# Effect of Oral Care and Swallowing Interventions on Post extubation Dysphagia among Children at Pediatric Intensive Care Units

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## Abstract

**Background**, Post extubation dysphagia is a frequently experience problem in critically sick children with recent intubation. Oral care and swallowing intervention are one of the treatment modalities that can help to enhance swallowing function and reduce swallowing problems after extubation. **Aim** was to evaluate the effect of oral care and swallowing interventions on post extubation dysphagia among children at pediatric intensive care units. **Design**, A quasi-experimental design was applied. **Setting**: the study was performed at the Pediatric intensive care units at Menoufia University hospitals. **Sample**, A purposeful sampling of 60 hospitalized pediatrics patients. **Instrument**s four instruments were used. I; Social Characteristics Structured Questionnaire, II; Oral Assessment Guide for Children. III; Bazaz dysphagia scale. IV; Functional Oral Intake Scale. **Result**s: There was a statistically significant improvement in the total mean score of oral status in the study group after 7$^{th}$ and 14$^{th}$ days of intervention than on pre intervention. Also, there was significant improvement in the study group in relation to severity of dysphagia after 14$^{th}$ days of intervention than on pre intervention. Moreover, oral intake level was improved in the study group after 14$^{th}$ days of intervention compared to control group. **Conclusion**; nursing interventions that involves swallowing and oral care reduces post-extubation dysphagia, improves clinical swallowing function, and increases the probability of faster oral intake. **Recommendations**; swallowing education and oral care intervention should be started as early as possible for children who intubated greater than 48 hours

**Keywords**: Post-extubation, Dysphagia, Swallowing exercise & Oral Care Interventions

## Introduction

Pediatric intensive care units introduce holistic care to children with both acute life-threatening disorders and chronic illnesses. The majority of children admitted to pediatric intensive care units require endotracheal intubation and mechanical ventilation to save their lives. (1) Despite the benefits of mechanical ventilation, it is associated with many complications, such as ventilator-associated pneumonia, ventilator-induced lung injury and it requires sedation that is associated with other complications including prolonged duration of mechanical ventilation. (2) In addition, prolonged duration of mechanical ventilation leads to dysphagia post extubation. (3)

Dysphagia is a well-defined phenomenon after extubation of critically ill population and it might last long after hospital discharge. (4,5) It includes any incapability or difficulty to efficiently and properly move food and drinks from the mouth to the esophagus. (6) Algendy & Bahgat (7) mentioned that up to 62% of intensive care unit patients experience dysphagia after extubation. This prevalence rate of dysphagia may potentially be higher in children due to anatomical variations in the size and physical relationship of the oral structures. So, children may be more susceptible to acquiring dysphagia as a result of these differences (8).

Post extubation dysphagia and difficulty of swallowing usually occurs in patients who experiencing long period of intubation more than 48 hours due to laryngeal damage , inactivity of the oropharyngeal muscles, glottis damage, mucosal inflammation that destroys tissue architecture & vocal cord ulcerations following endotracheal intubation.[3,9] Along with the possible inflammatory and traumatic effects of intubation and the endotracheal tube itself on the oropharynx and larynx, there is aversive stimuli such as endotracheal intubation, suctioning, and naso- or orogastric tubes that may develop oral aversions to children affecting their capacity for oral feeding. [10]

Furthermore, because swallowing and feeding are still developing during infancy and early childhood, any stoppage of these processes can have a major negative impact, including maladaptive oral motor functioning.[4] In light of this, after extubation, prolonged dysphagia is linked to an increased risk of pneumonia in hospitals, failure of weaning from mechanical ventilation, a prolonged stay in the pediatric intensive care unit, a higher risk of re-intubation, higher hospital expenses, and higher rates of mortality.[8] Moreover, the prolonged use of artificial ventilation associated with sedation, and bed rest, increase the risk of swallowing musculature dysfunction, which may last for months or years following discharge. [11]

Since Post-extubation dysphagia has the potential of life-threatening effects, early detection of post-extubation dysphagia is crucial to prevent complications. Also, comprehending the therapy methods of post-extubation dysphagia is crucial to reduce problems and raise the standard of care. [7]

So, swallowing intervention is one of the treatment modalities that can help to enhance swallowing function, preserve the capacity to consume food & liquids safely, and reduce swallowing problems that may develop after extubation. [12]

In addition, swallowing and oral care interventions including oral lubrication, perform massage to the upper & lower jaw and oral range of motion exercises for the lips, tongue, jaw, and cheeks would speed up the process of resuming oral intake and enhance saliva flow and would improve oral lubrication and strength in the lips, tongue, jaw, and cheeks. [13] Moreover, it helps to improve the oral sensation as the oral cavity has several somatosensory receptors. Stimulating these sensory receptors in the tongue and other areas of the mouth cavity may improve proprioception and oral sensorimotor regulation during swallowing. [14]

Nurses play a critical role in managing children with swallowing difficulties to help reestablish safe oral intake to normal level as soon as possible, minimize complications and improve quality of life for patients with post extubation dysphagia.[15] Additionally, they can manage patients' mealtimes, instruct patients on safe feeding techniques, and disseminate information on swallowing & oral care intervention, treatment plans and record patient progress which helpful in improving and preventing further injury in individuals who are vulnerable after extubation.[16,17] For this reason, this study aimed to examine effect of oral care and swallowing interventions on post extubation dysphagia among children at pediatric intensive care units.

**Significance of the study**

The children are more susceptible to dysphagia due to differences in the anatomical size and physical relationship of the oral structures. In addition, pediatric post extubation dysphagia incidence is higher than the published rates of 29% and 57% in previous pediatric research. This suggests that dysphagia in critically unwell children

after mechanical ventilation may be a problem that isn't fully understood. [18]

The majority of children with dysphagia presented with multiple comorbidities and was at high risk for mortality. It has been discovered that children with dysphagia have higher rates of morbidity and mortality. [18] Also, Warnecke et al., [19] mentioned that dysphagia is another sign of a poorer functional outcome and it increases the risk of aspiration pneumonia, malnutrition, and dehydration, all of which can result in serious complications. As a result, effective and efficient management is crucial to preserve the child's life. So, the current study was conducted to develop and use a variety of swallowing and oral care intervention to help children with post extubation dysphagia to improve their ability to swallow, maintain adequate nutritional intake, and maximize airway protection. For this reason, this study was aimed to examine effect of oral care and swallowing interventions on post extubation dysphagia among children in pediatric intensive care unit.

**Aim of the study**

The aim of the current study is to evaluate the effect of oral care and swallowing interventions on post extubation dysphagia among children at pediatric intensive care units. This aim can be achieved through the following objectives:

1. Improve oral care and maintain adequate nutritional intafke.
2. Evaluate the effect of swallowing exercises on children swallowing function.
3. Decreased severity of dysphagia among children at pediatric intensive care units.

