Effect of Shaker's Swallowing Exercises on Swallowing Ability among Dysphagic Patients with Cerebrovascular Accident

Zeinab Gamal Mohamed Ellatif Abouelezz [(1)], Eman Mohammed Ahmed Mohammed [(2)], Hanaa Farahat Ibrahim Ahmed[(3)], Heba Abd El Reheem Abd El Reheem Abd El Reheem [(4)], Wedad Saber Shafek Abdelkhalek [(5)]

(1)Fellow Medical Surgical Nursing, Student Hospital, Mansoura University
(2) Lecturer in Medical - Surgical Nursing Department, Faculty of Nursing, Beni-Suef University
(3) Lecturer in Medical-Surgical Nursing, Nursing College, Badr University in Cairo
(2) Lecturer in Medical - Surgical Nursing Department, Faculty of Nursing, Port Said University
(5) Medical Surgical Nursing Department, Faculty of Nursing, Mansoura University

Abstract

Background: Cerebrovascular accident (CVA) is the medical term for a stroke. A stroke is the sudden death of some brain cells due to lack of oxygen. Dysphagia is one of the most common symptoms in patients who have had their throat muscles paralyzed by a stroke. **The aim of the study:** was to evaluate the effect of Shaker's swallowing exercises on swallowing ability among dysphagic patients with cerebrovascular accident. **Research design:** A quasi-experimental research design was used to achieve the aim of the study. **Settings:** The study was conducted at the neurological department (A-B), Al-batina private building, at Main Mansoura University Hospital. **Subjects:** Purposive sample of 50 hospitalized adult patients with cerebrovascular accident were included in the study. **Tools of data collection:** Three tools were used for data collection: Tool I: Patient's Structured Interview Questionnaire, Tool II: Dysphagic patient's reported practice assessment sheet**,** and Tool III Swallowing ability observational checklist. **Results:** The study revealed that there was an improvement with highly statistically significant differences detected between dysphagic patients' knowledge regarding Shaker swallowing exercise pre, post two weeks, and one-month post- implementation. There was a highly significant positive correlation between dysphagic patient's total knowledge and swallowing ability at different phases of implementation ($p < 0.001$).**Conclusion**: The study concluded that Shaker's swallowing exercises were effective in improving swallowing ability among dysphagic patients with cerebrovascular accident. **Recommendation**: Shaker's swallowing exercise is recommended to be used in clinical settings for dysphagic patients with a cerebrovascular accident in medical wards and the neurological ward.

Keywords: Cerebrovascular accident, Dysphagic patients, Shaker's swallowing exercises.

Introduction:

Stroke is the leading cause of dysphagia, which is paralysis of the throat muscles. This condition can disrupt the swallowing process and make eating, drinking, taking medicine, and breathing difficulties. More than 70 percent of stroke survivors experience dysphagia at some point after a stroke. The stroke is manifested by facial or arm weakness, difficulty in speech, sudden confusion, numbness or weakness usually on any one side of the body; trouble seeing laterally or bilaterally, inability to walk, dizziness, imbalanced coordination, and gait; severe headache with unknown cause, because, these symptoms are timely attended can reduce much of the potential disabilities of the stroke (**World Health Organization, 2018**).

Swallowing is a complex function that affects the physical and mental health of all human beings. The mechanism of swallowing is coordinated by the operation of the mouth, pharynx, and esophagus. Human beings swallow 600 times per day. Under normal circumstances, swallowing is performed without thought or effort (**Logemann, 2016).**

Dysphagia is the health profession's term used to describe difficulty swallowing both solid and liquid foods. Dysphagia results from problems in nerve or muscle control that may accompany various medical conditions. These conditions cause weakness and structural problems in the stroke patients in the coordination of the mouth and throat muscles that direct food and/or liquids to travel down the trachea (windpipe) instead of the esophagus (food pipe) (**Brly, 2018).**

The initial steps in the assessment of swallowing include a careful history to assist in defining the reason for the patient's swallowing

disorder, generally followed by a clinical evaluation. The clinical assessment generally includes an evaluation of the patient's mouth, throat, or pharynx, and larynx or voice box. The clinician in the area of evaluation and treatment of dysphagia looks at the range of motion of structures, the speed of movement of structures, and the coordination of movement of the structures in the mouth and pharynx (**Cleveland, 2015).**

Dysphagia, like any other chronic disorder, affects adversely the quality of life. A person with dysphagia goes through social and psychological challenges along with a physical swallowing disability. Health care professionals can attend to the psychosocial as well as the physical concerns of dysphagia by considering an individual's perspective of need (**Langhorne et al., 2015)**.

