Effect of Implementing Dysphagia Care Bundle on Functional Oral Intake and Stroke Associated Pneumonia among Critically Ill Stroke patients

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Abstract

Background: dysphagia occurs post-stroke imposes a greater risk that can result in poor outcomes such as severe aspiration pneumonia, malnutrition, dehydration and prolonged ICU stay. So evidence-based interventions to prevent and manage is a necessity.**Aims:**To evaluate Effect of Implementing Dysphagia Care Bundle on Functional Oral Intake & Stroke Associated Pneumonia for the Severely Ill stroke patients. **Design**: A quasi-experimental design was utilized. **Settings**: The research was carried out at Neurointensive Care Unit at Tanta Main University Hospital affiliated to Ministry of Higher Education and Scientific Research. **Subjects**: Purposive samples of 60 critically ill adults→patients, newly admitted with acute stroke were involved in the study.**Tools**: Six tools were employed to gather data. **Tool (I)**: Demographic & Clinical data Sheet,**Tool (II)**: "Early dysphagia screening tool" Gugging Swallowing Screen (GUSS), **Tool (III)**: Functional Oral Intake Scale (FOIS),**Tool (IV)**: Stroke- associated Pneumonia Score, **Tool (V)**: Bedside Oral Exam (BOE) and the Barrow Oral Care Protocol (BOCP),**Tool (VI):** Modified Nutrition Risk Assessment in Critically Ill score (**m NUTRIC**).**Results**: results of the present research has shown that there were statistically meaningful improvement in levels of dysphagia and functional oral intake, Lower risk for Stroke associated pneumonia, malnutrition and Shorter duration of stay in the intensive care unit among patients in the study group after implementing intervention bundle in comparison with the control group (P<0.001).**Conclusion**: Dysphagia care bundle can significantly reduce dysphagia severity, improve functional oral intake and decrease risk of Stroke associated pneumonia among critically ill patients with acute stroke. **Recommendations**: Application of dysphagia care bundle as a part of treatment plan of critically ill stroke patients. Replication of the study on a larger probability sampling.

Keywords: Critically ill stroke patients, Dysphagia care bundle, Functional oral intake, Stroke associated pneumonia,

Introduction

Global mortality and disability rates revealed stroke ranks second and third, respectively. **(Babkair, 2023),** It includes cut off cerebral blood flow, leading to neural death and neurological impairments. **(Wilson & Ashcraft, 2023).** Cerebrovascular accident can affect many body functions such as motor activity, swallowing, sensation, communication, and intellectual functions **(Hollist etal , 2021).**There were more than 12.2 million new strokes globally each year in 2023, with about 16% occurring in people aged 15-49 years and over 62% beneath 70 years of age. Men accounted for 47% of all strokes and an extra 3.4 million individuals in the US will have experienced a stroke by 2030. **(Pu et al., 2023).** In Egypt, the most populous country in the Middle East and a low-middle income country, has a high overall crude prevalence rate of stroke (963/100,000 residents), which accounts for 6.4% of all deaths **(Aref et al., 2021).**

Moreover, one of the earliest deterrents to recovery and most common complications following acute stroke is difficulty swallowing. It affected 19% to 81% of stroke patients **(Azer & Kshirsagarup, 2022).** Stroke influences main swallowing promontories of the cerebral hemispheres, resulting in weakness in both oral and throat muscles leading to dysphagia. This cause trapping of food or liquids on the trachea and it manifested by excessive coughing, drooling, choking during eating, and difficulty in speaking or hoarseness **(Song et al., 2024).**

Moreover, consequences of dysphagia can be life-threatening, and profound complications such as aspiration pneumonia, chronic chest infection, malnutrition as well as increased hospitalization, bronchospasm, airway obstruction which increase morbidity & mortality risk occurred if not screened early **(Shen et al., 2024 &Masoud et al .,2023).**

Stroke-associated pneumonia has a widespread of 14.3% .It influences the results of treatment and linked to an augmented risk of longer hospital stay and postponed recovery. Dysphagia is a major risk factor which promotes the progression of pneumonia that is the primary cause of mortality during the acute phase of stroke. The increased risk of aspiration which occurs in up to 67% of stroke patients leading to mortality rate of 30% of cases within a 30-day **(Chang et al., 2022).**

Dysphagia involves incident of penetration and aspiration. Penetration occurs when fluid or bolus forces into the laryngeal space up to the true vocal folds; aspiration results when the fluid infiltrates below the trachea and may be occurred with coughing or without coughing, namely silent aspiration. This finally led to Aspiration pneumonia that considered the common type of hospital acquired pneumonia **(Raciti et al., 2022).**

Dysphagia and malnutrition are often closely correlated. Malnutrition emerges in 62% of stroke patients. The risk of malnutrition following a stroke is increased in individuals with poor food intake, poor nursing care, old age, delayed rehabilitation, certain chronic conditions including diabetes mellitus, hypertension, a history of stroke, heavy alcohol use, functional disabilities, and cognitive deficits. **(Yoon et al., 2023).**

Dysphagia increases the risk of malnutrition, which is an independent risk factor for increased morbidity & mortality. It impacts the duration of hospital stay, functional recovery, and prognosis after stroke **(Engberg et al., 2024)**.Malnutrition leads to the loss of muscle mass and atrophy of the swallowing muscles, and this eventually leads to dysphagia**(Wilson & Ashcraft, 2023).**

Critical care nurses have an essential role in the management of swallowing disabilities and post-stroke dysphagia because oropharyngeal dysphagia has no pharmacological management. So, early implementation of an integrated multidisciplinary approach is believed to treat dysphagia through a combination of different measures as dysphagia screening, feeding strategies, oral care, conducting shaker exercises & Neuromuscular electrical stimulation that could serve as a care bundle for reducing dysphagia **(Yan et al., 2021).**

Shaker exercises help to strengthen the suprahyoid muscles, enhance the opening of the upper esophageal sphincter, and improve coordination while feeding modifications reduce the risk of aspiration and improve food bolus formation. **(Abdelbaky et al, 2023)**.