**Research Hypotheses**

**1-** Children in the study group who are receiving swallowing and oral care interventions are more likely to experience improvement of oral care compared with control group.

**2-** Implementation of swallowing exercises program is expected to improve swallowing ability and alleviate swallowing problems of the study group compared with control group.

3- Children with post-extubation dysphagia who are receiving swallowing and oral care interventions are more likely to have increased functional oral intake and have lower severity of dysphagia than control group.

**Operational definitions**

1. **Oral Care intervention**

Oral hygiene is the process of maintaining a healthy, disease-free mouth. It included flossing and brushing teeth in addition to regularly visiting dentist for dental X-rays, exams and cleanings. [20] In this study, oral care intervention included the researcher used a soft toothbrush and distilled water to brush the participant's oral cavity (teeth/gum, tongue, and palate) and rinse the oral cavity. Then next applied Vaseline to the subjects' lips for moisture.

2. **Swallowing interventions**

Swallowing practices involve exercises of the jaw, lips, tongue, soft palate, pharynx, larynx, and/or respiratory muscles to enhance their function. Some of these interventions could also incorporate sensory stimulation [21]. **In this study**, the researcher softly massaged/ pressed the overlying surface of the parotid, sublingual, and submandibular salivary glands and then oral motor exercise were performed to lips, tongue, jaw, and cheeks

3. **Safe-swallowing education**

It is a brief and simple instruction was given for patients and their family caregivers to minimize the risk for aspiration. Like an examples, sitting up during eat and modifying viscosity and dietary texture etc [14].

## Method

### Research Design

A quasi-experimental design (Study and Control group) was utilized for this study.

### Research Setting

The study was conducted at the Pediatric intensive care units (PICUs) in Emergency hospital affiliated to Menoufia University hospitals. The PICUs were located at fourth floor include one intensive care room with 10 beds.

### Research Sampling

A purposive sample of 60 hospitalized children was selected from the above-mentioned setting according to the following inclusion and exclusion criteria:

**Inclusion criteria**

- Currently undergoing emergency oral endotracheal intubation for at least 48 hours.
- Aged from 6 -18 years old.
- Aware and able to communicate.
- Having no sensory deficit and accepted to participate in the research.

**Exclusion criteria**

- Those who have a history of neuromuscular disease.
- Preexisting Swallowing problems.
- Agitated children.

The sample size was established statistically by counting the number of children admitted to the pediatric intensive care units at Menoufia University Hospital.

Estimation approach for subjects:

- G power Program
  - Power= 80% Alpha error=5%
  - Medium effect size =0.4
  - The minimum required sample size=52 .

The selected sample was then split into two equal groups, each one consisted of 30 patients (study and control group).

**The control group**; it included 30 children who had successfully been extubated and maintained on routine hospital care by PICU staff.

**The study group** comprises of 30 children who were successfully extubated and received regular oral care interventions and swallowing exercises start the day after their successful extubation and extending for 14$^{th}$ days. Additionally, the participants were provided with a brief education on safe swallowing.

**Instruments**

Four instruments were utilized for data collection in order to achieve the aim of the research, as follows:

**Instrument one:** - A Children's bio-socio-demographic data: A structured interview questionnaire was developed by the researcher and consisted of two parts to collect the following data:

**Part One:** Socio-demographic characteristics for children that include child's age, gender, and educational level.

**Part Two**: Baseline clinical characteristics including admission diagnosis, prior medical history, pre intubation, the child's current weight, and height etc...

**Instruments two: - Oral Assessment Guide for Children (OAG).** This tool was created by Eilers in [22], refined by Prendergast [23], then supplemented with images, and then utilized in several researches. Voice, ability to swallow, lips, saliva, tongue, mucous membranes, gingiva and teeth are the eight categories it encompassed. Every category is rated on a scale ranging from 1 (without oral problems) to 3 (Severe oral problems). Total score of the oral assessment guide is ranged from 8 (without oral problems) to 24 (with severe oral problems) It has been graded as; excellent oral health (8), moderate oral health (9-16) and poor oral health (17-24).

**Instruments Three: Bazaz dysphagia scale:** It was developed by Bazaz, et al [24] to evaluate dysphagia symptoms. The degree of the children' dysphagia symptoms is determined by the degree of difficulty to

swallow both liquids and solid foods. Levels of dysphagia include none, mild, moderate, and severe. A numeric rating scale with values between 0 (none) and 3 (severe dysphagia). More severe dysphagia is indicated by a higher Bazaz score. Grades of dysphagia were; No episodes of difficulty swallowing with both liquids or solids =0, No difficulty swallowing liquids and only infrequently difficulty swallowing solids =1, difficulty swallowing only specific foods such as (bread or steak) = 2 and Frequent difficult swallowing with most of foods= 3

**Instruments Four**: - **Functional Oral Intake Scale (FOIS):** It developed by Chen et, al [25] to provide a numeric score to the level of functional oral intake of liquid and food in patients with dysphagia. It was applied three times; at assessment, 7th day, and 14th days after performing the swallowing exercises. It includes 7 items, the first three items (no oral intake, tube dependent with minimal/inconsistent oral intake, and tube supplements with consistent oral intake); rating scale from (1 to 3 levels tube dependent). The remains fourth items (total oral intake of a single consistency, total oral intake of multiple consistencies requiring special preparation, total oral intake with no special preparation, but must avoid specific foods or liquid items, and total oral intake with no restrictions); are rated on scale from (4 to 7 total oral intake). A higher score equates to better oral intake.

**Tools Reliability**

The reliability of tools was applied to establish the extent to which categories in the questionnaire were correlated to one another by Cronbachs co-efficiency alpha. The reliability of Oral Assessment Guide for Children (OAG) was (a = 0.87). The reliability of bazaz dysphagia scale was (a = 0.96). The reliability of Functional Oral Intake Scale (FOIS) was (a = 0.94) .

**Tools validity**

The study content was reviewed and approved by five experts (two pediatric nursing professors, professor in pediatric medicine and two medical surgical nursing professors) to assure the validity of content. The scale content index average (S-CVI/AVE) was used to evaluate the content validity. The lower limit of acceptability for S-CVI/AVE was 0.80. The experts' opinions showed that the items on the scales correlated well with each other.

**Pilot study**

A pilot study was conducted on randomly selected 6 patients (10% of the sample) to evaluate the applicability and clarity of the tools and to detect any potential difficulties that may be faced during the actual study. Additionally, the time required to answer the tools was also estimated. The instruments appeared to be understandable and clear no modifications were required. So children in the pilot study sample added to the whole study sample.

