Frequency and Outcomes of Post Extubation Dysphagia among Critically Ill Patients

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Abstract

Background: Post-Extubation Dysphagia (PED) is a prevalent condition among critically ill patients in intensive care units (ICUs) and is linked to a higher risk of complications and mortality in these individuals. **Aim:** Investigate the frequency and outcomes of post-extubation dysphagia among critically ill patients. **Research questions:** What is the frequency of post- extubation dysphagia among a selected sample of critically ill patients? What are the outcomes of post-extubation dysphagia among a selected sample of critically ill patients? **Design**: A descriptive exploratory research design, **Subjects:** Purposive sample of 80 critically ill patients constituted the study sample. **Setting:** The study was carried out at Medical and Surgical Intensive Care Units (ICU) affiliated to one University Hospital at Beni-Suef Governorate. **Tools:** three tools were utilized; Tool I - Patients' demographic and medical data sheet, Tool II: Yale Swallow protocol and Tool III: Patients' outcome. **Results:** 47.5% of the studied patients' age ranged from 45 to 65 years and 67.5% of them were males. 20% of them developed post-extubation dysphagia, 75 % of patients who have dysphagia developed malnutrition, and 62.5 of them developed pneumonia. **Conclusion:** The presence of dysphagia associated with poor outcomes, including a malnutrition, pneumonia and a longer ICU stay. **Recommendation:** Implement and evaluate early rehabilitation interventions, such as swallowing therapy and speech therapy, to assess their effectiveness in reducing dysphagia complications.

Key words: Critically ill patients, Dysphagia, Post-Extubation Dysphagia and Intensive care units.

Introduction:

Postextubation dysphagia (PED refers to the difficulty or inability to

safely and effectively move food and liquid from the mouth to the stomach following extubation. It is commonly observed in trauma and critically ill patients undergoing endotracheal intubation for mechanical ventilation, particularly after cardiac surgery. Post-extubation dysphagia (PED) is frequently observed in critically ill patients. **(Park et al., 2017).**

The Water Swallowing Test (WST) is a cost-effective screening method that involves ingesting water to identify swallowing-related aspiration. This technique demonstrates a sensitivity of 91% and a specificity of 53% for aspiration screening. Additionally, WST can be easily conducted by various healthcare professionals, including ICU physicians and nurses. **(Brodsky et al., 2016).**

Post-extubation dysphagia (PED) screening is an important procedure to detect the probability of dysphagia. Who suggested that the reliability and validity of a post-extubation dysphagia screening tool can help nurses to determine extubated patient's ability to swallow after prolonged endotracheal intubation. The timing and process are variable, often performed at 24 hours after extubation. In stroke unit, dysphagia screening is routinely performed before starting oral feeding for prevention of aspiration complication

Screening for post-extubation dysphagia (PED) is crucial for assessing the likelihood of dysphagia. It has been suggested that a reliable and valid screening tool can assist nurses in evaluating an extubated patient's swallowing

ability following prolonged endotracheal intubation. The timing and methodology of this screening can vary, typically taking place around 24 hours post-extubation. In stroke units, dysphagia screening is regularly conducted before initiating oral feeding to prevent aspiration complications. **(Johnson et al, 2018).**

Patients who are intubated and mechanically ventilated in an intensive care unit (ICU) are at risk of developing post-extubation dysphagia, which affects up to 20% of these patients after extubation. This condition is associated with several factors, including inactivity of the oropharyngeal muscles, glottal injury, mucosal inflammation that results in tissue damage, and vocal cord ulcerations. Additionally, the prolonged use of narcotics and anxiolytics can diminish protective airway reflexes (**Hou et al., 2023).**

Post-Extubation Dysphagia (PED) is a prevalent issue among critically ill patients admitted to the ICU. It is particularly common in individuals at high risk, such as the elderly, those with preexisting dysphagia, patients who have been intubated for more than 48 hours, and those with stroke or neurological conditions, renal failure, head and neck surgery or radiation, as well as post-tracheostomy patients **(Zuercher et al., 2020).**