Oral colonization is significant risk in Post-stroke patients owing to dysphagia, which causes bolus and salivary clearance to be diminished. Thus, Impaired oral health could have an unfavorable effect causing halitosis, dental caries and other microbial infections that may delay recovery leading to pneumonia when aspirated and vice versa. Consequently, health-related quality of life and swallowing recovery depend greatly on keeping optimal oral condition **(Cardoso et al., 2023).**

Neuromuscular electrical stimulation (NMES) has emerged as a viable intervention for dysphagia in recent years.It can enhance swallowing function by employing transcutaneous electrical stimulation in the submandibular region to activate muscles and nerve fibers. Two methodologies for NMES have been proposed. Initially, ***'Motor neuromuscular electrical stimulation***' seeks to induce contraction of the muscles involved in swallowing by using high voltage frequency has to be delivered to the region to induce muscular contraction. Consequently leading to a decrease pharyngeal transit time, swallow reaction time, and aspiration rate. It enhances laryngeal elevation, vocal fold closure, swallowing frequency, and airway protection.Comparatively***'Sensory neuromuscular electrical stimulation (SNMES)'*** employs a lower frequency just to stimulate peripheral nerves induce contraction of the deglutition muscles, facilitate motor cortex recovery, and improve motor function. Neuromuscular electrical stimulation (NMES) can activate the ascending sensory pathways to facilitate the reconfiguration of cortical motor regions for swallowing (**El Nahas et al., 2024; Assoratgoon et al., 2023).**

Significance of the study

Dysphagia is a dangerous potential condition that has lethal complications among critically ill patients. Oropharyngeal dysphagia is a condition characterized by the dysfunction of the swallowing mechanism. This condition is prevalent after stroke, affecting recovery of 64% to 78% of those. This disease is recognized as a significant contributor to malnutrition, dehydration, aspiration, and respiratory problems, particularly stroke-associated pneumonia (SAP). **(Assoratgoon et al., 2023).**Typically, the conditions gradually improve, but 50% of the patient develops prolonged swallowing dysfunction. This correlates with an elevated mortality risk and extended duration of ICU stay. The death rate for stroke patients with dysphagia is considerable, reaching 30% within 30 days **(Liu et al., 2023).** A comprehensive analysis indicated that post-stroke dysphagia (PSD) correlates with a 4.07-fold increased mortality risk in acute stroke patients **(Banda et al.,2022)**, Consequently, this research performed to find out the consequences of a dysphagia care bundle on functional oral intake and stroke-associated pneumonia in seriously ill stroke patients.

Aims of the Study

This study aimed to evaluate:

- The effect of implementing dysphagia care bundle on functional oral intake & stroke associated pneumonia among critically ill stroke patients.
- The consequences of dysphagia care bundle on dysphagia severity and risk of stroke-related pneumonia
- The impact of using dysphagia care bundle on Lowering malnutrition risk and shortening length of ICU stay among critically ill stroke patients

Research Hypotheses:

- Stroke patients suffering from dysphagia, who have implemented dysphagia care bundle will be expected to have decline in dysphagia severity with an improvement in functional oral intake than patients in control group.
- Stroke patients suffering from dysphagia, who have implemented dysphagia care undle will be expected to have a low risk of stroke-associated pneumonia than patients in control group.
- Stroke patients suffering from dysphagia who have implemented dysphagia care bundle will be expected to have a low risk of malnutrition and shorter ICU length of stay than patients in control group.

Study Outcomes:

Primary outcomes: Functional oral intake, Stroke-associated Pneumonia.

Secondary outcomes: Malnutrition, ICU length of stay.

Subjects and Method

Research design:

This study applied a quasi-experimental design. This design seeks to establish a causal link between an independent variable and a dependent variable. It does not depend on random allocation. It was applied as it allows for comparison between an intervention group and a control group .It enables the assessment of cause-and-effect relationships between Dysphagia Care Bundle and changes in dysphagia severity and risk of stroke-related pneumonia, malnutrition risk and length of ICU stay among critically ill stroke patients. Quasi-experimental design serves as a valuable methodology in scenarios when real experiments are infeasible due to ethical or practical constraints. **(Chow; 2024).**

Settings*:*

The study was conducted at **Neurological Intensive Care Unit** at **Tanta Main University** Hospital affiliated to Ministry of **Higher Education and Scientific Research**. It is prepared with 3 wards equipped with 20 beds.

Subjects:

A purposive sample **of 60 adults** newly admitted critically ill patients with acute stroke were included in the study based on the **power analysis using the G*Power software** (ver. **3.1.9.7**) according to the following parameter: G Power = **80%**, effect size =**0.4**, confidence coefficient **95%**, expected frequency **50%**.

Inclusion criteria:

- Patients admitted to the critical care unit **within the first 24 hours** of stroke symptom onset.

