Original Article

Effect of Swallowing Exercises on Improving Dysphagia among Stroke Patients in Neurocritical Care Unit

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1.ABSTRACT

Background: Patients with stroke frequently experience dysphagia. One of the stroke sequel that poses the greates one's life is post-stroke dysphagia, which can result in negative outcomes like pneumonia, starvation, dehydration, and eve Guidelines for treatment of post stroke dysphagia include a variety of physical therapy and precautions to prevent comp related to dysphagia. Swallowing exercises for post-stroke dysphagic patients appear to be a secure and efficient treatment have a substantial influence on patients' clinical outcomes. **Aim**: the aim of this study is to investigate the effect of swa exercises on improving dysphagia among stroke patients in neurocritical care unit. **Method**: the study has a quasi-expe research design with a convenience sample of 76 adult critically ill patients who admitted to neurocritical care unit o General Mansoura Hospital in Egypt. Data were collected using patient's dysphagia assessment tool and 30ml water, swa test tool. **Results**: there was a statistically significant increase in the average total score of dysphagia screening questionna swallowing training in comparison to its value before training program (P<0.001). **Conclusion and recommendation**: swa exercises is an effective method for improving post stroke dysphagia, therefore this intervention should be include routinaly nursing care for post stroke patient. Further large scale studies are required to strengthen the evidence to use this in dysphagia rehabilitation.

Keywords: *Swallowing exercises, Dysphagia, Stroke, Neurocritical care unit*

2.Introduction

A significant and growing public health concern is the burden of stroke. The second-leading cause of death and disability (143 million) worldwide in 2019 was stroke. Global stroke incidence increased by 70% during the previous three decades, prevalence climbed by 85%, death increased by 43%, and disability-adjusted life years (DALYs) increased by 32%, with LMICs experiencing a larger increase in stroke burden than high-income nations (HICs**) Owolabi, Mayowa O., et al 2022**. 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, Hany, et al 2021**. Hemiparesis, loss of dexterity, functional restrictions, gait abnormalities, cognitive impairment, dysarthria, stiffness, neglect, and dysphagia are just a few of the clinical problems that patients with stroke experience. A symptom called dysphagia is defined as a problem moving food or fluids from the mouth via the pharynx, oesophagus, and stomach **Chang, Min Cheol, et al 2022**.

The complicated sensorimotor process of swallowing requires the synchronization of several muscle groups in order to move a bolus of food or liquid from the mouth to the stomach while guarding the airway and leaving the past amount of residue. As a result, stroke-related lesions may cause dysphagia or trouble swallowing **Jones, Corinne A., Christina M. Colletti, and Ming-Chieh Ding 2020**. **Dziewas, Rainer, et al 2021** reported that more than 50% of acute stroke patients have post-stroke dysphagia (PSD), which raises the risk of complications, including aspiration pneumonia, malnutrition, and dehydration, and is associated with a poor prognosis and mortality. One of the main causes of disability and death worldwide is stroke.

Stroke-associated pneumonia is one of the most prevalent post-stroke illnesses. It has an impact on clinical outcomes and is linked to a higher risk of a lengthy hospital stay and a poor recovery **Eltringham, Sabrina A., et al 2020**. Pneumonia is the primary cause of death during the initial period of stroke. One of the most important risk factors for the development of pneumonia is dysphagia **Ge, Yanqiu, et al 2019**. Aspiration pneumonia is defined as pneumonia accompanied by known or suspected aspiration and preexisting risk factors. Choking, coughing, or a moist voice during or after eating are just a few of the clinical symptoms connected to oropharyngeal aspiration. It may also happen without coughing or other airway protective reactions, which makes diagnosis more challenging **Chang, Min Cheol, et al 2022**.

