosis

Characteristics	The studied patients (n=40)				χ^2 P
	Control group (n=20)		Study group (n=20)		
	N	%	N	%	
Admission diagnosis					
▪ Sarcoidosis					
▪ Lung cancer					
▪ GERD	0	0.0	1	5.0	
▪ GBS	0	0.0	3	15.0	
▪ Chest rib fracture	0	0.0	1	5.0	
▪ Meningitis	0	0.0	1	5.0	
▪ Head injury	0	0.0	1	5.0	
▪ Brain tumor	1	5.0	3	15.0	
▪ COPD	0	0.0	2	10.0	
▪ Stroke	0	0.0	1	5.0	
▪ Cancer of larynx	2	10.0	2	10.0	
▪ Skull fracture	4	20.0	2	10.0	
▪ Post thoracentesis	0	0.0	1	5.0	
▪ Bronchiectasis	0	0.0	1	5.0	
▪ Pulmonary infarction	1	5.0	0	0.0	
▪ Pulmonary edema	2	10.0	1	5.0	
▪ Pneumonia	1	5.0	0	0.0	
▪ ARDS	6	30.0	0	0.0	
▪ Atelectasis	1	5.0	0	0.0	
	1	5.0	0	0.0	
	1	5.0	0	0.0	
					27.133 0.102

Table (3): Percent distribution of the studied patients according to their medical history

Medical history	The studied patients (n=40)				χ^2 P
	Control group (n=20)		Study group (n=20)		
	N	%	N	%	
# Past medical history of disease					
1. CVS disorder	16	80.0	9	45.0	6.254 0.085
2. Diabetes mellitus	8	40.0	6	30.0	
3. Hepatic disease	3	15.0	3	15.0	
4. Cancer	2	10.0	5	25.0	
5. Respiratory disorder	13	65.0	7	35.0	
6. Neurologic disorder	3	15.0	5	25.0	
7. Gastrointestinal disease	3	15.0	2	10.0	
8. Renal disease	3	15.0	3	15.0	
Smoking habit					t=0.795 P=0.471
Number (%)	2 (10.0)		4 (20.0)		
Range	(20-20)		(10-40)		
Mean \pm SD	20.00 \pm 0.00		27.50 \pm 2.58		
No of cigarettes/day					t=0.730 P=0.506
Range	(2-3)		(1-3)		
Mean \pm SD	2.50 \pm 0.77		2.00 \pm 0.86		
Oxygen therapy device					7.175 0.067
▪ Simple O ₂ mask	13	65.0	6	30.0	
▪ Nasal cannula	4	20.0	7	35.0	
▪ Non-rebreathing mask	1	5.0	0	0.0	
▪ Bi-level positive airway pressure	2	10.0	7	35.0	

More than one answer was chosen

Table (4): Total Mean Scores of Items of the Modified Standardized Swallow Assessment (MSSA) Among the Studied Groups throughout Periods of Study

Modified Standardized Swallow Assessment (MSSA) items	The studied patients (n=40)									
	Control group (n=20)				F P	Study group (n=20)				F P
	Pre intervention	Day 1	Day 4	Day 7		Pre intervention	Day 1	Day 4	Day 7	
1. Assessment score	(0-2) 0.45±0.759	(0-3) 0.70±0.865	(0-4) 1.10±1.165	(0-4) 1.55±0.146	4.63 0.005*	(0-4) 0.90±0.373	(0-4) 1.00±0.376	(2-4) 3.40±0.940	(3-5) 4.60±0.754	51.13 0.000*
2. Water swallow test 1 score	(0-3) 1.15±0.875	(0-3) 1.15±0.875	(0-3) 1.35±0.988	(0-4) 1.85±1.226	2.17 0.098	(0-3) 1.15±0.813	(0-4) 1.75±1.209	(0-5) 3.40±1.603	(0-5) 4.00±1.589	20.03 0.000*
3. Water swallow test 2 score	(0-3) 1.15±0.875	(0-3) 1.15±0.875	(0-3) 1.35±0.988	(0-4) 1.85±1.226	2.17 0.098	(0-3) 1.50±0.827	(0-3) 1.90±0.912	(0-5) 3.55±1.317	(1-5) 4.25±1.020	32.11 0.000*
Total score of SSA	(0-8) 2.75±1.197	(0-9) 3.00±1.294	(0-10) 3.80±1.353	(1-12) 5.25±1.613	4.518 0.006*	(0-6) 3.55±1.701	(0-8) 4.65±1.927	(4-14) 10.35±2.739	(5-15) 12.85±2.815	72.59 0.000*