**Ethical Consideration**:

- The consent was obtained from the children who agreed to participate in the research and their parents or guardians.
- To gain the children's cooperation, a preparatory interview was conducted to explain the purpose and process of data collection to them. They reassured that the data obtained would be considered confidential and used only for the research. They were kept informed that participation in the study was completely voluntary and they were able to withdraw at any time.
- Anonymity of the personal data was assured through coding all data and put data through closed cabinet.

**Data collection**

- Prior to data collection, a written permission to carry out the study was obtained from the head of pediatric intensive care unit after submitting an official letter from the Dean of

the Faculty of Nursing at Menofia University explaining the purpose of the study and methods of data collection.

- Ethical approval was obtained from the scientific research and ethical committee of the Faculty of nursing to conduct the study.
- Data collection for this study was conducted for a period of 10 months extending from June 2021to the end of March 2022 during morning and afternoon shifts.
- Each patient in the study and control groups was interviewed by the researchers individually and in total privacy to assure confidentiality of information and its utilization only for the purpose of the research. The researchers introduced themselves to the patients and explained the purpose of the study and then the consent was obtained for participation in the study. To limit transmission of the data from study to control group, the control group was collected first to avoid contamination data and left for routine hospital care.
- **The control group**; after the successful extubation was, they kept on routine care and received standard hospital treatment provided by pediatrics ICU staff.
- **The study group:** They received oral care and swallowing intervention following successful extubation starting the day after extubation and continuing every day for $14^{th}$ consecutive days. Additionally; the children's who participated in the study and their care giver received a brief education about safe-swallowing technique. Oral care intervention and safe-swallowing education were carried out in three phases.
- **Assessment phase:** Baseline data was collected from children in both study and control group using tool I. During this interview instrument II was gathered from the children and pre assessment of oral cavity condition done for both groups to assess the oral health, it took about 30 minutes. After that both groups were utilized the tool III to assess their severity of dysphagia depending on the response of patients it took about 15 minutes then tool (IV) was used to evaluate oral intake for both groups.

**Implementation phase**

The researcher began work by establishing a welcoming environment that would make the children feel relaxed and win their cooperation. The researchers conducted individual interviews with each patient. The Swallowing and Oral Care (SOC) intervention was given the day after successful extubation, regardless of intake status, and every day for the following fourteen days. The researcher equipped with tongue holder, cheek retractor, and dental suction tube, during the morning and afternoon shifts, the researcher carried out the SOC intervention, which included tooth brushing, salivary gland massage, oral motor practice, and instruction about safe swallowing.

–**Tooth brushing:** To smother the sticky coated plaque and mechanically stimulate tissues, the researcher washes the child's mouth with distilled water before brushing the child's teeth, tongue, gums, and palate with a soft toothbrush. The mouth is then rinsed. Apply a thin layer of Vaseline to the child's lips three times per day; it should last for around five minutes.

– Illustrated pictures, videos and Printed material were used. Time for break was allowed and helpful suggestions were encouraged.

– Salivary gland massage: In order to "milk" the parotid gland, the submandibular gland, and the sublingual gland, the researcher gently massages the child's cheek area in front of the ears, moves along the chin under the jaw and tongue areas, and gently presses 5–10

times in the submental area with both fingers. This procedure takes about 15 minutes.

Figure (1) [26]

- Oral motor exercise of lips, tongue, jaw, and cheeks
- **Active- range of motion (ROM)**:- Ask the child to pucker the lips, spread them out to both sides of the faces, and move the tongues forward, out of the mouths to the right and left, and then back into the oral cavity . When pronouncing "sh," make sure to open the lips widely, puff up and down the cheeks, and keep the final "sh" as long as you can. Depending on the child's tolerance, each has 3, 5, or 10 repetitions.

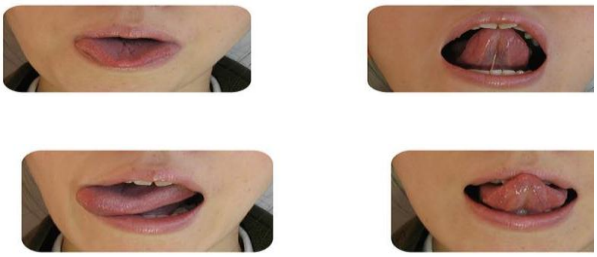

Figure (2) [27]

- **Resistive ROM when tolerated**

  Ask the child to open their mouth widest possible while resisting the researcher's pressure on their cheeks, push their lips outward against the force of the tongue depressor, push their tongues to their right and left cheeks while resisting the researcher's pressure on their cheeks, and blow out the party horn. Depending on the child's tolerance, each exercise has 3, 5, or 10repetitions and lasts for around 30 minutes

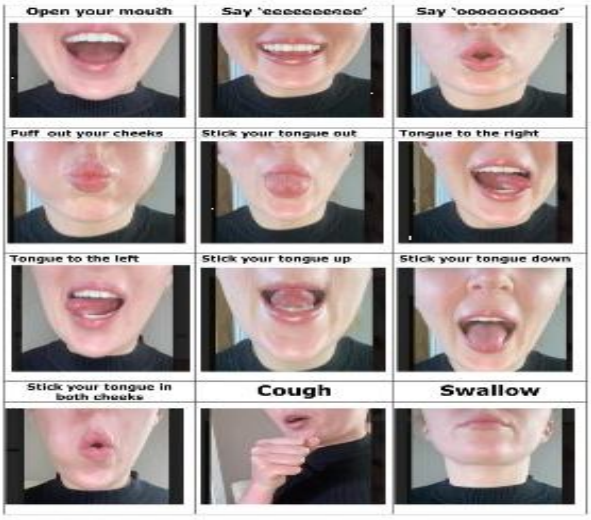


Figure (3) [28]

- **Abrief safe-swallowing education**:Based on the status of child's intake, a brief safe-swallowing education was given to patients and their families. This included explaining the warning symptoms and signs of unsafe swallowing, offering advice on how to eat while sitting up, and changing the texture and viscosity of food to lower the risk of aspiration.  Sit upright at 90 degrees when eating and drinking. Eat or drink nothing while sitting or lying down. Eats small bites of food. Take small sips of fluid. Before swallowing eat slowly and chew foods well. Make sure you have swallowed your food or drink before taking more. When you have food in your mouth, avoid speaking.

  –The researchers use a variety of foods to test participants' capacity to swallow, including potatoes, custard, biscuits, and teaspoons of water it last about 10 minutes.

  – Time allotted for each child to practice the steps under close observation until they feel confident in doing so.

  –The researcher improves interaction with the kids by sharing experiences and offering the necessary direction.

- **Evaluation phase**: This phase was implemented for both groups using tool 2, 3 and 4. The first measurement time was after 7th day's post-extubation. The second time was after 14th day's post-extubation. The

average score of the two measurements points was calculated.