Early detection, screening and prompt treatment of post-stroke dysphagia could be viewed as a crucial component of acute stroke management because it lowers the risk of aspiration pneumonia after stroke and improves the outcome of the stroke **Khedr, Eman M., et al 2021**. Swallowing functions screening is a process aims to find any clinical indicator of a possible risk for neurological deglutition dysfunction or aspiration. The evaluation of swallowing typically entails observation of various food textures and consistencies as well as a full description of the clinical function of the various phases of component swallowing along with a determination of the degree of malfunction **Jiang, Jiin-Ling, et al 2016**. Pneumonia risk has been decreased through the use of screening for irregular swallowing as the first step in an effective therapeutic approach **Ge, Yanqiu, et al 2019**. Different tests are used by medical practitioners to screen patients for dysphagia. The 3-oz water swallow test (WST), Burke Dysphagia Screening Test, Smithard's Bedside Swallowing Assessment, Kwashima's Dysphagia Screening Questionnaire, and Gugging Swallowing Screen are a few examples of established clinical exams. Medical professionals, skilled nurses, and speech-language therapists provide these screening exams **Uhm, Kyeong Eun, et al 2019.**

Whatever the form of dysphagia, some prerequisites must be met before a patient with a swallowing impairment can begin rehabilitation. The patient's posture, the level of alertness and The respiratory condition, once the fulfilment of these principles, the following principles are used to treat dysphagia: Alterations that might be made to the environment, the food, or the patient's position while eating and Particular rehabilitative activities that focus on strengthening the swallowing muscles and ensuring that propulsive and defensive systems are in place while swallowing **François, S., et al 2019**.

An effective and personalized rehabilitation program is subsequently created using the data acquired from these tests. Both compensatory and therapeutic treatments are used in dysphagia rehabilitation. While rehabilitative treatments are intended to enhance swallowing physiology, improve swallow safety, and increase tolerance of the least restrictive diet, compensatory measures are utilized to lessen symptoms of dysphagia without changing the physiology **González-Fernández, Marlís, et al 2013**.

Swallowing exercises aims to restore and enhance the motor function of swallowing weak muscles as well as enable muscle contraction in order to prevent muscle atrophy. Over three decades have passed since the introduction of exercise-based treatments for dysphagia **Dziewas, Rainer, et al 2021**. The main objective of these treatments is to improve the deglutition and airway protection-related muscle groups' strength and endurance. The oral musculature (maximum isometric pressure of tongue, lips, and jaw), pharyngeal constrictors (efortful swallow, Masako), hyolaryngeal complex (Mendelsohn, Shaker Head Lift), and respiratory muscle complex are among the specific muscles or groups of muscles targeted by these exercise techniques (inspiratory and expiratory muscle strength training) **Krekeler, Brittany N., Linda M. Rowe, and Nadine P. Connor 2021**.

2.1 Aim of the study

The aim of this study is to investigate the effect of swallowing exercises on improving dysphagia among stroke patients in neurocritical care unit.

2.2 Research hypothesis

To fulfill the aim of this study, the following research hypothesis is formulated:

H1: patients who receive dysphagia swallowing exercises will have improved or reduced post stroke dysphagia level compared to patients who don't receive this intervention.

3. Method

3.1 Design

A quasi-experimental research design will be used to investigate the effect of the swallowing exercises on improving the post stroke dysphagia. This study used to estimate the effect of an

intervention on its target population without randomization (Rockers et al., 2017).

3.2 Setting

This study will be conducted in the NCU of a New General Mansoura Hospital (NGMH). It receives patients admitted with neurological disorders. It consists of eight beds. This unit is well equipped with advanced technology needed for caring of stroke patients. The nurse patient ratio in this unit is 1:2 in the morning shift and 1:3 in other shifts.

3.3 Study Sample

A convenience of 76 adult critically ill patients of both genders, who admitted to above mentioned setting during the study period, will be included in the study.

3.4 Sample size calculation:

The sample size was calculated using sample size calculator software program. Calculating sample size for studying the effect of swallowing exercises in improving dysphagia among stroke patients. A study conducted by Jansi Rani, Porkodi and Seethalakshmi, (2013). They found that the mean swallowing ability score was 4.33 ± 1.047 vs. 5.00 ± 0.000 in the study and control group; respectively with an α error of 5%, β error of 20% (i.e. Study power 80%). Thus the sample size should be 38 for each control and study groups at least. The final sample is 76.

Inclusion criteria:

1. An adult patient diagnosed with stroke.
2. Patients who had been diagnosed with dysphagia after stroke.
3. Patients who are hemodynamically stable, conscious and have adequate cognitive ability to follow simple instructions and able to sit upright for at least 30 minutes.