* Significant at level $P < 0.05$.

Table (5): Percent distribution of the studied groups according to their satisfactory level of Modified Standardized Swallow Assessment (MSSA) throughout periods of study.

Level of satisfactory of MSSA	The studied patients (n=40)																	
	Control group (n=20)								χ^2 P	Study group (n=20)								χ^2 P
	Pre intervention		Day 1		Day 4		Day 7			Pre intervention		Day 1		Day 4		Day 7		
	N	%	N	%	N	%	N	%		N	%	N	%	N	%	N	%	
▪ Unsatisfactory	20	100.0	19	95.0	19	95.0	17	85.0	5.253 0.512	20	100.0	20	100.0	4	20.0	2	10.0	68.78 0.000*
▪ Moderate	0	0.0	1	5.0	1	5.0	2	10.0		0	0.0	0	0.0	7	35.0	2	10.0	
▪ Satisfactory	0	0.0	0	0.0	0	0.0	1	5.0		0	0.0	0	0.0	9	45.0	16	80.0	

<60% Unsatisfactory (60-75) % Moderate >75% Satisfactory

* Significant at level P < 0.05.

Table (6): Comparison and correlation between the sociodemographic characteristics of the studied groups and their mean score of the Modified Standardized Swallow Assessment (MSSA) throughout periods of study

Characteristics	The studied patients (n=40)							
	Total MSSA score							
	Mean ± SD							
	Control group (n=20)				Study group (n=20)			
	Pre intervention	Day 1	Day 4	Day 7	Pre intervention	Day 1	Day 4	Day 7
Age (in years)								
▪ (21 < 30)	8.00±0.00	9.00±0.00	10.00±0.00	12.00±0.00	5.00±1.155	5.00±1.155	10.75±2.630	14.00±2.000
▪ (30 < 40)	0.00±0.00	0.00±0.00	3.00±0.00	2.00±0.00	4.00±0.00	7.00±0.00	9.00±0.00	13.00±0.00
▪ (40 < 50)	2.50±1.00	3.50±0.577	4.75±0.957	5.75±0.957	2.60±1.949	4.20±2.490	11.80±2.168	14.40±0.548
▪ (50-60)	2.64±2.023	2.64±1.985	3.14±2.033	4.86±2.282	3.40±1.578	4.50±1.958	9.60±3.062	11.60±3.406
t , P	3.371 , 0.045*	4.881 , 0.013*	4.603 , 0.017*	4.487 , 0.018*	1.712 , 0.205	0.611 , 0.618	0.800 , 0.512	1.494 , 0.254
r , P	-0.044 , 0.855	-0.221 , 0.348	-0.402 , 0.079	-0.229 , 0.332	-0.263 , 0.263	-0.092 , 0.700	-0.194 , 0.412	-0.454 , 0.044*
Gender								
▪ Male	2.85±0.844	2.92±0.932	3.77±0.833	5.54±1.099	3.58±1.564	4.58±1.929	9.50±2.908	11.83±3.243
▪ Female	2.57±0.413	3.14±0.552	3.86±0.215	4.71±0.380	3.50±2.000	4.75±2.053	11.62±1.996	14.38±0.744
t , P	0.068 , 0.798	0.040 , 0.844	0.006 , 0.939	0.439 , 0.516	0.011 , 0.918	0.034 , 0.856	3.228 , 0.089	4.669 , 0.044*