There is no pharmacological treatment for oropharyngeal dysphagia. The main management is rehabilitation. The goal of swallowing rehabilitation is to reestablish a safe oral feeding to as normal as possible. Exercise is a crucial aspect of a preventive plan of action for many chronic illnesses including stroke. The best custom for recovery after a stroke is substantial rehabilitation to decrease the initial footprint caused due to stroke, prevent complications, and improve functional status (**Panebianco et al., 2020**).

Worldwide dysphagia is estimated that 400,000 to 800,000 individuals worldwide develop neurogenic dysphagia per year that dysphagia range from 25%-70% in patients who have experienced a stroke. Thus, swallowing exercises were believed to improve the swallowing ability of patients with dysphagia. Stroke swallowing exercises increase strength and awareness, compensate to make swallowing safer, to modify food textures to make food easier to manage **(Joundi et al., 2017).**

Shaker exercise is a series of sustained and repetitive head lifting exercises to enhance the strength of infrahyoid and suprahyoid muscular activity **(Abd-Allah, 2014**). It includes isometric and isotonic exercises. Isometric exercises are performed by raising the head up for 60seconds followed by a minute rest for a repetition of three times. Isotonic exercises are performed by thirty repetitions of alternate up-and-down movements of the head. This enhances the contraction of the thyrohyoid muscle, strengthens the suprahyoid muscles, facilitates the upward and forward movement of the larynx, and rebyopens the upper esophageal sphincter (**American Stroke Association, 2017**).

Moreover, Shaker exercise also improves both infrahyoid and suprahyoid muscular activity and reduces pyriformsinus residue and backflow aspiration. Clinical trials and post-therapy report from various institutes stated that the amount of aspiration was significantly less in those clients who performed the Shaker exercise than the traditional swallowing therapies. Shaker exercise facilitates oesphysiologic changes in the suprahyoid muscles due to its proximity to the pharyngeal muscles. Contraindications for the Shaker exercise are tracheostomy tube placement and limitations in neck mobility. It is not contraindicated for patients with cardiovascular disease or stroke (**Padma et al., 2016**).

Nurses are frequently in contact with the patients and can build trust, and therapeutic interpersonal relationships, and motivate patients to make the desired health behavior changes such as planned physical activity. A nurse has to assess and counsel patients on the benefits of physical activity. Nurses also have a great role in managing patients' meal time, documenting progress, teaching safe meal practices, and monitoring the bedside exercise regimen. The bedside exercise program for retrieving the dysphagic state involves the tongue, facial and neck movements, pharyngeal and laryngeal movements, and respiratory exercises which can be appropriately selected based on the affected swallowing stage (**Hines et al., 2016**). Hence, the present study is focused to evaluate the effect of Shaker's swallowing exercises on swallowing ability among dysphagic patients with cerebrovascular accident

Significance of the study:

Cerebrovascular accident (CVA) is one of the preeminent reasons leading to mortality and morbidity throughout the world. Every year nearly 20 million people are diagnosed with CVA. Out of them, 5 million deaths occur due to consequences, and 15 million survive; among those who survive, 5 million are disabled because of CVA. It is estimated that 70% of strokes and 87% of both stroke-related mortalities and

morbidities occur in lesser and moderate-income countries (**WHO, 2018**).

Dysphagia is one of the most common disabilities in patients with acute CVA. Swallowing exercises are very advantageous in safe swallowing for people with dysphagia, there are newer approaches with different types of exercises to improve and enhance swallowing function. It affects the quality of life of patients with stroke. Also, it may decrease the health care costs and patients' hospital length of stay (**Alaliet al., 2018**).

Aim of the study:

Evaluate the effect of Shaker's swallowing exercises on swallowing ability among dysphagic patients with cerebrovascular accident through:

- Assessing dysphagic patients' knowledge regarding Shaker's swallowing exercises pre and post implementation
- Assessing the swallowing ability pre and post Shaker's swallowing exercises implementation among dysphagic patients with cerebrovascular accident.

Research hypothesis:

There will be an improvement in knowledge, practices, swallowing ability after applying in post-test scores than pretest on knowledge regarding Shaker's swallowing exercises among dysphagic patients with cerebrovascular accident

Subjects and Method:

1. Technical design:

Research design:

A quasi-experimental research design was used to achieve the aim of the study. This design is important to the nature of the study issue, having one or more group subjects observed on pre and post manipulations (**Creswell, 2012)**.

Setting:

The study was conducted at the neurological department (A-B), Al-batina private building, at Main Mansoura University Hospital. These settings were chosen because of the high prevalence of adult patients in the selected setting, as well as the fact that it serves the most populous region of the country.