-Patients who had **Stroke severity scores** mild to moderately severe based on National Institute of Health Stroke Scale **(NIHSS)** Grade **(5 ➔14).**

- Patients with **moderate** or **severe dysphagia** according to **Gugging Swallowing Screen (GUSS) score (0-14)**.
- **Both sex** patients aged between **21 and 60** years.

Exclusion criteria

- Patients who had other diseases or condition that cause dysphagia problem as **Achalasia, Esophageal spasm, esophageal tumors Neurological disorders** as multiple sclerosis and Parkinson's disease, **Cancer** and cancer treatments
- Patients who had **severe cognitive function** based on The Short Portable Mental Status Questionnaire **(SPMSQ).**

Technique for Selecting the Sample:

A total of 60, adult stroke patients admitted to the ICU were recruited and assigned into two groups**:**

Study group: (n=30): Receive dysphagia care bundle

Control group: (n=30): Receive routine hospital care for dysphagia

Patient Eligibility Screening: Reviewing admission records to identify patients meeting the inclusion criteria.

Ensuring Equal Distribution: Stratification was performed based on **age**, **Stroke severity scores (NIHSS) and dysphagia severity Gugging Swallowing Screen (GUSS)** to ensure balanced representation between groups

Data Collection Tools

Six instruments were employed to gather the requisite data, which comprises this tools:

Tool (I): Demographic & Clinical Data: used for the collection of data on age, gender, education, duration of ICU stay, admission medical diagnosis (kind of

stroke), stroke location, and patient medical history. The investigator extracted data from the patient's medical records at the initial data collection point.

Tool (II): "Early dysphagia assessment tool" Gugging Swallowing Screen (GUSS). This instrument was created by **Trapl et al. (2007)**. The researcher adopted and utilized it to evaluate the degree of dysphagia. It consists of two assessments:

- **The indirect swallowing test assessed** the capacity to sustain attentiveness for 15 minutes, elicit an intentional cough, and effectively ingest saliva with no alterations in voice or drooling. The scoring system for each subgroup comprises pathological items (0 points) and physiologic items (1 point). A score of 5 is required to go to the subsequent exam.

-The direct swallowing screening exam, referred to as exam Two, was employed to assess swallowing ability. It has three subtests: a semisolid test, a liquid test, and a solid test, administered sequentially. , **the following was evaluated in each subgroup:**

- **Deglutition was evaluated using a number scale**: "0" for inability to swallow, "1" for delayed swallowing, and "2" for effective swallowing.

- Involuntary coughing, drooling, and **voice alteration during swallowing** were assessed using a binary scale of (Yes "0" and No "1").

- Each subgroup of this exam is scored with a maximum of 5 points, resulting in **a total score of 15** points for the entire test. This **Swallowing Screen** using GUSS is involved the sum scoring of the two **swallowing test**s and so it ranges **from 0 to 20**.It categorizes dysphagia severity; a score of 20 signifies no dysphagia, 15-19 denotes mild dysphagia with no aspiration, 10-14 indicates moderate dysphagia with aspiration risk, and 0-9 represents severe dysphagia with a high aspiration risk. The Gugging Swallowing Screen (GUSS) demonstrated great validity and reliability, with a sensitivity of 95.5%, specificity of 94.4%, and a Cronbach's alpha of 0.968 **(Umay et al., 2019).**

Tool (III): Functional Oral Intake Scale (FOIS): this instrument was created by **Crary et al. (2005)** and adopted to assess feeding capability and various conditions of NG feeding. It comprised a 7-point scale, Levels 1-3 indicated tube reliance, whilst levels 4-7 denoted entire oral consumption with varying consistencies of supplements. The Functional Oral Intake Scale (FOIS) demonstrated great validity and reliability, with interrater reliability exhibiting perfect agreement in 85% of assessments. Kappa statistics varied from .86 and .91. The consensual validity was elevated at .90. Criterion validity was elevated at the start and one month following the stroke **(Crary et al, 2005).**

Tool (IV): Stroke-associated Pneumonia Score (SAPS) was established by **Hoffmann et al. (2012)** and adopted to assess stroke-associated pneumonia. A 10-point scoring system for predicting post-stroke pneumonia by using the (A2DS2) scores (age, atrial fibrillation [AF], dysphagia, sex and stroke severity using the modified National Institutes of Health Stroke Scale (mNIHSS) score. Age > 75 years and atrial fibrillation assigned one point 1, Dysphagia take two points, Assigning one to male sex, **Stroke severity scores categorized** as follows: **NIHSS 0-4** equals 0, **5-15** equals 3, and scores of **16** or more equal 5. Through summing the above items a score ranging from ***5 to 10*** signifies ***a high risk for SAP***, while ***the low risk for SAP*** correlates with the score between ***0 and 4***. The tool's validity has shown superior discrimination (C-statistic 0.84; 95% CI, 0.83→0.85) and calibration (McFadden R2 = 0.21).

Tool (V): Bedside Oral Exam (BOE) and the Barrow Oral Care Protocol (BOCP) were developed by **Prendergast, Kleiman, and King (2013)** and adopted to evaluate eight items within the oral cavity: **swallowing, lips, tongue, saliva, mucous membrane, gingiva, teeth or dentures, and mouth odor**. **Each item is assigned** a **score** ranging from **1 to 3**. **The total BOE** score is calculated by aggregating the points of every component. **The total score** varied from **8** (excellent quality) **to 24** (poor quality). A score ranging from **8 to 10** signifies a **typical state of dental health**. A score of **11-14** indicates a **moderate risk** to oral health condition.