Level of education								
▪ Primary	2.00±2.236	2.14±2.478	2.57±2.507	4.00±2.517	3.00±2.121	4.00±2.646	10.00±3.082	12.40±3.130
▪ Preparatory	3.00±2.000	3.25±1.258	4.00±1.414	6.50±1.732	3.14±1.864	4.00±1.633	9.86±3.716	11.71±3.684
▪ Secondary	3.80±2.683	4.40±2.793	4.80±3.114	6.00±3.464	4.40±0.548	5.40±1.140	10.60±1.517	13.80±1.095
▪ High	2.50±1.915	2.50±1.915	4.50±1.291	5.25±2.217	4.00±2.000	6.00±2.000	11.67±1.528	14.67±0.577
t , P	0.649 , 0.595	1.030 , 0.406	1.078 , 0.387	0.972 , 0.430	0.765 , 0.530	1.245 , 0.326	0.310 , 0.818	1.034 , 0.404
r , P	0.190 , 0.423	0.193 , 0.414	0.399 , 0.082	0.335 , 0.148	0.267 , 0.256	0.342 , 0.140	0.163 , 0.493	0.338 , 0.146
Body mass index								
▪ Ideal weight	2.50±2.431	2.75±2.527	3.58±2.503	5.17±2.887	4.00±0.632	4.83±1.472	10.33±2.503	13.50±1.517
▪ Over ideal weight	3.60±1.517	4.00±1.581	4.80±0.837	5.40±1.140	3.42±2.109	4.33±2.060	10.17±3.070	12.25±3.388
▪ Obese	2.33±2.517	2.33±2.517	3.00±3.606	5.33±4.041	3.00±1.414	6.00±2.828	11.50±2.121	14.50±0.707
t , P	0.478 , 0.628	0.648 , 0.536	0.651 , 0.534	0.014 , 0.986	0.327 , 0.726	0.655 , 0.532	0.186 , 0.832	0.756 , 0.485
r , P	0.288 , 0.218	0.318 , 0.172	0.260 , 0.268	0.255 , 0.277	-0.223 , 0.345	-0.110 , 0.644	0.119 , 0.619	0.075 , 0.754

r: Pearson/Spearman' correlation coefficient

* Significant at level $P < 0.05$.

Table (7): Mean score comparison and correlation between the clinical data of the studied groups and their mean score of the Modified Standardized Swallow Assessment (MSSA) throughout periods of study