Exclusion criteria:

1. Unstable angina and myocardial infarction (MI)
2. History of seizure
3. Head injury or neurological disease other than stroke, neurosurgery
4. Oral and maxillofacial surgery
5. Dysphagia prior to stroke
6. Gastrointestinal tract upsets
7. Patients who receive hypnotics or sedation

3.5 Tools of data collection:

Two tools will be used in the study:

Tool I: "Dysphagia Assessment Tool"

This tool will be used to evaluate three main parts:

• **Part 1 "Patient's demographic Data"**

o This part will be developed by the researcher after reviewing the recent literature. This part will include patient's name, age, gender, admission date, occupation and level of education.

• Part 2 "Health Relevant Data"

o This part will be developed by the researcher after reviewing the recent literature. This part will include patient's diagnosis, present medical history, past medical history, ABG and O2 saturation (Printza et al., 2019).

• **Part 3 " Dysphagia Screening Questionnaire (DSQ)"**

This part will be adopted from W. Koyano., (1987). It will be used to assess the level of dysphagia. The DSQ consists of 15 questions about dysphagia, Three points Likert scale will be used in the tool scoring system as follows: "sever symptom = 1", "mild symptom = 2" and "no symptom = 3". This tool proved to be valid (42.8%) according to Papadopoulou et al., (2017), the reliability of this tool has been proved by Uhmet al., (2019) using the Cronbach's α coefficient (> 0.70).

Tool II: "30ml Water, Swallowing Test"

This tool was adopted from Kubota et al., (1982). The nature of the test explained to the patient who should be seated upright, preferably on a chair at a table. The patient given 30 ml of cold tap water to drink from a standard glass. The subject is asked to drink the water as quickly as possible but to take care and to stop if difficulty arises. This tool proved to be valid (69%) according to Nathadwarawala et al., (1992). This tool has been demonstrated to have moderate to excellent agreement with inter-rater reliability (100 and 70.8%, respectively) by Poorjavad and Jalaie, (2014).

3.6 Pilot Study

A pilot study will be carried out on 10% of the sample (8 patients) who will be excluded from the study sample. It will be conducted to assess the feasibility and applicability of the tools. Necessary modifications will be done accordingly.

3.7 Data Collection

This study will be conducted in three phases; preparation, implementation, and evaluation phases.

1. **Preparation phase**
   - Ethical approval will be obtained from the Research Ethics Committee, Faculty of Nursing, Mansoura University.
   - Permission to conduct the study will be obtained from the responsible authorities of the study setting after providing an explanation of the aim and nature of the study.
   - Tools will be reviewed for their validity by a jury of five experts in the study field before implementation.
   - Reliability test using Cronbach's α test will be done for part 1 & part 2 of tool I.
   - Suggestions of the jury members will be followed and the tools will be modified as indicated.
   - Formulation of tool I (part 3) DSQ will be translated from the English to Arabic language before collecting data from patient and back translation technique will be done after that.

2. **Implementation phase**
   - Informed consent will be taken from the participants.
   - An initial assessment will be carried out in all patients admitted to NCCU to confirm inclusion and exclusion criteria.
   - Patient's demographic and health relevant data will be collected by using tool I (part 1 and part 2).
   - Patients will be assessed for having dysphagia using tool I (part 3).
   - Patients will be assigned randomly into two groups, intervention group (dysphagia swallowing exercises group) and control group (hospital care group).
   - For the intervention group

Three dysphagia swallowing exercises will be applied as follows:

Shaker Exercise

Patients will be educated to lie recumbent and raise their head without raising their shoulders toward the chest while looking toward their toes. This position is kept up for one minute, after that they will rest some time recently rehashing this head- raising move. The exercise will be repeated twice daily in the morning and at afternoon for five consecutive days (Yeh, 2018).

Masako Maneuver

In this maneuver, the patients softly bite the end of their tongues with their front teeth and maintain this posture while swallowing. This maneuver will be conducted for 20 minutes per day, five consecutive days (Kumaresan and Nayak, 2018).