Individuals had **15-24** exhibits a significant **decline in oral health condition**.

According to the ratings obtained by the patient from BOE, BOCP recommends three categories of oral care alternatives. The frequency and quantity of oral care augment **as the overall score derived from the BOE enhances oral health status.**

Conforming to the BOCP, patients exhibiting optimum oral health **(scoring 8-10)** were provided with **fundamental oral care**, which included teeth brushing and oral mucosal care. Also, patients exhibiting **mild oral** health dysfunction **(scoring 11-14)**, receive **standard oral care plus mucosal care** every four hours. Patients with an oral health score between **15 and 24** got further **Chlorhexidine (CHG) swabbing therapies** one hour post tooth brushing. The tool exhibited Inter-rater reliability 0.89.

Tool (VI): Modified Nutrition Risk Assessment in Critically Ill (NUTRIC): created by **Heyland et al. (2011)**. This was the earliest dietary risk assessment instrument designed particularly for the ICU population, capable of identifying individuals susceptible to malnutrition. Subsequently revised and modified by **Rahman et al. (2016),** through the elimination of IL-6 levels, when unavailable, for evaluating nutritional risk upon admission. **The Modified NUTRIC adopted to** assess malnutrition risk in patients considering these factors:

age, number of comorbidities, duration from hospitalization to intensive care unit admission , Acute Physiology and Chronic Health Evaluation II (APACHE II) and Sequential Organ Failure Assessment (SOFA) scores upon admission. The revised NUTRIC score spans from zero to nine. Patient had the ***total score of ≥5***, indicating an elevated risk of malnutrition. A low ***mNUTRIC score of 0-4*** is related with a decreased risk of malnutrition. **Rahman et al. (2016)**. The tool's validity showed sensitivity over **80%**. The interrater reliability identified to be considerable, with **k = 0.68** and k = **0.74 (Mirmiran et al., 2011).**

Method

1. **Official Approval** was obtained from the responsible authorities at the Faculty of Nursing, Tanta University to the director of the Neurological Intensive Care Unit at Tanta main University Hospital.

2. Ethical considerations:

- Approval was obtained from Scientific Research Ethics Committee with code number (563-12-2024) the Faculty of Nursing, ensuring compliance with ethical standards for patient autonomy and protection.
- Consent will be obtained from the patient following an explanation of the study's purpose, including the right to withdraw from participation at any time.
- The preservation of privacy and anonymity was guaranteed through the use of code numbers rather than their names. The patient privacy was prioritized during data collection.

3. The study tool (I) created by the researcher following investigation of the pertinent literatures. Tool (II) developed by **(Trapl et al., 2007).** Tool (III) developed by **(Crary, Carnaby, & Groher, 2005)**. Tool (IV) developed by **(Hoffmann et al., 2012),** tool (V) developed by **(Prendergast, Kleiman, King, 2013)** and tool (VI) developed by **(Heyland et al., 2011)and all adopted by researcher.**

4. Validity of the tools will be established through evaluation by seven specialists in the area of Critical Care and Emergency Nursing, neurologist and medical biostatistics.

5. The tools were pilot tested on 10% of patients to assess the feasibility, clarity, and applicability of the study instruments. Minor modifications were required following the pilot study

6. Reliability was measured with the usage of Cronbach's alpha on the research instruments yielding the following results; Tool I: **0.896**, Tool II: 0.968 and Tool III: **0.86** Tool IV: **0.84** Tool V: **0.89** Tool VI: **0.74** .These values indicate high reliability, affirming that the instruments provided **accurate** and **constant** measurements.

7. Data was gathered over the course of **six** months, beginning in **March 2024** and ending in **August 2024**

8. **Data Collection Procedure Construction of Dysphagia care bundle:**

- The Dysphagia care bundle was developed using evidence-based care framework to assist stroke patients who suffer from difficulty swallowing. It consists of **five steps**: **defining** the issue, **gathering** and **analyzing** relevant literature, **developing** and **testing** potential treatments, and **assessing** the outcomes. **(Brown et al., 2020; Vere & Gibson, 2019).** Systematic retrieval of pertinent literature on

stroke patients with dysphagia encompassed medium- or high-quality data. Subsequently, a treatment bundle for these patients was systematically designed in accordance with hospital policies.

-The researcher **retrieved the demographic** data from the participants' medical records and evaluated all participants to determine the date of ICU admission, the medical diagnosis upon admission, kind and site of stroke. Also the researcher evaluated stroke severity utilizing the Modified National Institute of Health Stroke Scale **(NIHSS)** and the patient's nutritional state at the **commencement of data collection as a baseline data.**

- **The Modified National Institutes of Health Stroke Scale (mNIHSS), developed by Lyden et al. (2001),** which assesses **stroke severity** through the examination of **consciousness**, eye movements, visual fields, motor and sensory deficits, ataxia, speech, cognition, and inattention. The NIHSS consists **of 11 items**, each evaluating a distinct skill on a scale **from 0 to 4**. **A score of zero (0)** generally signifies normal function in that particular skill, whereas a higher number denotes varying degrees of impairment. **A score over 25** indicates a very serious stroke. **A score of 15-24** indicates a severe stroke, whereas **a score of 5-14** signifies a mild to moderately severe stroke. The tool's validity showed a sensitivity of 95% for both sexes. The interrater reliability of the screening instrument was deemed substantial, with a k value of 0.62. **(Lyden et al., 2001)**