Clinical data	The studied patients (n=40) Total MSSA score Mean ± SD							
	Control group (n=20)				Study group (n=20)			
	Pre intervention	Day 1	Day 4	Day 7	Pre intervention	Day 1	Day 4	Day 7
Admission diagnosis								
▪ Sarcoidosis	-	-	-	-	2.00±0.00	2.00±0.00	14.00±0.00	15.00±0.00
▪ Lung cancer	-	-	-	-	4.00±1.732	4.67±0.577	9.33±3.055	11.67±4.163
▪ GRDS	-	-	-	-	3.00±±0.00	4.00±0.00	10.00±0.00	13.00±0.00
▪ GBS	-	-	-	-	3.00±±0.00	3.00±0.00	14.00±0.00	15.00±0.00
▪ Chest rib fracture	-	-	-	-	6.00±±0.00	6.00±0.00	13.00±0.00	15.00±0.00
▪ Meningitis	4.00±0.00	2.00±0.00	4.00±0.00	6.00±0.00	2.00±0.013	4.67±4.041	10.00±1.732	13.00±0.00
▪ Head injury	-	-	-	-	5.00±1.414	5.00±1.414	9.50±3.536	13.00±2.828
▪ Brain tumor	-	-	-	-	4.00±±0.00	4.00±0.00	4.00±0.00	5.00±0.00
▪ COPD	3.50±2.121	4.00±2.828	3.50±2.121	3.50±0.707	2.50±3.536	3.50±2.121	11.00±2.828	14.50±0.707
▪ Stroke	2.25±2.062	2.50±2.082	3.25±2.986	4.75±3.304	3.00±±0.00	6.00±0.00	8.00±0.00	9.00±0.00
▪ Cancer of larynx	-	-	-	-	4.00±±0.00	6.00±0.00	12.00±0.00	13.00±0.00
▪ Skull fracture	-	-	-	-	4.00±±0.00	4.00±0.00	11.00±0.00	15.00±0.00
▪ Spinal cord injury	-	-	-	-	4.00±±0.00	8.00±0.00	13.00±0.00	14.00±0.00
▪ Post thoracentesis	2.00±0.00	3.00±0.00	3.00±0.00	5.00±0.00	-	-	-	-
▪ Bronchiectasis	4.00±2.828	4.00±1.414	5.00±0.00	7.50±2.121	5.00±±0.00	5.00±0.00	9.00±0.00	14.00±0.00
▪ Pulmonary infarction	2.00±0.00	4.00±0.00	6.00±0.00	7.00±0.00	-	-	-	-
▪ Plumonary edema	1.33±1.633	1.50±1.761	2.67±1.633	3.83±1.602	-	-	-	-
▪ Pneumonia	5.00±0.00	5.00±0.00	5.00±0.00	5.00±0.00	-	-	-	-
▪ ARDS	8.00±0.00	9.00±0.00	10.00±0.00	12.00±0.00	-	-	-	-
▪ Atelectasis	2.00±0.00	2.00±0.00	2.00±0.00	6.00±0.00	-	-	-	-
F , P	1.531,0.258	1.775,0.192	1.511, 0.264	1.739, 0.201	0.428, 0.906	0.356, 0.944	0.995, 0.537	1.148, 0.459

# Past medical history of disease									
1. CVS disorder	2.38±1.928	2.44±1.896	3.13±1.708	4.50±1.966	3.89±1.167	5.67±1.414	9.67±3.041	12.00±3.536	
2. Diabetes mellitus	2.63±1.188	2.88±1.356	3.25±1.165	4.63±1.302	2.67±1.506	4.67±2.338	11.50±2.074	14.00±0.894	
3. Hepatic disease	3.00±1.732	3.00±1.732	3.67±2.887	5.00±3.606	3.00±1.000	6.00±2.000	10.33±2.517	12.67±3.215	
4. Cancer	2.00±0.000	2.50±0.707	2.50±0.707	4.50±0.707	3.20±1.304	4.20±1.483	11.60±1.673	13.80±1.095	
5. Respiratory disorder	2.62±2.329	3.00±2.582	3.69±2.428	4.77±2.522	3.71±1.890	4.14±1.215	10.43±2.760	13.00±2.769	
6. Neurologic disorder	2.67±3.055	2.33±2.517	2.67±2.082	5.00±3.606	2.80±0.837	5.60±2.074	11.40±2.408	13.20±2.490	
7. Gastrointestinal disease	3.67±1.528	3.67±1.528	4.00±1.732	5.00±1.00	2.50±3.536	2.50±3.536	9.00±0.000	13.50±0.707	
8. Renal disease	2.00±0.013	2.00±0.013	2.33±2.517	3.00±2.646	3.00±1.000	5.67±1.528	8.00±1.000	9.00±1.00	
F , P	2.516, 0.130	6.100, 0.024*	0.811, 0.380	9.558, 0.006*	0.637, 0.435	5.676, 0.028	1.019, 0.326	1.534, 0.231	
Smoking habit & No. of cigarettes/day									
▪ 0	2.94±2.209	3.22±2.290	4.11±2.246	5.67±2.401	3.69±1.621	5.06±1.692	10.88±2.062	13.56±1.672	
▪ 1	-	-	-	-	0.00±0.00	0.00±0.00	9.00±0.00	13.00±0.00	
▪ 2	2.00±0.00	2.00±0.00	2.00±0.00	2.00±0.00	3.50±0.707	3.50±0.707	9.00±1.071	10.00±1.071	
▪ 3	0.00±0.00	0.00±0.00	0.00±0.00	1.00±0.00	5.00±0.00	5.00±0.00	6.00±0.00	7.00±0.00	
F , P	0.902, 0.424	1.039, 0.375	1.925, 0.176	2.754, 0.092	2.005, 0.154	3.329, 0.046*	1.350, 0.293	3.400, 0.044*	
Oxygen therapy device									
1. Simple O ₂ mask	2.46±1.984	2.46±1.808	3.23±1.878	4.85±2.410	3.50±2.168	5.17±2.639	10.00±2.449	12.33±2.733	
2. Nasal cannula	2.50±1.000	3.25±0.957	4.50±1.732	5.50±1.732	4.43±1.134	5.00±0.816	9.29±2.928	12.00±3.697	
3. Non-rebreathing mask	0.00±0.00	0.00±0.00	1.00±0.00	4.00±0.00	-	-	-	-	
4. Bi-level positive airway pressure	6.50±2.121	7.50±2.121	7.50±3.536	8.00±5.657	2.71±1.496	3.86±2.035	11.71±2.563	14.14±1.464	
F, P	3.607, 0.037*	6.141, 0.006*	3.460, 0.041*	0.918, 0.454	1.962, 0.171	0.915, 0.419	1.526, 0.246	1.181, 0.331	