Effortful Swallow

Patients will be instructed to squeeze hard with all of their tongue muscles when they swallow. This technique will be performed twice daily, in the morning and in the evening for five consecutive days (Benfield, Everton, Bath and England, 2019).

3. **Evaluation phase**

Both groups will be assessed for improving dysphagia level by using tool II.

3.8 Data Analysis

Data will be analyzed using the Statistical Package of Social Sciences (SPSS) version 24.0. Data will be computerized and analyzed using appropriate descriptive and inferential statistical tests. Statistical analysis will be done according to the most currently reliable and valid statistical methods.

3.9 Ethical considerations

An ethical approval will be obtained from the Research Ethics Committee, Faculty of Nursing Mansoura University. Written informed consent will be obtained from the patients or first degree of kinship of the participants after providing them with details about the study, including the aim, procedure, benefits and risks. They will be informed that their participation in the study is voluntary and that they have the right to refuse or withdraw from the study at any time without any effect on their patient's care. Moreover, they will be assured that the personal data will be kept confidential.

4. Result

Table (1) shows the characteristics of the studied groups. It is found that the age of patients among the study group is older (59.34 ±11.78) years than in control group (53.50 ±13.86) but the difference is not significant (P>0.05). Gender ratio shows that male prevalence is higher in study group (63.2%) than control group (42.1%) with no significant difference (P>0.05). Occupations and educational levels of both groups are nearly the same.

Table (2) show the type of stroke among studied groups. Hemorrhagic type is more prevalent in both groups being (57.9% in study group and 65.8% in control group), followed by ischemic stroke, while transient ischemic attack is present in two and one cases respectively. No

significant difference between both groups (P<0.05) as regard type of stroke.

Table (3) show the past medical history was reported among 78.9% of the study group and 89.5% of the control group with no statistical significant difference (P 0.208). Hypertension was more reported in both groups, followed by D.M. and heart diseases in study group, but followed by heart diseases then D.M. in control group. No reporting for peripheral vascular nor others diseases (table 3)

Table (4) shows the dysphagia Screening Questionnaire (DSQ) among studied group on admission. It is found for most of the items of DSQ, the percentages of response (sever, mild and no symptoms) are not significantly (P>0.05) differ in study and control groups on admission.

Table (5) show that the average total score of DSQ significantly (P<0.001) increased in study group after swallowing training in cmparsion to its value before training program.

Table (1): Characteristics of the studied groups

Characteristics	Study group (38)		Control group (38)		Significance test
	No	%	No	%	
Age (years)					
40-	18	47.4	25	65.8	χ^2=2.631,
60-	17	44.7	11	28.9	MEP 0.269
80-85	3	7.9	2	5.3	
	59.34 ±11.78		53.50 ±13.86		t=1.980, P0.052
Gender					
Males	24	63.2	16	42.1	χ^2=3.378,
Females	14	36.8	22	57.9	P 0.066
Occupations:					
Employee	8	21.1	12	31.6	
Worker	1	2.6	4	10.5	χ^2=5.695,
House wife	12	31.6	12	31.6	MEP 0.233
Farmer	5	13.2	1	2.6	
Retired	12	31.6	9	23.7	
Education:					
Illiterate	13	34.2	10	26.3	χ^2=5.658,
Preparatory	13	34.2	7	18.4	MEP 0.205
Secondary	11	28.9	19	50.0	
Bachelor	1	2.6	2	5.3	

Table (2): Type of stroke among the studied groups

Type of stroke	Study group (38)		Control group (38)		Significance test
	No	%	No	%	
Ischemic	14	36.8	12	31.6	
Hemorrhagic	22	57.9	25	65.8	χ^2=0.679,
Transient ischemic attack	2	5.3	1	2.6	MEP 0.719

Table (3): Past history of medical problems among the studied groups

Past history of medical problems	Study group (38)		Control group (38)		Significance test
	No	%	No	%	
Medical history:					
- Yes	30	78.9	34	89.5	χ^2=1.586,
- No	8	21.1	4	10.5	P 0.208
Hypertension	22	57.9	25	65.8	χ^2=0.501,P0.479
Heart disease	3	7.9	6	15.8	FET, P0.480
D.M.	5	13.2	3	7.9	FET, P0.711
Peripheral vascular D					
Others					