Although dysphagia is not a life-threatening condition, it is a significant medical issue that requires proper treatment due to its association with increased risks of morbidity and mortality in ICU patients. Common complications of PED (post-extubation dysphagia) include pulmonary aspiration, which can lead to aspiration pneumonia, higher rates of re-intubation, insufficient nutritional support, prolonged reliance on feeding tubes and delayed return to oral feeding, extended ICU and hospital stays, and a diminished quality of life **(McIntyre et al., 2021).**

Postextubation dysphagia (PED) may result in aspiration and complications such as aspiration pneumonia, chemical pneumonitis, transient hypoxemia, bronchospasm or mechanical obstruction with atelectasis. As a result, malnutrition, prolonged hospital stays, financial burden and increased mortality rate. Understanding the treatment modalities and screening tests is essential to minimize complications, improve quality of treatment and develop standard screening guidelines **(Rassameehiran et al., 2015).**

Early detection of PED is essential to reduce complications and improve quality of life. Post-extubation dysphagia is crucial to improve patient outcomes, enhance clinical management and establish targeted interventions for this vulnerable population **(Park et al., 2017).**

Developing reliable and efficient methods for identifying and screening patients at risk of post-extubation dysphagia is vital. Early detection can facilitate timely interventions and prevent complications associated with dysphagia. By studying the factors associated with dysphagia in this specific patient population, healthcare professionals can implement targeted screening protocols to minimize the impact of this condition on patients' recovery **(Smith et al., 2023).**

Post-extubation dysphagia can significantly impact patients' overall health and recovery process. Dysphagia can lead to aspiration, malnutrition, dehydration and respiratory complications, including aspiration pneumonia, which may further exacerbate the patients' already compromised health condition. Understanding the clinical implications of dysphagia in this context is essential to develop tailored care plans that reduce associated risks and promote better patient outcomes (**Johnson et al., 2023).**

Investigating the efficacy of various dysphagia management techniques and interventions in post-extubation patients can provide valuable insights. Determining the most effective strategies, such as therapeutic exercises, diet modifications or specific medications, can significantly improve patient outcomes, reduce complications and optimize the overall care provided in ICUs and acute care settings (**Smith et al., 2023).**

Significance of the study

Post-extubation dysphagia (PED) has been observed in 41% of critically ill patients who require endotracheal intubation for mechanical ventilation. Patients with PED tend to experience higher rates of aspiration pneumonia and longer stays in both the Intensive Care Unit (ICU) and the hospital compared to those without dysphagia after extubation. PED can result in extended hospitalizations, increased readmission rates, and greater use of medical resources. Furthermore, it has been identified as an independent predictor of mortality **(McIntyre et al., 2021).**

The study of post-extubation dysphagia for patients after weaning from mechanical ventilation holds immense significance in the field of critical care nursing. Therefore, investigating its frequency, outcomes, screening methods, and management strategies, healthcare providers can enhance patient care, reduce complications and optimize resource utilization. This contributes to better patient outcomes, shorter hospital stays and improved quality of life. Therefore, the aim of this study is to assess the frequency and outcome of post extubation dysphagia among critically ill patients.

Aim of the study:

The aim of this study was to investigate the frequency and outcomes of post-extubation dysphagia among critically ill patients.

Research questions

The following research questions were formulated to fulfill the aim of the study.

1- What is the frequency of post-extubation dysphagia among a selected sample of critically ill patients?
2- What are the outcomes of post-extubation dysphagia among a selected sample of critically ill patients?

Subjects and Method:

Study Design: A descriptive exploratory research design was used in this study to fulfill the aim of the study. A descriptive design is used to examine variables in a single sample. This descriptive design includes identifying the variables within a phenomenon of interest, measuring these variables, and describing them.