* Significant at level P < 0.05.

Discussion

The present study was conducted in an attempt to assess the effect of oral care intervention and safe-swallowing education on dysphagia of ICU patients post endotracheal extubation.

The result of the present study illustrated that; half and more than two third of study and control group respectively aged between 50 and 60 years, majority were male. More than half and same percent of control and study group had ideal and over body weight respectively. In addition; one third and fifth of the control group admitted with pulmonary oedema and stroke respectively, while less than fifth of the study group admitted by lung cancer and meningitis. More than half of control group compared to less than half of the study group, had a history of cerebral vascular disease (CVS) and respiratory disorders, compared to less than half in the study group. Less than fourth of both groups were smoker from 1 to 3 cigarettes per day. More than half and one third of the study and control group respectively were on simple oxygen mask.

The current study revealed that; there is a dramatic improvement in all items and in Total MSSA score post intervention in the study group which was highly statistically significant. On the other hand; there was a slight gradual improvement in assessment

score and MSSA score in the control group post intervention. Regarding the satisfactory level of MSSA; there were no significant differences in the level of MSSA scores throughout the study period in the control group, related to study group; there was a high significant difference of MSSA satisfactory level throughout the study period, thus the majority of the participants showed satisfactory level at day seven post intervention compared to none of them pre-intervention, thus the first study hypothesis has been proved.

Wu et al. (2019)⁽⁸⁾, supported the results of the current study; he proved that; the participants who received the Swallow and Oral Care (SOC) intervention following extubation took less time to resume total oral intake than controls, he concluded that the SOC intervention successfully increased patients' chances of resuming total oral intake and enhanced salivary flow 14 days post extubation after prolonged (≥ 48 h) endotracheal intubation; this result is significant since Chen et al. (2018)⁽¹⁴⁾, assured that; patients who were successfully extubated after ≥ 48 h endotracheal intubation frequently complained of dry mouth and had difficulty to resume total oral intake. Also, El Gharib et al. (2019)⁽¹⁾, stated that; improvement of swallowing was observed

after five consecutive days of swallowing exercises in the majority of patients and the exercises done in the rehabilitation program assisted the patients to improve their swallowing ability, by decreasing the neuromuscular weakening resulted from orotracheal intubation.

In addition, Crary et al. (2012)⁽¹⁵⁾, supported the present study and concluded that McNeill Dysphagia Therapy Program (MDTP) resulted in marked functional swallowing improvement in a limited time frame with no dysphagia-related problems during or after program.