Subjects:

A sample of 50 hospitalized adult patients with CVS was included in the study through a purposive non-probability sampling technique.

Inclusion criteria:

1. Both sexes male and female
2. First days of acute stroke
3. Conscious and oriented
4. Aged from 21-60 years old
5. Willing to participate in the study.

Exclusion criteria:

1. Willing to not participate in the study.
2. Tracheostomy tube placement and limitations in neck mobility.
3. Comatose and unconscious patients

Sample size calculation:

G Power Program Medium effect size =0.4 Power= 80%**,** Alpha error=5% and required sample size=50.

Tools of data collection: Three tools were used for data collection

Tool 1: Patient's Structured Interview Questionnaire: was adopted by the researchers after an extensive review of recent and relevant literature and then translated into the Arabic language by a specialist in English language translation. The translation was refined until agreement was obtained among the researchers. It included three parts:

Part 1: Demographic data: This part was developed by the researchers to gather the necessary data regarding age, gender, level of education, residence, and occupation.

Part 2: Health relevant data: This part was developed by the researchers to gather the necessary data regarding previous cerebrovascular stroke, type of stroke (ischemic, hemorrhagic), affection side (left hemisphere, right hemisphere), the pattern of speech (dysarthria, receptive aphasia, expressive dysphasia) and consistency of diet (liquid, semisolid).

Part (3): Dysphagic patient's knowledge assessment sheet: It was developed by the researchers after an extensive review of recent and relevant literature **(Alali et al., 2016; Balou et al., 2019)** and included 15 questions (multiple choice questions). It was created to

gather information on dysphagic patient's knowledge about swallowing exercises an overview of stroke and its possible effect on swallowing, the definition of dysphagia, the levels of food consistency given to the dysphagic patient according to his/her swallowing level, types of food that should be avoided for patients with dysphagia, steps of feeding the dysphagic patients, definition, and benefits of shaker exercise and how to perform this exercise.

Scoring system: The tool was given a score of 1 for correct answers and 0 for incorrect answers. The overall knowledge score ranged from 0 to 15, with 0 being the lowest and 15 being the highest. The knowledge score went from 0 to 7 and was considered to have unsatisfactory knowledge (< 50%), and those who scored from 8 to 15 were considered to have satisfactory knowledge (≥50%) **(Henok et al., 2020).**

Tool 2: Dysphagic patient's reported practice assessment sheet: It was developed by the researchers after an extensive review of recent and relevant literature **(Alali et al., 2016; Balou et al., 2019)** and included 10 questions (multiple choice questions). It was created to gather information on dysphagic patient's reported practice about shaker exercise such as definition, and benefits of shaker exercise and technique to perform this exercise.

Scoring system for dysphagic patient's reported practice: The steps which were done correctly were scored (1), and the items not done were scored zero. For each area, the scores of the items were summed up, and the total was divided by the number of the items, giving the mean score for the part. These scores were converted to a percentage score. The overall practices score ranged from 0 to 10, with 0 being the lowest and 10 being the highest. The dysphagic patient's reported practice score from 5 to 10 was considered adequate and if the percentage score was 50% or more from 0 to 4, it was considered inadequate.

Tool (3): Swallowing ability observational checklist: This tool was adapted from Northwestern Dysphagia Patient Checklist which was developed by **Logemann et al., 1999,** updated by **Audag et al, 2019** and modified by the researchers then translated into the Arabic language by a specialist in English language translation. The translation was refined until agreement was obtained among the researchers. It is a screening procedure for oropharyngeal dysphagia. It was used to assess the swallowing ability of different food types and their amount. This tool included six items which were; apraxia of swallow, oral residue, coughing/throat clearing, delayed pharyngeal swallow, reduced laryngeal elevation, and multiple swallows per bolus. Each item was rated on a 3-point Likert scale (never=3, sometimes=2, and always=1). For each one, the score of the items was summed up and the total was 18. These scores were converted into a percent score were computed.

2- Administrative design:

Administrative permission was obtained through an issued letter from the Dean of Faculty of Nursing, Mansoura University to the Director of neurological department(A-B), Al-batina private building, at Main Mansoura University Hospital.

3-Operational design

Validity of the tools:

The content validity of the tools was tested by a jury of 3 experts in the field of medical surgical nursing and 2 experts in neurology medicine as well as its clarity, comprehensiveness, appropriateness, and relevance. To ensure sentence clarity and content appropriateness, no changes were made based on the panel's assessment.