Table (4): Dysphagia Screening Questionnaire (DSQ) among studied group on admission

DSQ	Group	Severe (1)		Mild (2)		No (3)		Significance test
		No	%	No	%	No	%	
1. Have you ever been diagnosed with pneumonia?	S	4	10.5	1	2.6	33	86.8	χ^2=1.015, MEP0.602
	C	4	10.5	0	0.0	34	89.5	
2. Do you feel are becoming thin?	S	0	0.0	1	2.6	37	97.4	χ^2=1.013, MEP0.314
	C	0	0.0	0	0.0	38	100.	
3. Do you ever have difficulty when you swallow?	S	16	41.1	22	57.9	0	0.0	$\chi2$=0.502, P0.479
	C	13	34.2	25	65.8	0	0.0	
4. Do you ever chock during a meal?	S	16	41.1	22	57.9	0	0.0	$\chi2$=0.502, P0.479
	C	13	34.2	25	65.8	0	0.0	
5. Do you ever chock when swallowing liquids?	S	9	23.7	26	68.4	3	7.9	$\chi2$=4.973, MEP0.078
	C	5	13.2	33	86.8	0	0.0	
6. Do you ever have difficulty with coughing up phlegm during or after meal?	S	7	18.4	30	78.9	1	2.6	$\chi2$=1.467,MEP0.546
	C	5	13.2	33	86.8	0	0.0	
7. Do you ever have the feeling that food is getting stuck in your throat?	S	9	23.7	28	73.7	1	2.6	$\chi2$=1.128, MEP0.794
	C	8	21.1	30	78.9	0	0.0	
8. Does it take you longer to eat a meal than before?	S	10	26.3	28	73.7	0	0.0	$\chi2$=0.070, P0.791
	C	9	23.7	29	76.3	0	0.0	
9. Do you feel that it's getting to eat solid foods?	S	30	78.9	8	21.1	0	0.0	FET, P0.014
	C	37	97.4	1	2.6	0	0.0	
10. Do you ever drop food from your mouth?	S	9	23.7	20	52.6	9	23.7	$\chi2$=10.283, MEP0.007
	C	13	34.2	25	65.8	0	0.0	
11. Do you ever have the feeling that food is remaining in your mouth?	S	4	10.5	32	84.2	2	5.3	$\chi2$=2.401, MEP0.409
	C	6	15.8	32	84.2	0	0.0	
12. Do you ever have the feeling of food or liquid going into your throat from your mouth?	S	7	18.4	31	81.6	0	0.0	$\chi2$=0.092, P0.761
	C	6	15.8	32	84.2	0	0.0	
13. Do you ever have the feeling of food is stuck in your esophagus?	S	7	18.4	31	81.6	0	0.0	
	C	7	18.4	31	81.6	0	0.0	
14. Do you ever have difficulty sleeping because of coughing during the night?	S	6	15.8	8	21.1	24	63.2	$\chi2$=0.652, P0.788
	C	5	13.2	11	28.9	22	57.9	
15. Do you feel that your voice is getting hoarse?	S	2	5.3	5	13.2	31	81.6	$\chi2$=5.196, MEP0.064
	C	0	0.0	1	2.6	37	57.9	

Table (5): Dysphagia Screening Questionnaire (DSQ) among study group before and after application of swallowing training program

DSQ	Time	Severe (1)		Mild (2)		No (3)		Significance test
		No	%	No	%	No	%	
1. Have you ever been diagnosed with pneumonia?	Pre	4	10.5	1	2.6	33	86.8	χ^2=2.811, P0.245
	Post	1	2.6	3	7.9	34	89.5	
2. Do you feel are becoming thin?	Pre	0	0.0	1	2.6	37	97.4	FET P0.500
	Post	0	0.0	2	5.3	36	94.7	
3. Do you ever have difficulty when you swallow?	Pre	16	41.1	22	57.9	0	0.0	χ^2=28.332, P<0.001
	Post	0	0.0	26	68.4	12	31.6	
4. Do you ever chock during a meal?	Pre	16	41.1	22	57.9	0	0.0	χ^2=28.240, P<0.001
	Post	1	2.6	22	57.9	15	39.5	
5. Do you ever chock when swallowing	Pre	9	23.7	26	68.4	3	7.9	χ^2=20.501,