- **Investigators evaluated the cognitive performance** of individuals using The Short Portable Mental Status Questionnaire **(SPMSQ)** to ***eliminate those with significant cognitive impairment***. It is a concise instrument intended to assess cognitive deficit. The Cronbach's alpha coefficient for the SPMSQ was 0.88. The instrument exhibited a sensitivity of 86.4% and a specificity of 88.2%. The **assessment consists of 10 items** evaluating many facets of cognitive functioning, **including long-term and short-term memory, environmental orientation, knowledge of current events, and the ability to execute sequential mathematical operations.**

-**Patients are needed to answer eight questions** accurately to achieve a normal score**.** A patient exhibiting **0-2 mistakes** is classified as having normal mental functioning; **3-4 errors** indicate mild cognitive impairment; **5-7 errors** signify moderate cognitive impairment; and **8 or more errors** are categorized as severe cognitive impairment**. (Kojaie et al., 2020) .**

- The researcher used Tool **I, II, III, IV** and **VI** prior to intervention as baseline data.

-**The researcher subsequently divided the patients into two equal cohorts**:

- **Control group** received standard hospital care including nasogastric tube feeding, dietary replacement, and routine oral care for dysphagia
- **Study group** received a dysphagia care bundle comprising ***dysphagia screening, feeding strategies, oral care, implementation of Shaker exercises, and neuromuscular electrical stimulation*** over **a duration of four weeks.**

-**Feeding techniques were implemented according** to the degree of dysphagia, as per the dietary guidelines of the GUSS employing tool II. Patients with moderate dysphagia received nutrition via nasogastric tube and were provided with supplements in the form of pureed food. Patients with severe dysphagia were NPO, and supplementation was administered via nasogastric tube.

-The researcher utilized **tool V** twice -daily.

- **The researcher also applied shaker exercises**; The Shaker method called the Head Lift. It is a therapeutic technique used to improve the coordination and strength of the muscles included in swallowing. Generally, the patients with swallowing difficulties have less hyolaryngeal movement. As a result, the patient is in danger of aspirating debris into the pyriform sinuses.
- **The exercise was done** as outlined in the research by the following technique; **the patient must lie flat** and raise their head to stare at their toes while keeping their shoulders on the bed or mat. They must then perform the **shaker exercises** while swallowing. The patients hold this position for the desired 60 seconds then repute **it twice**. **The second exercise** involves doing **a repeating motion**. The patient elevates **their head to look at their chin, lowers it back to the starting position**, and then does this exercise **Three sets** of **thirty times**.
- The researcher employed **neuromuscular electrical stimulation (NM-ES)** with the Vital Stim Therapy System for the stimulation of nerves and muscles in the treatment of patients. The stimulation intensity was calibrated based on the **patient's dysphagia severity** (0-10 mA), maintaining a consistent pulse rate of 80 Hz. Two output electrodes were positioned in distinct anatomical locations. Specifically on the anterior neck swallowing muscles (omohyoid, sternohyoid, sternothyroid, and thyroid muscles), where minimal electrical currents are administered to

stimulate the muscles involved in swallowing. Simultaneously, the patient was instructed to eat or swallow during stimulation. The stimulation was conducted for **30 minutes** daily, **five days a week.**

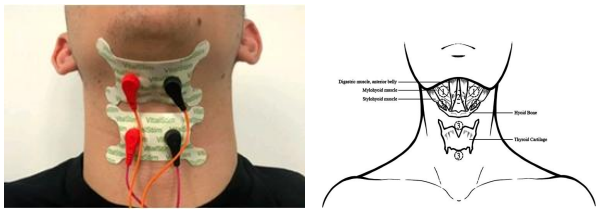

Illustration of electrode placements; Costa et al. 2020 and Zhang et al. 2016

- **Finally, the researcher evaluated both groups** by using (**Tool II, III, IV and VI**) Also monitoring for any adverse events such as aspiration and length of ICU stay **post four weeks of intervention.**

Statistical Analysis

The data was coded and organized into a specific format to facilitate the computer data entry process. Statistical analysis was done using (SPSS) version 20 .The findings were gathered, arranged, and analyzed statistically using two categories of statistics:

Descriptive Statistics:

- Frequency (%): number and percentage distribution of Sociodemographic characteristics of the participants.
- The arithmetic mean (X) was utilized for the purpose of describing the mean or central tendency of the data.
- The dispersion of the result around the mean was measured by using the Standard Deviation (SD).
  Statistics for Analysis.
- The mean and standard deviation of quantitative variables were measured using a student t-test.
- Chi square test was done for qualitative variables to compare results across categories.
- The significance threshold was established at the 5% level for all statistical tests, with p-values set at <0.05 (**Tabachnick & Fidell , 2021)**.
- **Level of significance**

A p value <0.05 ^{S} was consider significant, <0.001 ^{HS} was considered highly significant, and >0.05 ^{ns} was consider not significant.

Results :

Table (1): delineated the demographic characteristics of the sample with acute stroke. The mean age of the study group was 54.50±5.97, while the control group had a mean age of 52.00±5.15. In terms of gender, over half of the patients in the study group were female (53.3%), whereas the control group comprised 60.0% male. Concerning educational background, more than half of the sample was uneducated in both groups (63.3% in the study group and 58.4% in the control group). No statistically significant differences were observed between the two groups regarding age, gender, and education, indicating a homogenous sample. However, there was a highly statistically significant difference in ICU length of stay (P<0.001), with the study group experiencing a mean ICU stay of 6.90±0.758 days, which was significantly shorter by nearly four days compared to the control group's mean of 10.80±1.47 days.