**Statistical Analysis**

Data was coded and transformed into specially designed form to be suitable for computer entry process. Data was entered and analyzed by using SPSS (Statistical Package for Social Science) statistical package version 20. Graphics were done using Excel program. Quantitative data were expressed inform of mean and standard deviation (X ±SD) independent t-test was used for comparison between the two groups. Qualitative data was expressed in form of number and percentage, chi-square test ($X^2$) was used. For comparison between the quantitative data at different intervals for the same group, ANOVA test was used. Spearmen correlation was also used for explaining relationship between normally distributed quantitative variable. A statistical significant difference was used if P-value $\leq$ 0.05. A highly statistical significant was considered if P-value $\leq$ 0.001.

**Results**

**Table 1** shows socio-demographic characteristics of the studied children in the study and control groups. It was obvious from this table that more than one third of the studied children in the study and control groups were in the age group of 12-15years. Regarding children's gender, more than half of studied children in both study and control groups (53.3% & 60.0% respectively) were females. In relation to educational levels, more than one third of children in both study and control group (36.7% & 40.0% respectively) were in the middle school.

**Table 2** clarifies distribution of children in the study and control groups according to their previous medical history. This table revealed that, 20.0% of children were admitted with diabetic ketoacidosis (DKA) and pneumonia in the study group. Meanwhile, this was noted that nearly one third of studied children (30.1%) were admitted with pneumonia in the control group. As regards previous intubation, the majority of children in both study and control groups did not have previous intubation (63.3% & 73.3%) respectively.

**Figure 4** illustrates the total mean score of child's weight among study and control groups on pre intervention, after $7^h$ and $14^{th}$ days. It was obvious that the total mean score of child's weight in the study group has been increased after $7^{th}$ and $14^{th}$ days of intervention (28.85 ±5.50 & 28.92 ± 5.50 respectively) than on pre intervention (28.58±5.47). Meanwhile, in the control group the mean total score of child's weight has been decreased after $7^{th}$ and $14^{th}$ days of intervention (30.00 ±5.62 & 29.77 ± 5.52 respectively) than on pre intervention (30.23 ±5.75).

**Table 3** represents mean score of oral status assessment among study and control groups on pre intervention, after $7^{th}$ and $14^{th}$ days. This table pointed out that in the study group, the children had healthier oral cavity after $14^{th}$ days in the means and standard deviations of Voice, Ability to swallow, Lips (1.20 ± 0.48, 1.23 ± 0.43,& 1.07 ± 0.25 respectively) compared to (2.46 ±51, 2.37 ± 0.56, 2.23 ±0.63 respectively) in pre intervention. Regarding salivary flow, this table reflected that the children in the study group had greater salivary flow after $7^{th}$ and $14^{th}$ days following swallowing exercise (1.50 ± 0.57 &1.20 ± 0.48 respectively) than the control group (2.40±0.59 & 2.43±0.73 respectively). Above all, there were statistically significant improvement in the mean score of oral status assessment at 5% level of statistical significance in the study group on $7^{th}$ and $14^{th}$ days after swallowing exercise than pre intervention.

**Table 4** illustrates the total mean scores of oral status assessment guide among study and control groups on pre intervention, after

7th and 14th days. This table pointed out that there was a statistically significant improvement in the total mean score of oral status assessment in the study group after 7th and 14th days of swallowing exercise (11.87 ±2.33 & 9.43 ± 1.69) respectively than on pre intervention, (18.43±2.43). Therefore, there were highly statistical significant differences at 1 % level of statistical significant between pre intervention, after 7th and 14th days of swallowing exercise. Meanwhile, in the control group the mean total score of oral status assessment decreased after 7th and 14th days of intervention (18.70 ±2.44 & 18.20 ±1.32) respectively compared to (19.03 ±1.97) on pre intervention, for this reason, there were no statistical significant differences between pre, after 7th and 14thdays of intervention.

**Figure 5** reflects level of oral status assessment among study and control groups on pre intervention, after 7th and 14th days. The results found that the majority of children in both study and control group had severe oral problems on pre intervention (73.30%, 93.30%) respectively. Meanwhile, in the study group oral health status was improved after demonstrate swallowing exercise which indicated that 96.70% of children had slight or no oral problems after14th days of intervention. On the other hand, it was obvious that the majority of children (86.7 %) have poor oral health and the percent were increased from after 7th days to (90.0 %) after 14th days in the control group.

**Figure 6** reflects severity of dysphagia among study and control groups on pre intervention, after 7th and 14th days. This table reveals that about three quarters in both study and control group had severe dysphagia in pre intervention (76.70% &73.30%) respectively. Moreover, there was significant improvement of dysphagia level of the studied children in the study group that 20.0% of children having moderate dysphagia after 7th days of intervention. Also, absence of dysphagia was observed in 73.30% of children after 14th days of practicing swallowing exercises. While, the percent of severe dysphagia increased in the control group from 76.70 % after 7th days to 80.00 % after 14th days.

**Figure 7** Clarifies functional oral intake among study and control groups on pre intervention, 7th and 14th days after the program. The results illustrated that the majority of children were tube dependent on pre intervention in both study and control groups (76.70% &86.7%) respectively, while significant improvement was observed among the studied children in the study group regarding oral food intake after application of swallowing exercises. Meanwhile, the children were assumed total oral intake on 7th and 14th days in the study group (63.3 %, & 93.3%) respectively, compared to (20.0%, &26.70%) respectively in the control group. There was an improvement in functional oral intake after 7th days of application of swallowing exercises and more significant improvement was observed 14th days later with continuous application for the swallowing exercises.

**Table 5** shows correlation between level of oral status assessment and severity of dysphagia & functional oral intake. It was obvious that, there were positive correlation was between severity of dysphagia and level of oral status assessment in the study group. Likewise, it was clear that there was a negative correlation was between functional oral intake and level of oral status assessment with (P <0.001) in the study group, the presence of poor oral health limited the patients' functional level of oral intake. With contrast to that, there were no correlation between severity of dysphagia,

functional oral intake and level of oral status assessment in the control group.

**Figure 8** describes correlation between severity of dysphagia and functional oral intake for the study and control groups. It was clear that there was negative correlation between severity of dysphagia and functional oral intake. The severity of dysphagia limited the patients' functional level of oral intake. Meanwhile, there was no correlation between severity of dysphagia and functional oral intake for the control group.