liquids?	Post	0	0.0	20	52.6	18	47.6	P<0.001
6. Do you ever have difficulty with coughing up phlegm during or after meal?	Pre Post	7 0	18.4 0.0	30 23	78.9 60.5	1 15	2.6 39.5	χ^2=20.171, P<0.001
7. Do you ever have the feeling that food is getting stuck in your throat?	Pre Post	9 0	23.7 0.0	28 19	73.7 50.0	1 19	2.6 50.0	χ^2=26.921, P<0.001
8. Does it take you longer to eat a meal than before?	Pre Post	10 0	26.3 0.0	28 18	73.7 47.4	0 20	0.0 52.6	χ^2=32.171, P<0.001
9. Do you feel that it's getting to eat solid foods?	Pre Post	30 5	78.9 13.2	8 30	21.1 78.9	0 3	0.0 7.9	χ^2=33.590, MEP<0.001
10. Do you ever drop food from your mouth?	Pre Post	9 0	23.7 0.0	20 18	52.6 47.4	9 20	23.7 52.6	χ^2=15.841, P<0.001
11. Do you ever have the feeling that food is remaining in your mouth?	Pre Post	4 0	10.5 0.0	32 16	84.2 42.1	2 22	5.3 57.9	χ^2=26.001, P<0.001
12. Do you ever have the feeling of food or liquid going into your throat from your mouth?	Pre Post	7 0	18.4 0.0	31 18	81.6 47.4	0 20	0.0 52.6	χ^2=30.452, P<0.001
13. Do you ever have the feeling of food is stuck in your esophagus?	Pre Post	7 0	18.4 0.0	31 15	81.6 39.5	0 23	0.0 60.5	χ^2=35.571, P<0.001
14. Do you ever have difficulty sleeping because of coughing during the night?	Pre Post	6 0	15.8 0.0	8 9	21.1 23.7	24 29	63.2 76.3	χ^2=6.530, P0.038
15. Do you feel that your voice is getting hoarse?	Pre Post	2 0	5.3 0.0	5 3	13.2 7.9	31 35	81.6 92.1	χ^2=2.74, P0.254

5.Discussion

Dysphagia is one of the most common complications, which may occur after a stroke, and it occurs to approximately 37-78% of patients with a stroke. This may lead to a degraded quality of life, as well as cause malnutrition, dehydration, and severe aspiration pneumonia. Severe aspiration pneumonia is life-threatening and possibly lead to death *WARDA and EBRAHIM, 2018.*

There is emerging evidence that early detection of dysphagia in patients with acute stroke reduces not only these complications but also reduces length of hospital stay and overall health care expenditures *Martino et al, 2009*.

All staff working with stroke patients should have the knowledge and skills appropriate to their role in the pathway, including those for the detection and management of dysphagia and its complications, inter professional competences have been developed to inform the training and organization of teams in all aspects of dysphagia *(Abu-Snieneh and Saleh, 2018).*

Strategies to improve dysphagia are aimed at decreasing its complications through changing patient's posture, feeding in upright position, turning the head to paretic side, diet modifications and oral motor exercise. In many hospitals, dysphagia screening is performed by speech-language therapists who are often not available on weekends/holidays, which results in delayed dysphagia assessment *(Cohen et al, 2016).*

The presence of formal guidelines for the identification and management of dysphagia may have a significant effect on serious adverse outcomes such as chest infections and death. Training nurses to conduct dysphagia screening and management protocol will improve patient outcomes. If nurses screen patients with an acute neurological impairment within 24 h of admission, it may reduce the time that patients spend without appropriate methods of nutrition and hydration and improve clinical outcomes *(Hines et al, 2016).*

Therefore, the current study aimed to investigate the effect of swallowing exercises on improving dysphagia among stroke patients in neurocritical care unit. This part aims to interpret and discuss the result of this study considering the pertinent publication.