Table (2): showed the distribution of acute stroke patients' in the study medical history and revealed that the most of the groups which were investigated had Ischemic Stroke (73.3%, 56.7%) in the Right hemisphere (86.7%, 70%). Regarding past medical history, 36.0% of patients in the study group& 39.3% in the control group had Cardiac disease. In addition, when comparing the two groups based on diagnosis, stroke site, and previous medical history, no statistically significant differences were found. groups based on

Table (3): show distribution of the study groups with acute stroke concerning Dysphagia Severity .A highly significant improvement was observed in the levels of dysphagia among patients in the study group after implementing dysphagia care bundle as compared to the control group that received usual care (P<0.001).

Table (4) Revealed that the study group's mean score of Functional Oral Intake showed a highly statistically significant improvement after four weeks intervention compared to the control group where it was (6.00±0.78, 2.80±1.47) respectively

(P<0.001).This mean that the study group turned from tube dependence pre intervention into total oral intake with different consistency of supplements post intervention. While the control group remained tube dependent post intervention.

Table (5): showed Percent distribution of the studied groups with acute stroke considering risk of stroke associated pneumonia (SAP). It was observed that most of participants (90.0%) comprising the study group exhibited low SAP risk post-intervention as compared to the control group (10.0%). Also the mean score of SAP was 3.50±1.07 in the study group indicated that they were less likely to have pneumonia compared to 6.83±1.76 in the control group post intervention. Also, there was a highly statistically noticeable difference between the two groups regarding the risk of stroke-associated pneumonia (P <0.001).

Table (6) illusterated the Percent distribution of the studied groups with acute stroke according to Modified Nutric Risk Assessment Score and showed that the majority of participants (83.3%) in the study group had low malnutrition risk post-intervention in comparison with the control group (20%). Also, there was a highly statistically significant difference between the two groups regarding the Modified nutric risk assessment score

(P<0.001).

Table (7) Percent distribution of the studied groups with acute stroke in relation to Oral Health Status and showed that nearly half of the participants (43.3%) in the study group had normal oral health status post four weeks of intervention in comparison with the control group (6.7%) who had the routine hospital intervention. Also, there was a highly statistically significant difference between the two groups regarding oral health status (P<0.001).

Table (1): Demographic distribution and ICU length of stay for the studied groups with acute stroke (n=60)

demographic Characteristics	*Study Group (n=30)*		*Control Group(n=30)*		P- Value
	No	%	No	%	
Age X ± SD	54.50±5.97		52.00 ±5.15		**t=1.73 P >0.05 ns**
Gender					
Male	14	46.7%	18	60.0%	**X^2=1.07 P >0.05 ns**
Female	16	53.3%	12	40.0%	
Education					
Educated	11	36.7%	10	41.6%	**X^2=.73 P >0.05 ns**
Non Educated	19	63.3%	14	58.4%	
ICU Length of stay by day X ± SD	6.90±.758		10.80±1.47		**t=12.90 P< 0.001 Hs**

ns= no significance Hs= Highly significanc

Table (2): Acute stroke patients' distribution in the study groups based on medical history. (n=60)

Medical history	*Study group (n=30)*		*Control group (n=30)*		P value
	No.	%	No.	%	
Diagnosis					
▪ Ischemic Stroke	22	73.3%	17	56.7%	**X^2=1.83 P >0.05^{ns}**
▪ Hemorrhagic Stroke	8	26.7%	13	43.3%	
Site of Stroke					
▪ Right hemisphere	26	86.7%	21	70%	**X^2=2.45 P >0.05^{ns}**
▪ Left hemisphere	4	13.3%	9	30%	
Past medical history					
Yes	25	83.4%	28	93.4%	**X^2=1.54 P >0.05^{ns}**
No	5	16.6%	2	6.6%	
Type of past medical history					
▪ No	5	6.7%	2	8.3%	
▪ Diabetes Mellitus (DM),Hypertension (HTN)	7	28.0%	6	21.4%	**X^2=1.96 P >0.05^{ns}**
▪ Cardiac disease	9	36.0%	11	39.3%	
▪ Renal disease	2	8.0%	2	7.1%	
▪ Liver disease	3	12.0%	3	10.7%	
▪ Chest disease	4	16.0%	6	21.5%	

ns= no significance Hs= Highly significance

Table (3): Distribution of the study groups with acute stroke concerning Dysphagia Severity (n=60).

Dysphagia Severity	Pre Intervention		Post four weeks Intervention		Paired t- test	P →value
	No	%	No	%		
Study Group						
	0	0.0%	5	16.7%		
(No Dysphagia)	0	0.0%	20	66.7%		
(Slight Dysphagia)	13	43.3%	5	16.7%		
(Moderate Dysphagia)	17	56.7%	0	0.0%		
(Sever Dysphagia)						
Mean ± SD					**t=12.361**	**P<0.001^{Hs}**
	9.86±2.79		16.70±2.69			
Control Group						
(No Dysphagia)	0	0.0%	0	0.0%		
(Slight Dysphagia)	0	0.0%	2	6.7%		
(Moderate Dysphagia)	16	53.3%	6	20.0%		
(Sever Dysphagia)	14	46.7%	22	73.3%		
X ± SD	9.70±2.52		9.66±2.07		**t=.054**	**P>0.05^{ns}**
Independent t- test	**.234**		**11.33**			
P →value	**P>0.05^{ns}**		**P<0.001^{Hs}**			

ns= no significance Hs= Highly significance

Table (4): Mean Functional Oral Intake score of the observed groups with acute stroke (n=60).