**Table (1): Socio-demographic Characteristics of the Studied Children (N=60).**

| Socio-demographic Characteristics | Study group (N=30) | | Control group (N=30) | | $\chi^2$ | P-value |
|---|---|---|---|---|---|---|
| | No | % | No | % | | |
| **Age** | | | | | | |
| **– 6-9 years** | 7 | 23.3% | 7 | 23.3% | | |
| **– 9-12 years** | 7 | 23.3% | 10 | 33.3% | 0.85 | 0.84 |
| **– 12-15 years** | 12 | 40.0% | 10 | 33.3% | | |
| **– 15-18 years** | 4 | 13.4% | 3 | 10.1% | | |
| **Gender** | | | | | | |
| **– Male** | 14 | 46.7% | 12 | 40.0% | 0.27 | 0.80 |
| **– Female** | 16 | 53.3% | 18 | 60.0% | | |
| **Educational level** | | | | | | |
| **– Primary School** | 9 | 30.0% | 8 | 26.7% | | 0.95 |
| **– Secondary School** | 10 | 33.3% | 10 | 33.3% | 10,0 | |
| **– Middle School** | 11 | 36.7% | 12 | 40.0% | | |

**Table (2): Distribution of Children in the Study and Control Groups According to Their Previous Medical History (N=60)**

| Medical data | Study group (N=30) | | Control group (N=30) | | $\chi^2$ | P-value |
|---|---|---|---|---|---|---|
| | No | % | No | % | | |
| **Admission Diagnosis** | | | | | | |
| - **DKA** | 6 | 20.0% | 4 | 13.3% | | |
| - **Pneumonia** | 6 | 20.0% | 9 | 30.1% | | |
| - **Respiratory** | 5 | 16.8% | 3 | 10.0% | | |
| **Failure** | 3 | 10.0% | 3 | 10.0% | 4.50 ns | 0.81 |
| - **COPD** | 1 | 3.3% | 1 | 3.3% | | |
| - **Atelectasis** | 4 | 13.3% | 4 | 13.3% | | |
| - **Head Injuries** | 3 | 10.0% | 2 | 6.7% | | |
| - **Pulmonary** | 1 | 3.3% | 4 | 13.3% | | |
| **Edema** | 1 | 3.3% | 0 | 0.0% | | |
| - **Skull Fracture** | | | | | | |
| - **Brain Tumor** | | | | | | |
| **Previous Intubation** | | | | | | |
| - **NO** | 19 | 63.3% | 22 | 73.3% | 0. 69 ns | 0.29 |
| - **Yes** | 11 | 36.7% | 8 | 26.7% | | |

**NB:** *ns = not significant (p>.05)*

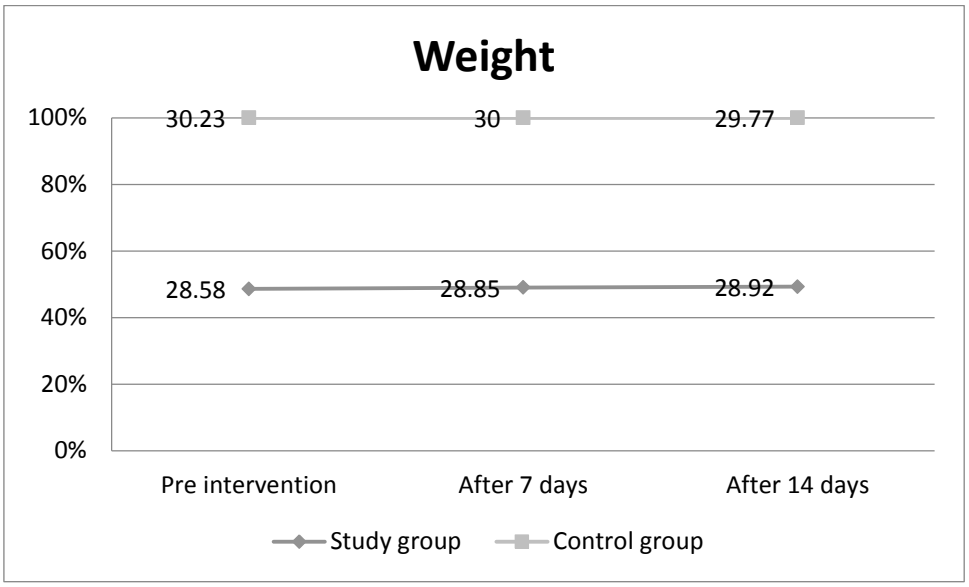


**Figure (4) : Total Mean Score of Children's Weight pre interventions, at 7th and 14th days post interventions.**

**Table (3): Mean Score of Oral Status Assessment among Study and Control Groups on Pre intervention, after 7th and 14th days.**

| Mean score of OAG | Pre intervention | After 7th days | After 14th days | Anova test | P -value |
|---|---|---|---|---|---|
| | X ± SD | X ± SD | X ± SD | | |
| **Voice** | | | | | |
| **Study group** | 2.46 ±51 | 1.60 ± 0.56 | 1.20 ± 0.48 | 46.63 S | 0.00 |
| **Control group** | 2..43 ±0.63 | 2.20 ±0.55 | 2.33 ± 0.60 | 1.16 ns | 0.32 |
| ***Independent t test*** | 0.27. ns | 4.17. HS | 7.99 HS | | |
| ***p-value*** | 0.82. | 0.00 | 0.00 | | |
| **Ability to swallow** | | | | | |
| **Study group** | 2.37 ± 0.56 | 1.67± 0.55 | 1.23 ± 0.43 | 37.76 H.S | 0.00 |
| **Control group** | 2.40. ±0.62 | 2.13±0.63 | 2.37±0.55 | 1.74 ns | 0.18 |
| ***Independent t test*** | 0.22 ns | 3.07 HS | 8.83 HS | | |
| ***p-value*** | 0.83 | 0.00 | 0.00 | | |
| **Lips** | | | | | |
| **Study group** | 2.23 ±0.63 | 1.43 ± 0.63 | 1.07 ± 0.25 | 37.76 H.S | 0.00 |
| **Control group** | 2.50±0.57 | 2.25 ±0.72 | 2.23±0.43 | 3..30 ns | 0.06 |
| ***Independent t test*** | 1.72 ns | 4.66 HS | 12.79 HS | | |
| ***p-value*** | 0.09 | 0.00 | 0.00 | | |
| **Saliva** | | | | | |
| **Study group** | 2.17 ± 0.65 | 1.50 ± 0.57 | 1.20 ± 0.48 | 22.45 H.S | 0.00 |
| **Control group** | 2.37 ±0.56 | 2.40±0.59 | 2.43±0.73 | 0.07 ns | 0.93 |
| ***Independent t test*** | 1.28 ns | 5.43 HS | 7.28 HS | | |
| ***p-value*** | 0.21 | 0.00 | 0.00 | | |
| **Tongue** | | | | | |
| **Study group** | 2.23 ± 0.68 | 1.43 ± 0.57 | 1.23 ± 0.50 | 24.28 H.S | 0.00 |
| **Control group** | 2.46 ±0.57 | 2.23 ± 0.50 | 2.17 ±0.59 | 2.40 | 0.09 |
| ***Independent t test*** | 1.44 ns | 5.77 HS | 6.58 HS | | |