Setting:

The study was conducted in Medical and Surgical Intensive Care Units (ICU) affiliated to one University Hospital at Beni-Suef Governorate. Medical Intensive Care Units composed of two units which contain 17 bed and Surgical Intensive Care Units composed of one unit which contains 12 beds.

Subjects: A purposive sample of 80 patients was selected from the previously mentioned setting. The minimum sample size required for this study was determined using Epi-Info version 7.2.5 StatCalc (developed by the Centers for Disease Control (CDC) and the World Health Organization (WHO)), based on the following parameters: the incidence rate of the problem, a 95% confidence level, and a 5% margin of error.

Inclusion criteria: all patients (adult) both male and female, admitted to the ICU that required intubation for the first time and then extubation for the first time.

Exclusion criteria: Patients with altered mental status, those receiving enteral tube feeding through the stomach or nose, those with head-of-bed restrictions greater than 30 degrees, and individuals with a tracheostomy or who were fasting due to gastrointestinal surgery were excluded

Tools of data collection:

Three tools were utilized to gather data relevant to the study. These tools were developed after reviewing recent literature:

Tool I - Patients' demographic and medical data sheet: developed by the researchers. It is divided into two parts:

Part I: Demographic data: to assess patients' characteristics, including age, gender, marital status, education level, and occupation.

Part II: Medical data to collect information regarding patients' Glasgow Coma Scale, body mass index, diagnosis at admission, APACHE II score, fluid balance, duration of intubation (in days), duration of ventilator use, and the time between extubation and the swallowing test.

Tool II: Yale Swallow protocol: A standardized swallowing screening tool developed by Debra Suiter and Steven Leder in 2008. It is a reliable, validated tool used for both adults and children. A patient is considered free of dysphagia if they can drink 3 ounces of water without interruption or signs of aspiration (such as coughing or choking) during or immediately after drinking. Dysphagia is diagnosed if the patient cannot drink the entire 3 ounces in one go due to pauses or shows signs of aspiration, like coughing or choking, during or after the test.

Tool III: Patients' outcome: Developed by the investigators to assess effect of dysphagia on patients' outcome such as malnutrition, dehydration, aspiration pneumonia, choking, length of the ICU stay/day, discharge and death.

Validity and Reliability

The validity of the tools was assessed by a panel of seven experts in the medical-surgical nursing field, who reviewed the tools for relevance, clarity, comprehensiveness, and applicability. Based on their feedback, minor adjustments were made, and the final version of the tools was developed. The validity of the proposed tools was evaluated through face and content validity, ensuring that the items accurately measured what they were intended to assess. The reliability of the tools was tested using the internal consistency method. For Tool III, which was developed by the researchers, the Cronbach's alpha reliability coefficient was found to be 0.829.

Pilot study

Prior to conducting the main study, a pilot study was performed on 10% of the patients (8 patients) who were extubated for the first time in the Medical and Surgical Intensive Care Units (ICU) at a University Hospital in Beni-Suef Governorate. The purpose of the pilot study was to test the clarity and applicability of the tools used. The patients involved in the pilot study were excluded from the final study sample.

Legal and Ethical Considerations

Official approval was obtained from the Research Ethics Committee at the Faculty of Nursing, Beni-Suef University, to proceed with the proposed study. Participation was entirely voluntary, and each patient had the right to withdraw at any time without providing a reason. Informed consent was obtained from all participants. Confidentiality and anonymity were maintained by coding all data, and patients were assured that their information would not be reused in future research without their consent.

Procedure for Data Collection:

This study was conducted on two phases: preparatory and implementation.

Preparatory phase:

It involves preparation of the study tools and testing its validity. Before conducting the study, formal written approval was obtained from the administrators of the hospital to implement the study. This phase was ended by conducting a pilot study.