Functional Oral Intake	Pre Intervention	Post four weeks Intervention	Paired t-test	P-value
Study Group X ± SD	3.13±1.30	6.00±0.78	**t=19.164**	**P<0.001^{Hs}**
Control Group X ± SD	3.83±1.98	2.80±1.47	**t=5.154**	**P<.001^{Hs}**
Independent t-test **P-value**	**t=1.61** **P>0.05^{ns}**	**t=10.50** **P<.001^{Hs}**		

ns= no significance Hs= Highly significance

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Table (5): Percent distribution of the studied groups with acute stroke considering risk of stroke associated pneumonia (SAP) (n=60).

Stroke associated Pneumonia(SAP)	Pre Intervention		Post four weeks Intervention		Paired t-test	P-value
	No	%	No	%		
Study Group						
(low risk for SAP)	4	13.3%	27	90.0%		
(high risk for SAP)	26	86.7%	3	10.0%	**t=11.35**	**P<.001^{Hs}**
X ± SD	7.16±1.83		3.50±1.07			
Control Group						
(low risk for SAP)	5	16.7%	3	10.0%		
(high risk for SAP)	25	83.3%	27	90.0%		
X ± SD	7.6±2.05		6.83±1.76		**t=.465**	**P>0.05^{ns}**
Independent t-test P-value	**.927 P>0.05^{ns}**		**5.083 P<.001^{Hs}**			

ns= no significance Hs= Highly significance

Table 6: Percent distribution of the studied groups with acute stroke according to Modified Nutric Risk Assessment Score (n=60).

Modified Nutric risk assessment score	Pre Intervention		Post four weeks Intervention		Paired t- test	P value
	No	%	No	%		
Study Group (low malnutrition risk) (high malnutrition risk)	7 23	23.3% 76.7%	25 5	83.3% 16.7%	**t=5.152**	**P<.001^{Hs}**
X ± SD	6.03±2.02		3.56±2.17			
Control Group (low malnutrition risk) (high malnutrition risk)	4 26	13.3% 86.7%	6 24	20% 80%		
X ± SD	6.76±1.54		6.00±1.46		**t=5.152**	**P<.001^{Hs}**
Independent t- test **P value**	**1.57** **P>0.05^{ns}**		**5.08** **P<.001^{Hs}**			

ns= no significance Hs= Highly significance

Table (7): Percent distribution of the studied groups with acute stroke in relation to Oral Health Status (n=60).

Oral Health Status	Pre Intervention		Post four weeks Intervention		Paired t-test	P-value
	No	%	No	%		
Study Group						
Normal	0	0.0%	13	43.3%		
moderate	14	46.7%	17	56.7%		
severe	16	53.3%	0	0.0%	**t=9.314**	**P<.001^{Hs}**
X ± SD	17.20±4.61		10.93±2.03			
Control Group						
Normal	0	0.0%	2	6.7%		
moderate	16	53.3%	14	46.7%		
severe	14	46.7%	10	33.3%	**t=1.408**	**P>0.05^{ns}**
X ± SD	16.10±4.05		14.63±3.45			
Independent t-test	**.980**		**5.051**			
P-value	**P>0.05^{ns}**		**P<.001^{Hs}**			

ns= no significance Hs= Highly significance

Discussion

Dysphagia frequently occurs after a stroke, impacting 55% of acute stroke patients, and results in consequences like aspiration pneumonia, malnutrition, and elevated death rates. A new initiative has aimed to enhance the early detection of dysphagia by screening, seen as a crucial first measure to facilitate appropriate care and enhance recovery **(Sherman et al., 2021).**

Regarding demographic characteristics, no statistically significant variation in demographic features was noticed between the two groups. This may be ascribed to the homogeneity of traits in the selection of the two groups.

Addressing demographic Characteristics, The current study's findings indicated that the **mean age of** patients in the study and control groups was 54.50±5.97 and 52.00±5.15, respectively, which may be attributed to the significant rise in stroke event rates among older age demographics. This finding was corroborated by **Murphy et al. (2020)** who indicated that older adults face a higher risk of stroke compared to younger adults, noting that age is a significant contributor to stroke risk, with incidence doubling for each decade after the age of 55 years. This aligns with **Yousef, El-Deeb, & Rady (2020),** who said that over fifty percent of both groups were aged over 50 years. This may be connected to the increased prevalence of stroke with advancing age.

Furthermore, over fifty percent of the patients in the study group **were female**, whereas two-thirds of the control groups were male. This aligns with the findings of **Kharbach et al. (2020),** which indicated that the bulk of the study sample consisted of females, suggesting that the female gender may be at a greater risk for strokes than males. Furthermore, these findings were corroborated by **Dongol et al. (2021),** who demonstrated that over fifty percent of the examined patients were female.

Conversely, **Battaglini et al. and Charles et al. (2023)** contested these findings, indicating that over half of the subjects in the study group and over half of the patients in the control group were male, with no significant differences in socio-demographic characteristics between the two groups. Consistent with **Abo Elfetoh and Karaly (2018)**, who said that the majority of participants were male.

These findings align with those of **Magdy et al. (2021),** who indicated no significant differences between the examined patients in terms of age or gender. Nonetheless, these results contradict those of **Gamal et al. (2020)**, who indicated that the majority of the participants were male. The risk doubles for both genders beyond the age of 50 due to atherosclerotic changes in the brain associated with aging.