The current study found that the age of patients among the study group was older (59.34 ±11.78) years than in control group (53.50 ±13.86) but the difference is not significant (P>0.05). In harmony with our results, the post stroke dysphagic patients enrolled in **Joundi et al, 2017** study were ≥ 70 years old. Also, **Roje-Bedekovic, 2020** found mean age in his study was 73 years old. **Kang, Jung-Ho, et al, 2012** reported that the mean ages of the experimental and control groups were 68.3 and 66.7, respectively. In consistent with our

findings the mean age of patients in **Reham and Arzak, 2021** was 41.37±6.82 this result might be due to increased incidence of dysphagia among middle age patients.   Patients who received documented dysphagia screening tended to be older. The older age was significantly associated with dysphagia screening ($\geq$ 80 versus < 60 years, adjusted OR, 1.44; 95% CI: 1.18–1.75).

Gender ratio showed that male prevalence was higher in study group (63.2%) than control group (42.1%) with no significant difference (P>0.05). In the same line, **Kim, Kyoung Don, et al**, **2015** noted that the male participants in the study group were higher than control group. Occupations and educational levels of both groups were nearly the same. No reported family history was in both groups and smoking habit was 44.7% among study group and 28.9% in control group with no significant statistical difference (P=0.154).

The current study evaluated the type of stroke among studied groups showing that hemorrhagic type was more prevalent in both groups being (57.9% in study group and 65.8% in control group), followed by ischemic stroke, while transient ischemic attack presented in two and one cases respectively. No significant difference between both groups (P<0.05) as regard type of stroke. Unlikely **Reham and Arzak, 2021** found that 70.3% of the patients had ischemic stroke and 29.7% of them had hemorrhagic stroke. Also the study conducted by **Park, Jin-Woo, et al 2012** revealed that three quarters of patients who participate in this study were suffered from hemorrhagic type.

On the other hand, *Kang et al, 2012* examined the effects of a bedside exercise program on the recovery of swallowing after a stroke. Fifty stroke patients with dysphagia were enrolled and classified into two groups, the experimental (25 subjects) and control groups (25 subjects). The control group was treated with conventional swallowing therapy. The experimental group received additional bedside exercise training. The mean ages of the experimental and control groups were 68.3 and 66.7, respectively. There was no significant difference in the baseline swallowing capacity, daily activity performance and stroke location and type of the stroke, where ischemic stroke was more prevalent in both groups than hemorrhagic type.

The current study reported past medical history among 78.9% of the study group and 89.5% of the control group with no statistical significant difference (P= 0.208). Hypertension was more reported in both groups, followed by D.M. and

heart diseases in the study group, but followed by heart diseases then D.M. in control group. No reporting for peripheral vascular or others diseases. Similarly, *Elabdeny et al, 2020* study revealed that more than one third of the studied patients had hypertension. These findings were supported by *Boehme et al, 2017* who studied stroke risk factors, genetics and prevention and found that the higher the blood pressure, the higher the risk of stroke. Conversely, *Kuo et al, 2020* found that patients with documented dysphagia screening were more likely to have a medical history (ie, atrial fibrillation, current smoking) that could increase the risk of pneumonia.

The current study showed that the most presentations in patients of both groups were Dizziness, Coordination and balance problems and Severe headache with no statistical significant difference (P>0.05). Complete paralysis of one side of the body represented 50% of patients of the study group and 44.7 of patients of control group with no statistical significant difference (P>0.05), while Face dropping and Mouth or eye dropping were significantly (P<0.05) more prevalent among patients of the study group. Furthermore, *Elfetoh et al, 2018* reported that speech problems whether dysarrthria or expressive dysphasia was found in all patients, that is supported by *Joundi et al, 2017* who indicated that there is a strong correlation between dysphagia and speech impairments. In this respect by the American Stroke Association (2017) who documented that dysarrthria-slowed, slurred, and/or imprecise speech is a clinical indicator that can signify dysphagia.

The current study showed the average values of blood gases among studied groups before and after swallowing training. It is found that there was no significant (P>0.05) difference of the most blood gases before or after training in both groups. The exceptions are only for the average HCO3 values and O2 saturation after training. There was a significant (P<0.05) increase in HCO3 and O2 saturation among study group in comparison to control group after training.