| | | | | | |
|---|---|---|---|---|---|
| ***p-value*** | 0.16 | 0.00 | 0.00 | | |
| **Mucous membrane** | | | | | |
| **Study group** | 2.27 ± 0.69 | 1.33 ± 0.61 | 1.20 ± 0.41 | 30.06 H.S | 0.00 |
| **Control group** | 2.33 ± 0.55 | 2.27 ± 0.64 | 2.27 ± 0.52 | 0.14 ns | 0.87 |
| ***Independent t test*** | 0.41 ns | 5.80 HS | 8.84 HS | | |
| ***p-value*** | 0.68 | 0.00 | 0.00 | | |
| **Gingiva** | | | | | |
| **Study group** | 2.27 ± 0.64 | 1.37 ±0 0.61 | 1.13 ± 0.35 | 35.54 H.S | 0.00 |
| **Control group** | 2.27± 0.52 | 2.17 ±0.59 | 2.20 ± 0.48 | 0.72 ns | 0.76 |
| ***Independent t test*** | 0.00. ns | 5.13 HS | 9.82 HS | | |
| ***p-value*** | 1.00. | 0.00 | 0.00 | | |
| **Teeth** | | | | | |
| **Study group** | 2.43 ±0.50 | 1.53 ± 0.73 | 1.17 ± 0.46 | 38.23 H.S | 0.00 |
| **Control group** | 2.27 ±0.52 | 2.07±0.45 | 2.17 ± 0.46 | 1.31 ns | 0.27 |
| ***Independent t test*** | 1.26 ns | 3.41 HS | 8.40 HS | | |
| ***p-value*** | 0.21 | 0.00 | 0.00 | | |

**NB:** *ns = not significant (p>.05), S= significant (p≤.05), HS = highly significant (p≤.01).*

**Table (4): Total Mean Scores of Oral Status Assessment Guide among Study and Control groups on Pre intervention, after 7th and 14th days.**

| Total Mean Score of OAG | Pre intervention | After 7th days | After 14th days | Anova test | P -value |
|---|---|---|---|---|---|
| | X ± SD | X ± SD | X ± SD | | |
| **Study group** | 18.43±2.43 | 11.87 ±2.33 | 9.43 ± 1.69 | 137.24 HS | 0.00 |
| **Control group** | 19.03 ±1.97 | 18.70 ±2.44 | 18.20 ±1.32 | 1.37 ns | 0.26 |
| ***Independent t test*** | -1.14 ns | -11.10 HS | -22.32 HS | | |
| ***p-value*** | 0.26 | 0.00 | 0.00 | | |

**NB:** *ns = not significant (p>.05) HS= highly significant (p≤.01)*

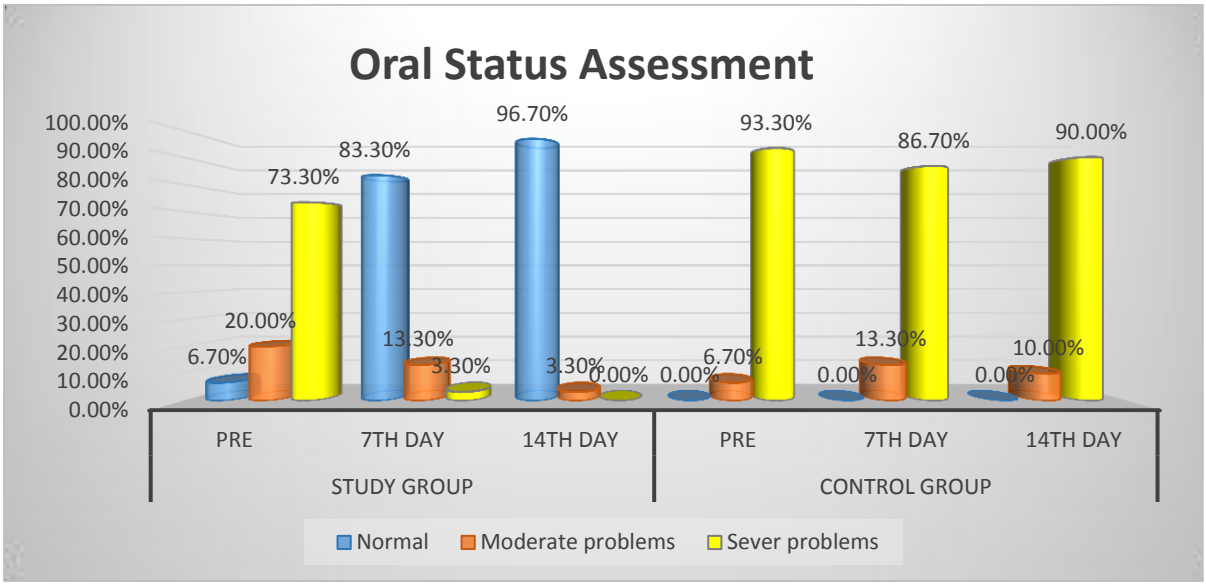


**Figure (5): Level of Oral Status Assessment among Study and Control groups on Pre Intervention, after 7th and 14th days.**