Implementation phase:

The data collection started from June 2023 to January 2024. The investigators approached the head nurse to obtain the patients planned to be extubated. Then the investigator selected the patients who met the inclusion criteria, the patients interviewed individually by the researcher to clarify the nature, benefits and steps of the study. Written consent was obtained from patients who agreed to participate in the study. Following this, the researcher completed the patients' demographic and medical data

sheet (Tool I). Patients who met the inclusion criteria and consented to participate were then assessed for dysphagia using the Yale Swallow Protocol (Tool II) to determine its prevalence. The assessment included a brief cognitive screening, where patients were asked their name, current location, and the year. An oral-mechanism examination followed, checking labial closure, lingual range of motion, and facial symmetry (by asking the patient to smile or pucker). Next, the 3-ounce water swallow challenge was conducted. Patients were seated upright at an angle of 80-90° (or as high as tolerated, but not below 30°). They were instructed to drink 90cc of water sequentially, either from a cup or through a straw, at a steady pace without pausing. The investigator monitored for interrupted drinking and any signs of coughing or choking during or immediately after the challenge. A patient was considered to not have dysphagia if they could drink all 3 ounces of water continuously without interruption or overt signs of aspiration, such as coughing or choking, either during or after the test. Dysphagia was identified if the patient was unable to drink the entire 3 ounces without stopping or exhibited signs of aspiration. Finally, the investigator completed the patient outcome assessment (Tool III) to evaluate the impact of dysphagia on all participants.

Statistical Analysis

The data were verified before being entered into the computer. The Statistical Package for Social Sciences (SPSS), version 25.0, developed by IBM in Illinois, Chicago, USA, was used for data entry, analysis, and tabulation. For numerical data, the mean and standard deviation were calculated. A significance level was set at $p<0.05$, while a highly significant level was considered when $p \leq 0.001$.

Results

Table (1) shows that approximately 47.5% of the patients in the study were between 40 and 65 years old. In terms of gender, 67.5% were male. Regarding marital status, 72.5% of the patients were married. For educational level, 40% had completed secondary education, while only 5% had higher education. In terms of occupation, 40% of the patients were unemployed.

Table (2) indicates that approximately 87.5% of the patients' Glasgow coma scale was ranged from 12-15. Regarding body mass index (BMI) of the studied patients, 42.5% of patients their BMI was 18.5 < 25. Moreover, regarding diagnosis on admission, 30% of them admitted to hospital for neurological operation and the mean APACHE II score was 8.52 ± 4.26. Regarding duration of intubation use per days for patients under study, 87.5% of them intubated from 1-7 days. 85% of them used the mechanical ventilator from 1-7 day and making the swallowing test after extubation from1-3 day.

Table(3)This table revealed that, 75%, 68.75%, 62.5%, 100%, 75% of patients who had dysphagia developed malnutrition, dehydration, aspiration pneumonia, choking and death respectively with a mean length of ICU stay was7.05± 1.18 and 81.25% of them were not discharged from hospital.

Table(4)This table demonstrated a significant statistical correlation between dysphagia and malnutrition, dehydration, aspiration pneumonia, choking, length of hospital stay, and discharge.

Table (1): Frequency distribution of demographic characteristics of the studied patients (n=80).

Items	Studied Patients (n = 80)	
	N	%
Age in years		
• 0 < 40 years.	34	42.5
• 40 < 65 years.	38	47.5
• > 65 years	8	10
Gender		
• Male	54	67.5
• Female	26	32.5
Marital status		
• Single.	22	27.5
• Married	58	72.5
Educational level		
• Illiterate	16	20
• Read and write	28	35
• Secondary education	32	40
• Higher education	4	5
Occupation		
• Does not work	32	40
• House wife	10	12.5
• Manual work	30	37.5
• Employee	8	10

Table (2): Frequency distribution of medical data for the studied patients (n=80).