Moreover, Affoo et al. (2018)⁽¹⁶⁾ indicated that; whole salivary flow amounts increased markedly for up to five minutes after either manual or electric brushing of the teeth, tongue, and palate. It is documented by Affoo (2015)⁽¹⁷⁾ that; saliva, a vital secretion for preserving oral homeostasis and completing the oral preparatory and oral stages of swallowing, and the amount of oral saliva helps for activating the pharyngeal phase of swallowing and increasing swallowing ability.

The current study demonstrated that; there was a significant correlation between the patient's age and the total MSSA mean score throughout the study period and in day seven for control and study group respectively, this may explained by the fact

that the muscular tone is expected to be decline with advanced age. These results congruent with Sassi et al. (2018)⁽⁴⁾, who denoted that; patients with positive results of Swallowing functional level were significantly younger when compared with other groups. Also, Skoretz et al. (2014)⁽¹⁸⁾, concluded that; patients had a double increase in their chances of developing dysphagia for each additional decade in age added that a higher dysphagia risk was reported in patients aged greater than or equal to fifty-five years post extubation. Moreover, Rech et al. (2018)⁽¹⁹⁾, stated that there was higher incidence of oropharyngeal dysphagia in elders over seventy six years old than younger adults. In contrast to the current study; Wu1 et al. (2019)⁽⁸⁾, founded that; patient who are equal to or more than sixty-five years and received the SOC were more likely to resume total oral intake than their younger counterparts aged from fifty to sixty-four.

In relation to the correlation between gender and MSSA mean score, this study revealed that the only significant was in the study group, and the female have high MSSA mean score in day seven than male which may be attributed to different sex will not greatly affect the MSSA mean score. This result contradicted with Sassi et al. (2018)⁽⁴⁾, who founded that there is no

significant relation between the gender and Swallowing functional levels, also Rech et al. (2018)⁽¹⁹⁾, founded the incidence of oropharyngeal dysphagia was more in female than male, also; the results of the study done by Wu1 et al. (2019)⁽⁸⁾, revealed that there is no any significant relation between the gender and resuming oral intake for participant received SOC. Moreover, Park et al. (2017)⁽²⁰⁾, indicated that no relation between patients' age or gender and occurrence of post extubation dysphagia.

The results of the present study indicates that; there is no significant correlation between level of education and the MSSA mean score in both control and study group, which may be explained by the fact that education level have no effect on physiology of swallowing; this result is inconsistent with Rech, et al. (2018)⁽¹⁹⁾, who documented that there was higher incidence of oropharyngeal dysphagia in patients with up to elementary education than who have higher education.

Also the current study denotes that; there is no significant correlation between the body mass index (BMI) and the MSSA mean score in both control and study group, and this result agreed with Macht et al. (2011)⁽⁷⁾, who founded that there is no relation between the body weight and the severity of post extubation dysphasia, also Rech et

al. (2018)⁽¹⁹⁾, indicated that no correlation between the occurrence of oropharyngeal dysphagia and the BMI.

This study revealed that; there is no significant correlation between the admission diagnosis and the MSSA mean score in both control and study group. This result is contradicted with Macht et al. (2013)⁽¹¹⁾, who concluded that; the occurrence of post-extubation dysphagia is linked with worse outcomes in survivors of acute respiratory failure who required mechanical ventilation and had neuromuscular or cerebrovascular disease. The current study demonstrated that; there is a significant correlation between the past medical history and the mean scores of MSSA in day one and day seven in the control group, while; for the study group there is no correlation between the past medical history and the MSSA mean scores, for control group; the present study showed that the participants who had past medical history of hepatic, respiratory, neurologic and gastrointestinal disorders got high mean scores of MSSA than others. The result of Rech et al. (2018)⁽¹⁹⁾, founded that; the participants with three or more chronic disorder have more incidence of oropharyngeal dysphagia than others; also Barker, Martino, Ralph-Edwards (2009) and Macht et al. (2011)⁽²¹⁾, founded that there is no relationship between the

degree of post extubation dysphasia and presence of comorbidities.