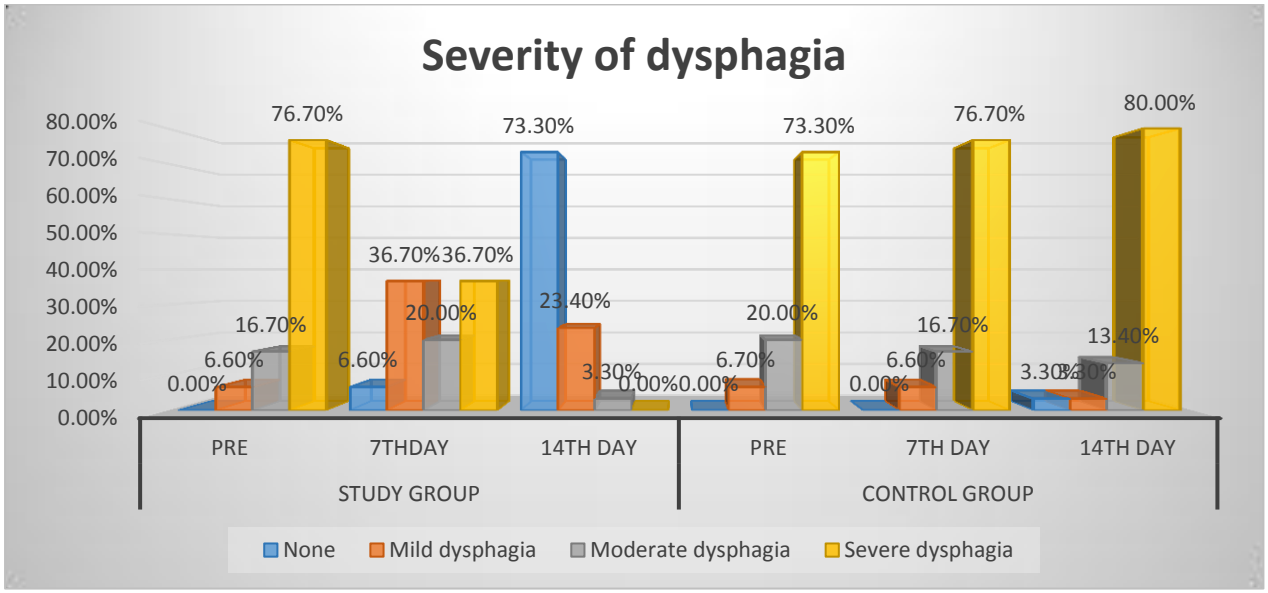


**Figure (6) Severity of Dysphagia among Study and Control groups on Pre Intervention, after 7th and 14th days.**

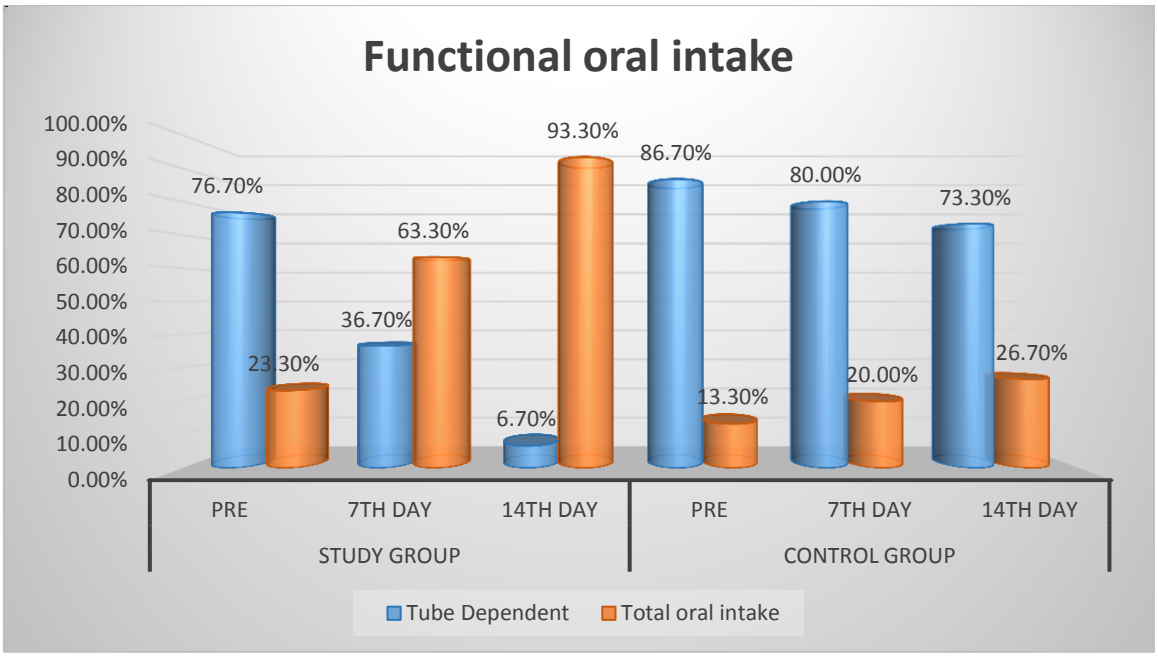


**Figure (7): Functional Oral Intake among Study and Control groups on Pre Intervention, after 7th and 14th days of the Program.**

**Table (5): Correlation between Level of Oral Status Assessment and Severity of Dysphagia &Functional Oral Intake for the Study and Control Groups.**

| Variables | level of oral Status Assessment | | | |
|---|---|---|---|---|
| | Study group | | Control group | |
| | R | p. value | R | p. value |
| **Severity of dysphagia** | 0.59** | .000 | -0.08 ns | .42 |
| **Functional oral intake** (FOIS) | -0.37** | 0.00 | -0.02 ns | 0.86 |

**NB:** *ns = not significant (p>.05)* ***= highly significant (p≤.01)*

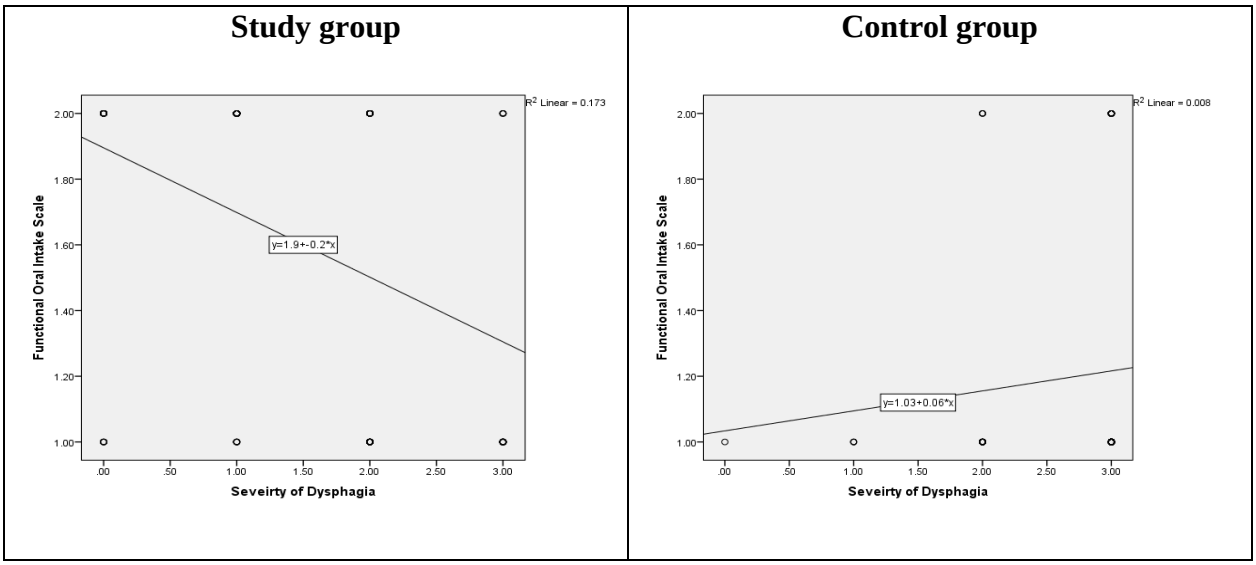


**Figure (8) Spearman correlation between severity of dysphagia and functional oral intake for the study and control groups.**