Items	**Studied Patients (n = 80)**	
	N	**%**
GCS:		
• 3-7	0	0
• 8-11	10	12.5
• 12-15	70	87.5
BMI:		
• 18.5 < 25	34	42.5
• 25 ≤ 30	22	27.5
• >30	24	30
Mean±SD = 26.67±4.65		
Diagnosis on admission:		
• Cardiovascular (operation)	18	22.5
• Respiratory	6	7.5
• Gastrointestinal	4	5
• Trauma	10	12.5
• Hematology	2	2.5
• Endocrinology	6	7.5
• Neurology (operation)	24	30
• Cardiovascular &Neurology	6	7.5
• Gastrointestinal & Endocrinology	2	2.5
• Gastrointestinal &Neurology	2	2.5
APACHE II score:	Mean±SD = 8.52 ± 4.26	
Duration of intubation use/ days:		
• 1-7 day	70	87.5
• 8-14 day	6	7.5
• 15-21 day	4	5
Mean±SD=4.15 ± 4.98		
The duration of ventilator use (if used):		
• 1-7 day	70	85
• 8-14 day	6	5
• 15-21 day	4	10
Mean±SD=4.15±4.98		
Time from extubation until swallowing test:		
• 1-3 day	68	85
• 4-6 day	4	5
• 7-9 day	8	10
Mean ± SD= 2.02±1.99		

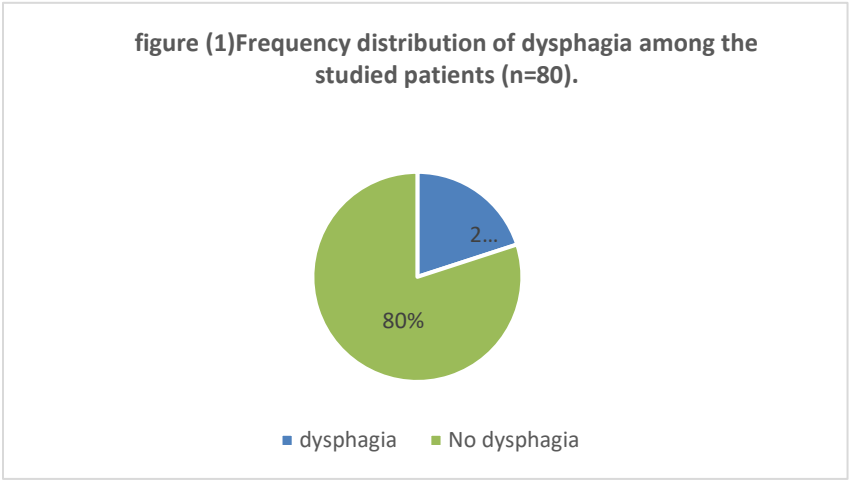

Figure (1) clarifies that, 20% of the studied patients developed dysphagia post-extubation.

Table (3): Frequency distribution of the patients outcomes among patients had dysphagia (n=16).

Patient's Outcomes	Dysphagia (16)			
	Yes		No	
	N	%	N	%
Malnutrition	12	75	4	25
Dehydration	11	68.75	5	31.25
Aspiration Pneumonia	10	62.5	6	37.5
Choking	16	100	0	0
Length of ICU stay (Mean± SD)	7.05± 1.18		2.52±0.41	
Discharge	3	18.75	13	81.25
Death	12	75	4	25

Table (4): Correlation between patient's outcomes and presence or absence of dysphagia

Patient's outcome	Dysphagia (16)				No Dysphagia (64)				X2	P-value
	Yes		No		Yes		No			
	N	%	N	%	N	%	N	%		
Malnutrition	12	75	4	25	0	0	64	100	11.429	0.003*
Dehydration	11	68.75	5	31.25	0	0	64	100	5.946	0.000*
Aspiration Pneumonia	10	62.5	6	37.5	0	0	64	100	5.000	0.04*
Choking	16	100	0	0	0	0	64	100	5.354	0.05*
Length of ICU stay (Mean± SD)	7.05± 1.18				2.52±0.41				27.381	0.000*
Discharge	3	18.75	13	81.25	60	93.75	4	6.25	8.205	0.02*
Death	12	75	4	25	0	0	64	100	3.828	0.039

Discussion

In this study, post-extubation dysphagia (PED) was observed in 20% of patients in the intensive care unit (ICU). PED has been linked to negative health outcomes, with affected patients being more prone to malnutrition, aspiration pneumonia, dehydration, choking, extended ICU stays, and increased in-hospital mortality.