In relation to the smoking habit for the study group; the non-smoker participants got high mean score of MSSA followed by smokers who smokes one cigarette per day, while the smoker participants who smoke three cigarettes per day got lower score of MSSA, with a statistical significance in days one and seven post intervention. This result is contradicted with Rech et al. (2018) ⁽¹⁹⁾, who proved that the non-smoker patients have oropharyngeal dysphagia than smokers, also Barker, Martino, Reichardt, Hickey, Ralph-Edwards (2009) ⁽²¹⁾, documented that no association between smoking and post extubation dysphagia.

As regard to the Oxygen therapy device; this study revealed a high significant correlation between the Oxygen therapy device and the MSSA mean score in the control group, the participant who were connected to Bi-level positive airway pressure device got the higher scores than the participants who were connected to other oxygen therapy devices along the study period. No previous studies correlated the post extubation dysphasia and oxygen therapy device or particularly Bi-level mask, only Rattanajajaroen and Kongpolprom (2020) ⁽²²⁾, founded that high flow nasal oxygen enhanced the

swallowing-breathing coordination in the post extubation patients and possibly decreased the hazard of aspiration.

Conclusion

Although numerous recent developments in ICU practices, dealing with dysphagia post extubation; still a big challenge to healthcare workers and carries a significant weight of morbidity and mortality. The study results shows that oral care intervention consists of brushing participants' oral cavity with a soft toothbrush, mechanically stimulate tissues, and rinse the oral cavity, moisturizing participants' lips, gentle massaging of participants 'cheeks / pressing the surface overlying the parotid, sublingual, and submandibular salivary glands, and ROM exercises for the lips, tongue, jaw, and cheeks, along with safe-swallowing education for the patients and their family care giver reduces dysphagia of ICU patients post endotracheal extubation.

Recommendations

1. Nurses should acquire comprehensive knowledge related to oral care intervention and safe-swallowing education to reduce dysphagia of ICU patients post endotracheal extubation.
2. Nurses should play an important role in reducing dysphagia of ICU patients post endotracheal extubation by including oral care intervention and safe-

swallowing education in the daily routine care provided for patients post endotracheal intubation.

3. Conducting further similar studies in different intensive care units in Egypt with larger number of participants to widely assess the effect of oral care intervention and safe-swallowing education on dysphagia among ICU patients post endotracheal extubation.

References

- 1-El Gharib G, Felix B, Rossoni F, Yamada S. Effectiveness of Therapy on Post-Extubation Dysphagia: Clinical and Electromyographic Findings. *Clinical Medicine Insights: Ear, Nose and Throat*. 2019; 12(1): 1–6.
- 2-Tsai H, Ku C, Wang G, Hsiao Y, Lee J, Chan C, et al. Swallowing dysfunction following endotracheal intubation: Age matters. *Medicine (Baltimore)*. 2016; 95(1): e3871.
- 3-Yang J, Park E, Min S, Huh W, Kim R, Oh M, et al. Association between clinical risk factors and severity of dysphagia after extubation based on a videofluoroscopic swallowing study. *Korean J Intern Med*. 2020; 35(1):79-87.
- 4-Sassi C, Medeiros C, Zambon S, Zilberstein B, ECBC SP, Andrade F. Evaluation and classification of post-extubation dysphagia in critically ill patients. *Rev Col Bra Cir*. 2018; 45(3): e1687
- 5-Zuercher P, Moret CS, Dziewas R, Schefold JC. Dysphagia in the intensive care unit: Epidemiology, mechanisms, and clinical management. *Crit Care*. 2019; 23(1): 103.
- 6-Schefold JC, Berger D, Zurcher P, Lensch M, Perren A, Jakob SM, et al. Dysphagia in mechanically ventilated ICU patients (DYnAMICS): A prospective observational trial. *Crit Care Med*. 2017; 45(12): 2061–9.
- 7-Macht M, King J, Wimbish T, Clark B J, Benson B, Burnham L, et al. Postextubation dysphagia is persistent and associated with poor outcomes in survivors of critical illness. *Critical Care*. 2011; 15(1): R231.
- 8-Wu P, Xu J, Wang G, Ku C, Chan C, Lee J, et al. Effects of a swallowing and oral care intervention for patients following endotracheal extubation: A pre- and post-intervention study. *Critical Care*. 2019; 23(1):350. Available from: [https:// doi.org/10.1186/s13054-019-2623-2](https://doi.org/10.1186/s13054-019-2623-2)
- 9-Sarkar A, Andablo-Reyes E, Bryant M, Dowson D, Neville A. Lubrication of soft oral surfaces. *Curr Opin Colloid Interface Sci*. 2019; 39(1): 61–75.