## Discussion

Post-Extubation Dysphagia is frequently evident in critically ill patients requiring endotracheal intubation for mechanical ventilation particularly in patients who have had protracted endotracheal intubation (greater than 48 hours). According to recent research, postoperative patients who had extended intubation had a higher incidence of post-extubation dysphagia than those who needed intubation for a shorter period of time. [13] Post-extubation dysphagia is associated with poor outcomes for patients including delayed oral intake, low quality of life, aspiration pneumonia and prolonged hospital stays. Moreover, public health care systems have a heavy financial strain. [29]

In order to overcome the problem of post-extubation dysphagia, various techniques for swallowing training are created. Exercises for strengthening, stimulation of the biofeedback system, temperature control, and taste stimulation are some of these techniques. [30] Moreover, Swallowing and oral care intervention combined oral lubrication and oral sensation will enhance chewing, swallowing, and tactile perception. [31] In addition, because of the large number of somatosensory receptors in the oral cavity, oral feeling is also significant. It may be possible to enhance oral sensor-motor control when swallowing by stimulating these sensory receptors in the tongue. [32]

Concerning weight of studied children, the finding of the current study showed that there were no statistical significant differences at 5 % level of statistical significant in both study and control group between pre, 7th and 14th days of intervention. This result was in the same line with previous study [33] , who stated that no significant weight changes were observed among the studied patient on pre and post intervention. From the researchers' point of view this may be due to the short period of the intervention. In the contrary previous study [34] that mentioned that swallowing dysfunction had a significant relation with the long-term loss of weight.

Regarding oral assessment guide, the present study reflected that the children in the study group had good voice, ability to swallow, lips and greater salivary flow over 7th and 14th days of intervention following extubation than the control group. This result pointed to that there was a statistically significant improvement in the total mean score of oral assessment guide in the study group after 7th and 14th day of swallowing exercise. This result was consistent with previous study [35] that indicated that there was marked improvement in functional swallowing with no dysphagia-related problems during or after program. Also, other previous study [31] concluded that the salivary flow markedly increased for up to five minutes after the intervention. In addition, another previous study [36] that discovered, there was a statistically significant improvement of oral motor structures and reflexes after receiving swallowing and an oral care intervention compared to pre intervention.

Similar results [14] have been reported that oral intervention post extubation enhanced salivary flow after prolonged endotracheal intubation greater than 48 hours. Also, another study [9] stated that there was a considerable improvement of swallowing in the majority of patients after five consecutive days of swallowing exercises. In addition, previous research [29] clarified that there was a statistically significant improvement in the total mean score of oral assessment guide that indicate slight to moderate oral problems post intervention compared to pre intervention. Moreover, another previous research [7] showed that there was a dramatic improvement in oral assessment score in the study group on post intervention.

In relation to Bazaz dysphagia scale score regarding severity of dysphagia, the current finding revealed that, more than half of the studied children in the study group were having moderate dysphagia after 7th days and absence of dysphagia after 14th days of practicing swallowing exercises. This finding was congruent with previous study [36] that indicated there was absence of dysphagia after the application of the swallowing exercises for patients with post extubation dysphagia. Also, previous study, [33] indicated that the majority of patients had absence of dysphagia after swallowing exercises. This may be related to the swallowing exercises that is associated with a positive effect on swallowing physiology which leads to improvement in swallowing initiation, laryngeal elevation, post swallowing residue and thus reduce the severity of dysphagia over the course of intervention.

Concerning functional oral intake, there was an improvement in functional oral intake after 7th days of application of swallowing exercises & education and more significant improvement were observed 14th days later with continuous application of the swallowing exercises& education. From the researchers' point of view this could be due to early starting of swallowing exercises immediately after diagnosis led to significant improvement in level of dysphagia that enhance patients` functional oral intake and

reduce complications of dysphagia as aspiration. This result was in the same line with previous research [37], that discovered a statistically significant increase in oral intake and a high probability of patients restarting complete oral consumption after intervention than before intervention. It has been demonstrated that performing daily 15-minute swallowing exercises increased patients' odds of resuming oral intake because they kept their oral cavities lubricated and clean and allowed their lips, tongue, and jaw to move easily.

The present study's findings are also consistent with previous study [36] that reported that there was improvement in the functional oral intake after the application of the swallowing exercises for patients with post extubation dysphagia. Also, in another previous study [29] mentioned that there was a statistically significant improvement of the functional oral intake post intervention compared to pre intervention. In addition, in previous study [33] the majority of patients had improvement in the functional oral intake after swallowing exercises.

On the other hand, in previous study [29] mentioned that examined how lingual exercise affected swallowing in elderly persons over the age of 75 and discovered that there was no improvement in oral intake over the course of the next 14 days. This could be explained by the subjects' advanced age, which is a factor associated with alterations in swallowing function.

Regarding correlation between level of oral assessment and severity of dysphagia &functional oral intake for the study and control groups. The findings revealed that there were highly statistical significant relation was found between functional oral intake and level of oral assessment. This could be due to the presence of good oral health status that improve the patients' functional level of oral intake. This finding was congruent with previous study [33] that reported that the severity of dysphagia decreased and functional level of oral intake increased with improving oral health status.

Concerning correlation between severity of dysphagia and functional oral intake for the study group, the present study revealed that there was negative correlation between severity of dysphagia and functional oral intake. This could be due to decrease the difficulty of swallowing after the intervention which consequently improve the total oral intake. This finding was consistent with previous study [33] that showed that there was a significant relation between functional oral intake score and Bazaz dysphagia scale score (dysphagia severity),

**Conclusion**

Based on the findings of the present study, it was concluded that nursing intervention that involves swallowing and oral care for a period of 30 minutes per day for 14$^{th}$ days reduces post-extubation dysphagia, improves clinical swallowing function, and increases the probability of faster oral intake after extubation.

**Recommendations**

Based on the findings of the present study, the following recommendations can be suggested:

1. Swallowing education and oral care interventions should be integrated as a part of routine daily care for critically ill child post extubation.
2. Swallowing education and oral care interventions should be started as early as possible for patients who intubated greater than 48 hours.
3. Critical care nurses should receive ongoing training in oral care protocols for child who is at high risk of developing post-extubation dysphagia as part of normal clinical procedures.
4. The length of the study period should be increased more than two weeks to gain

comprehensive data on the favorable impact of swallowing and post-extubation dysphagia oral care intervention.

5. A systematic routine screening should be performed in all patients at risk for post-extubation dysphagia.
6. 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

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