The current investigation indicated a very statistically significant difference between the two groups **considering duration of ICU stay per day**. The findings align with **Labeit et al. (2023) that** revealed the average ICU stay was extended by 4.7 days for patients with post-stroke dysphagia.

Taking into account Diagnosis and Site of Stroke, The current investigation shown that most patients in both the study and control groups experienced **Ischemic Stroke** in **the Right hemisphere** the findings align with those of **Gamal et al. (2020)** and **Magdy et al. (2021),** who concluded that most patients experienced ischemic stroke. Also this consistent with **Kim et al. (2020),** who identified cerebral infarction as the primary etiology of stroke. Similarly, **Jongprasitkul and Kitisomprayoonkul (2020)** discovered that over fifty percent exhibited right hemisphere involvement. It correlates with the literature, since ischemic stroke is more prevalent than the hemorrhagic form **(Cho et al., 2021)**. This data aligns with the study was done by **Abdu et al. (2021)** who indicated that 65.4% of patients were admitted to ICU due to ischemic stroke.

Regarding past medical history, the current investigation indicated that most individuals in both groups had a history of cardiac illness. Perhaps this is associated with the reality that a significant majority of studied patients were older. Numerous studies have demonstrated the correlation between acute stroke and cardiovascular diseases, as reported by the **American Heart Association and American Stroke Association (AHA/ASA)** in their publication titled ↑2024 Guideline for the Primary Prevention of Stroke.↓ It showed that conditions such as atrial fibrillation (AF), coronary artery disease (CAD), heart failure (HF), and valvular abnormalities were frequently noted in the medical histories of acute stroke patients. This **highlights** that comprehensive management of cardiovascular disease and its risk factors can markedly diminish the incidence of stroke. Furthermore, the research conducted by **Kamel and Healey (2021)** demonstrated the contribution of heart

failure and valvular heart diseases to the heightened threats of cardioembolic stroke.

The impact of the dysphagia care bundle on the severity of dysphagia

The results from the current research pointed to an extremely notable enhancement in dysphagia severity and patients' ability to swallow after receiving intervention as opposed to those in the control group. The findings correspond with **Yan et al. (2021) and Abdelbaky et al. (2023),** who investigated the impact of shaker exercises, dietary modifications, and concomitant depression alleviation as a dysphagia care bundle, reporting significant enhancement in post-intervention scores within the bundle group. Nonetheless, these results are refuted by **Teuschl et al. (2018) and Magdy et al. (2021),** who determined that **there was no significant disparity** in the degree of dysphagia in the two groups that were examined.

The impact of the dysphagia care bundle on functional oral intake

Concerning Oral Intake, The results of the present research demonstrated a robust statistical significant enhancement in the mean score of Functional Oral Intake between the two groups post intervention; this improvement are likely to result from the implementation of shaker exercises and neuromuscular electrical stimulation. The findings in the same line with **Gamal et al. (2020),** who revealed that patient with a mild degree of dysphagia had improved functional oral intake after the exercises. These results were compatible with **Chen et al. (2020),** who stated that modifications in feeding, including dietary texture and adjustments liquid viscosity, significantly alleviated dysphagia symptoms.

The impact of the dysphagia care bundle on pneumonia associated with stroke

The current study demonstrated that over three-quarters of participants in the intervention group exhibited low **stroke associated pneumonia (**SAP) risk post four weeks intervention and were less likely to develop pneumonia compared to the **majority in the control group**, who were at a higher risk for pneumonia.These results are in line with those of **Magdy et al. (2021),** who found that the research group's SAP rates dropped significantly once the intervention was implemented. Identical outcomes were also showed in a study by **Chang et al. (2022)** that examined the correlation between dysphagia and pneumonia in individuals who had recently acute stroke. These results, however, contradict those of **Teuschl et al. (2018),** who found no statistically significant reduction in SAP rates among patients who followed the GUSS diet.

The impact of dysphagia care bundle on malnourished patients

concerning malnutrition, the current investigation demonstrated that the almost of participant in study group had low malnutrition risk post intervention in comparison with control group. Also there was extremely statistically significant difference between the two groups regarding **Modified nutric risk assessment score** .These findings are in accordance with **Yoon et al.,(2023)** who explored the link between malnutrition and related variables in stroke patients with dysphagia and observed that dysphagic stroke patients exhibited higher malnutrition risk. Also similar findings reported by **Huppertz et al., (2022)** who identified considerable malnutrition risk among these patients.

The effect of dysphagia care bundle on oral health

The current findings demonstrated that almost half of the participants in the study group had normal oral health status post-intervention in contrast with the control group .Also, there was a very statistically significant difference between the two groups for oral health condition. These findings are congruent with **Sakai et al.,(2024)** who revealed that the individuals with dysphagia received oral treatment had improved oral health status. Similar findings were observed by **Tian et al., (2023)** who evaluated the differences in the oral health status in hospitalized stroke patients according to swallowing function.

Conclusion:

Dysphagia care bundle can significantly mitigate **dysphagia severity** and relieve **swallowing difficulties**, improve **oral health condition** therefore promote **functional oral intake**, **lower the risk of Stroke-associated pneumonia** & **malnutrition** and **shortening** the **length of ICU** stay for critically ill stroke patients

Recommendations:

The study's findings prompt the following recommendations:

- Establishing dysphagia bundle into the treatment regimen for critically ill stroke patients
- Repetition of the current research with a larger probability sample

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