- 10-Haggard P, deBoer L. Oral somatosensory awareness. *Neuroscience and Biobehavioral Reviews*. 2014; 47(1): 469–484.
- 11-Macht M, King CJ, Wimbish T, Clark BJ, Benson AB, Burnham, et al. Post-extubation dysphagia is associated with longer hospitalization in survivors of critical illness with neurologic impairment. *Crit Care*. 2013; 17(1): R119.
- 12-Zuercher P, Schenk V, Moret C, Berger D, Abegglen R, Schefold C., Risk factors for dysphagia in ICU patients following invasive mechanical ventilation. *Chest*. 2020; 158(1): 1983-1991.
- 13- Perry, L. Screening swallowing function of patients with acute stroke. Part one: Identification, implementation and initial evaluation of a screening tool for use by nurses. *Journal of Clinical Nursing*, 2001; 10(1): 463-473.
- 14-Chen CC, Wu KH, Ku SC, Chan DC, Lee JJ, Wang TG, et al. Bedside screen for oral cavity structure, salivary flow, and vocal production over the 14 days following endotracheal extubation. *J Crit Care*. 2018; 45(1):1–6.
- 15-Crary A, Carnaby D, LaGorio A, Carvajal J. Functional and physiological outcomes from an exercise-based dysphagia therapy: A pilot investigation of the McNeill Dysphagia Therapy Program. *Arch Phys Med Rehabil*. 2012; 93(1): 1173-1178.
- 16-Affoo H, Trottier K, Garrick R, Mascarenhas T, Jang Y, Martin E. The effects of tooth brushing on whole salivary flow rate in older adults, *BioMed Research International*. 2018. Available from: <https://DOI.org/10.1155/2018/3904139>
- 17-Affoo A, Rebecca H. Eating and Swallowing, Oral Health, and Saliva Production. 2015. Electronic Thesis and Dissertation Repository. Available from: 3459. <https://ir.lib.uwo.ca/etd/3459>
- 18- Skoretz M, Yau J, Ivanov T, Granton J, Rosemary M. Dysphagia and associated risk factors following extubation in cardiovascular surgical patients. 2014; 29(6): 647-54. DOI: 10.1007/s00455-014-9555-4. Epub 2014 Aug 15.
- 19-Rech S, Baumgarten A, Colvara C, et al. Association between oropharyngeal dysphagia, oral functionality, and oral sensorimotor alteration. *Oral Dis*. 2018; 24(1): 664–672. Available from: <https://doi.org/10.1111/odi.12809>
- 20-Park S, Koo J, Song S. Association of post-extubation dysphagia with tongue weakness and somatosensory disturbance in non-neurologic critically ill patients. *Ann Rehabil Med*. 2017; 41(6): 961-968.
- 21-Barker J, Martino R, Reichardt B, Hickey J, Ralph-Edwards A. Incidence and impact of dysphagia in patients receiving prolonged endotracheal intubation after cardiac surgery. *Can J Surg*. 2009; 52(2): 119–124.

22-Rattanajajaroen P, Kongpolprom N.
Effects of high flow nasal cannula on
the coordination between swallowing
and breathing in postextubation
patients: A randomized crossover
study. European Respiratory Journal.
2020; 56: 4414. DOI: 10.1183/
13993003.congress-2020.4414
<https://doi.org/10.3904/kjim.2018.055>