Regarding the demographic characteristics of the studied patients, the results of the current study showed that approximately half were middle-aged to older adults. This finding may be attributed to the fact that older patients are at a higher risk of developing post-extubation dysphagia as a result of physiological changes associated with aging, such as decreased salivary production, decreased muscle mass function, and reduced swallowing muscle tissue elasticity. In accordance with these results, **Abdalla et al. (2019)** found that, 68% of the studied patients aged between 51-60 years old. This result is also consistent with **Rassameehiran et al, (2015)**, who found that older adults are generally more prone to dysphagia due to factors such as age-related muscle weakness, reduced sensation, and comorbidities.

In accordance with the study result, **Hegde & Shanbhag, (2018)** confirm that post-extubation dysphagia is prevalent in older adults, typically within the 45-65 age range. It attributes this to age-related physiological changes that affect swallowing function. Contradicting the study result, **Smith & Thompson, (2020)** suggest that while age is a factor, the impact of other variables such as the severity of illness or intubation duration might be more critical in predicting dysphagia.

In respect to gender, the study showed that more than two-thirds of the patients were male. This may be attributed to the fact that a majority of males are smokers. and this has a negative impact on swallowing function especially after extubation. This is consistent with **Sirgy (2021)** research showing that men are often more likely to suffer from post-extubation dysphagia. This gender difference might be attributed to the generally higher rates of critical illness and longer durations of mechanical ventilation in males, both of which are risk factors for dysphagia. This result aligns with **Langmore & Miller, (2015).** This study highlights a higher prevalence of post-extubation dysphagia in males, potentially due to anatomical differences and higher exposure to conditions requiring intubation.

The study results showed that, majority of the studied patients' Glasgow coma scale ranged from 12-15. This indicates mild to moderate brain injury. This level of consciousness is typically associated with better outcomes compared to lower scores. Studies have shown that patients with GCS scores in this range generally have lower mortality rates and better functional outcomes. This supported by a study by **Hegde & Shanbha (2018)** demonstrated that GCS is a reliable predictor of patient outcomes, with higher scores correlating with lower mortality.

Regarding body mass index (BMI), more than one third of patients their BMI was from 18.5 to less than 25. Moreover, regarding diagnosis on admission, nearly one third of them admitted to hospital for neurological operation with mean APACHE II score 8.52 ± 4.26 suggests a relatively low severity of illness, which is consistent with the high GCS scores observed. Studies indicate that lower APACHE II scores are associated with lower mortality and better outcomes. This is incongruent with **Abdalla et al. (2019)** who found that the mean of APACHE II score, was 22.58±7.12. In addition, **Omura et al., (2019)** who found, the APACHE II score in the studied patients 24.

Regarding duration of intubation use \ days of patients under study, the current study results showed that, majority of patients were intubated for 1-7 days, and used mechanical ventilation for the same duration. This duration is typical in ICU settings for patients with moderate injuries and aligns with protocols aimed at minimizing complications associated with prolonged intubation and ventilation. Early extubation and subsequent swallowing tests within 1-3 days post-extubation are standard practices to assess and prevent dysphagia and other complications. This result is in accordance with research by **Esteban et al. (1999)** showing that shorter durations of mechanical ventilation are linked to better outcomes and fewer complications like ventilator-associated pneumonia. A study by **Macht et al. (2013)** supports this practice, indicating that early swallowing assessments are crucial in reducing