Interestingly, the current study showed that the percentages of the items of the swallowing test were nearly the same in both groups before training with no significant difference (P=0.178). Also, there was no significant (P>0.05) difference as regard the average total score (P=0.698).

Comparison of dysphagia screening questionnaire among studied group.

Dysphagia screening is a key process in the care of patients with post-stroke. All studies agreed the benefit of screening dysphagia among stroke patients. However, there was currently no agreement regarding the best approach to dysphagia screening. Disagreement exists regarding what tool should be used for screening and who should administer the screening **Dondorf et al, 2016**.

Our results are aligned with other similar studies **Magalhães Junior, Hipólito Virgilio, et al 2020 & Uhm, Kyeong Eun, et al 2019** which found that screening questionnaire was developed as a quick and efficient way to identify and evaluate patient who have dysphagia and take appropriate care of them. All studies addressed the benefits of training nurses in screening for dysphagia among stroke patients in this literature review. In addition, various studies have created different protocols for a nurse in order to conduct a dysphagia screening, but there was no one universally utilized dysphagia screening in the hospitals **Abu-Snieneh and Saleh, 2018**.

The current study evaluated the dysphagia Screening Questionnaire (DSQ) among the studied groups on admission. For most of the items of DSQ, the percentages of response (sever, mild and no symptoms) were not significantly (P>0.05) different in study and control groups on admission. The average total score of DSQ was nearly the same in study and control groups before swallowing training.

Comparison of dysphagia screening questionnaire among study group before and after application of swallowing training program.

As regard the dysphagia Screening Questionnaire (DSQ) among the study group before and after application of swallowing training program, the current study found for most of the items of DSQ that the percentages of response (no symptoms) were significantly (P<0.001) increased after application of the program. The average total score of DSQ significantly (P<0.001) increased in study group after swallowing training in comparison to its value before training program. These findings were consistent with **Carnaby et al, 2006** and found that their intervention for dysphagia within the first week after stroke improved swallowing function.

In agreement with our results, **Kang et al, 2012** showed that, after the 2-month treatment for dysphagia, both groups showed an improvement in the swallowing capacity, and the experimental group, with combined exercise program, showed a statistically significant improvement, compared to the control group. Also, there was no significant difference between the groups in the incidence of aspiration pneumonia, which is a common complication of dysphagia, and transmission from tube feeding to oral feeding, but in FOIS (Functional oral intake scale), the experimental group showed significant improvement, compared to that of the control group. Also, **Elabdeny et al, 2020** found that there was a statistically significant difference in the severity of dysphagia in the study group patient throughout pre and post intervention. Regarding comparison according to the severity of dysphagia among study and control group patients, it was found that there is a highly statistically significant difference in the severity of dysphagia between study and control group patients.

Our current findings were in agreement with **El-Tamawy et al, 2015** who studied that the influence of physical therapy on oro- pharyngeal dysphagia in acute stroke patients and reported that after intervention there was significant improvement in all variables in the study group. Also these finding was disagree with **Lopes et al, 2019** who studied impact of the systematic use of the gugging swallowing screen in patients with acute ischemic stroke and stated that systematic administration of GUSS in a population of patients with acute ischemic stroke did not reduce the occurrence of stroke associated pneumonia, mortality and three-month functional dependence when compared with the systematic administration of the 10 ml waters swallowing test.

6.Limitation

This study involved a small convenience sample and was conducted only in one ICU in traditional hospital. These factors limited the generalizability of the research findings.

7.Conclusion and recommendations

Overall, the findings of the current study are corroborated by findings from related studies that found swallowing exercises to be effective in treating post-stroke dysphagia. A safe and practical nursing intervention for dysphagia is the swallowing exercise. The present data thus confirmed our research hypothesis that swallowing exercises had a considerable beneficial impact on reducing dysphagia following stroke. So, in order to provide routine daily care for stroke patients,

critical care nurses should employ this strategy. Further investigations on other patient populations will be necessary to produce more convincing data in favors of this strategy.

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9.Declaration of Conflicting Interests

There were no potential conflicts of interest that the authors disclosed regarding the study or publishing of the article.

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