the incidence of aspiration pneumonia and improving overall outcomes

Regarding incidence of post extubation dysphagia, the study revealed that, one fifth of patients developed post extubation dysphagia. This result in consistent with **Millett., et al. (2009)** and **Bhat et al., (2014)** who found that dysphagia occurred in approximately 13% to 30% of patients following extubation, supporting the notion that a significant proportion of patients can experience this complication. The study acknowledges that the prevalence of dysphagia is lower than what has been reported in several previous studies, as demonstrated by **Regala et al. (2019)** who stated that 41.4% had clinically significant dysphagia. In addition, **McIntyre et al. (2021)** documented that, Dysphagia following endotracheal intubation is prevalent, affecting 41% of critically ill adults. Although it does not specifically state a 20% incidence rate, it supports the general idea that a notable percentage of patients can develop dysphagia.

Contradicting this results, **McIntyre et al., (2023)** found that, Dysphagia was recorded in 7.3% (n = 5203) of those cases.

Regarding outcomes of post extubation dysphagia, the study revealed that, majority of patients with dysphagia, developed malnutrition, dehydration, choking, more than two thirds percent of them developed aspiration pneumonia and stayed three times longer in ICU and had been died as compared to patients without dysphagia. In addition, there were a significant statistical correlation between dysphagia and these outcomes. These findings are in line with **Omura et al. (2019)** showing complications of post extubation dysphagia, Including extended hospital and ICU length of stay, prolonged enteral nutrition, reintubation, and higher mortality rates. Moreover, **Fong & Wong (2015)** found that, patients with dysphagia often experience longer ICU stays and higher rates of hospital readmission. In the same line. **Linden & Fitzsimons (2015)** found a significant correlation between dysphagia and poor nutritional and hydration outcomes in critically ill patients, supporting the association between dysphagia and malnutrition and dehydration.

Contradicting these results **Hsu & Kuan, (2017)** and **Balestreri & Miller, (2010)** query the severity of complications like death and ICU discharge rates, proposing that dysphagia's impact may not be as noticeable as reported. Moreover, **Regala et al. (2019)** stated that, Dysphagia was not linked to mortality, ICU or hospital length of stay, ICU readmission, or discharge destination.

Conclusion

This study highlights incidence of dysphagia in patients after endotracheal intubation and adverse outcomes. The study has demonstrated that, twenty percent of patients developed dysphagia post extubation. Majority of patients with dysphagia, developed malnutrition, dehydration, choking, more than fifty percent of them developed aspiration pneumonia and stayed three times longer in ICU as compared to patients without dysphagia. Moreover, there is a significant statistical correlation between dysphagia and malnutrition, dehydration, aspiration pneumonia, chocking and length of hospital stay and with discharge and death.

Recommendation

- Follow-up assessments are recommended to evaluate the ongoing effects of post-extubation dysphagia on patient's recovery, quality of life, and long-term health outcomes.
- Implement and evaluate early rehabilitation interventions, such as swallowing therapy and speech therapy, to assess their effectiveness in reducing dysphagia complications.
- Establish standardized screening protocols for early detection of dysphagia in ICU patients to minimize delays in intervention and reduce complications.
- Assess the role of psychological factors, such as anxiety, depression, and delirium, in the development of post-extubation dysphagia and how they might be mitigated.

limitations for the study

1- Small sample size: The study only included 80 patients, which may limit the generalizability of the results to a larger population.

2- Single center study: The study was conducted in one hospital ICU setting, limiting the applicability of findings across other healthcare settings.

3- -Limited generalizability: The findings are specific to a certain ICU population in Beni-Suef Governorate, which might not

reflect other regions or healthcare environments.

4- Short assessment window: The swallowing assessment was conducted within a short period (up to 3 days), which may not capture late-onset dysphagia cases.

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