Reliability of the tools:

Tool (I) The tool reliability was tested by the test-retest method where Cronbach's alpha test was 0.88.

Tool (II): Its reliability was assured by the inter-rater method the association between the two rater ratings of percentage was estimated using Pearson's correlation. This association was high, where r = 0.94& p = 0.001.

Filed work:

The study was implemented through the following 3 phases preparatory, implementation, and evaluation and the data collection was

conducted from the beginning of February 2019 to July 2019.

The researchers gathered information from dysphagic patients with a cerebrovascular accident three days a week from 9 a.m. to 1 p.m. during the morning shift for six months. Each interview took approximately 25-35 minutes to complete tools.

A-Preparatory phase:

The data collection tools were distributed to the dysphagic patients with cerebrovascular accident as a pre-test to assess their knowledge and practices before adopting instructional guidelines.

After reviewing the related literature and assessing the actual needs of the studied dysphagic patients with a cerebrovascular accident, the simplified booklet was used as a supportive material and given to dysphagic patients with a cerebrovascular accident in the Arabic language to cover all items regarding the knowledge and practices' regarding Shaker's swallowing exercise. Lectures, discussions, photographs, and posters were all employed as instructional methods.

A pilot study

A pilot study was conducted on 10% of the total sample (5 dysphagic patients with cerebrovascular accident) to test the clarity and applicability of the tools. Modifications were carried out to develop the final form of the tools. In addition, the time needed to answer the tools was also estimated. Dysphagic patients with cerebrovascular accident in the pilot were excluded from the research study.

Ethical considerations:

Before beginning the study, official approval was done, and obtained an issued letter from the Dean of Faculty of Nursing, Mansoura University to conduct this study. The researchers visited with the medical and nursing directors of the selected setting to explain the study's aim and obtain their agreement. To gain Dysphagic patients with cerebrovascular accident cooperation, oral consent was acquired. To secure authorization for data collection, the purpose of the study was stated, as well as the expected outcomes from its implementation. The patients were informed that participation in the study was entirely optional, and they were free to decline. Patients have the right to withdraw from the study at any time and for no reason. Patients were informed that their information would be kept private and only utilized for research.

Observational checklist to assess swallowing ability was done by the researchers for the study sample using a tool (II). The researcher spring different types of food to assess swallowing ability as Potatoes, Custard, and biscuits, with a Teaspoon of water

The researchers created and implemented instructional guidelines for Shaker's swallowing exercises. It was implemented through lectures, posters, educational films, scenarios, and role-plays. Patients were given an educational booklet written in simple Arabic with illustrative photos provided by the researchers regarding Shaker's swallowing exercises.

Booklet preparation:

The researchers reviewed the recent medical and nursing knowledge and relevant literature (**Abd-Allah, 2014, Padma et al., 2016; Hines, 2016; Amol et al., 2018)** and then developed a booklet. It contained a definition of dysphagia, the levels of food consistency given to the dysphagic patient according to his/her swallowing level, types of food that should be avoided for patients with dysphagia, steps of feeding the dysphagic patients, and benefits of shaker exercise (head lifting) and how to perform this exercise. The booklet was then reviewed by a jury of three experts in the medical surgical nursing field and two experts in neurology medicine.

B-Implementation phase:

Training sessions for the study sample about the Shaker exercise were done by interviewing each patient for 25-35minutes/session individually and privately. The researchers provide the patients with a detailed explanation of the swallowing exercises through six sessions (2 theoretical and 4 practical).

- **The first session:** Teach the patients an overview of stroke and its possible effect on swallowing.
- **The second session**: teach the patients about the definition of dysphagia, the levels of food consistency given to the dysphagic patient according to his/her swallowing level, and

types of food that should be avoided for patients with dysphagia, steps of feeding the dysphagic patients.

- **The third session**: teach the patients swallowing exercises such as effortful swallow, isokinetic (dynamic) shaker, and an isometric (static) shaker and as jaw thrust, lollipop swallowing, and Masako maneuver.
- **The fourth session**: teach the patients swallowing exercises such as the Mendelsohn maneuver, yawn, and supraglottic maneuver.
- **The fifth session**: teach the patients swallowing exercises such as tongue strength exercise, tongue range of motion, and tongue retraction.
- **The sixth session**: teach the patients swallowing exercises such as effortful pitch glide, and lip range of motion.
- **Each patient in the study sample was taught to do the following Shaker exercise throughout the training session:**

- Request that each patient select a comfortable position. Exercises using a shaker can be done in both the supine and sitting postures.
- Oral motor activities for the lips, tongue, cheeks, and jaw are included in the exercises. It took around 30 minutes to deliver. Three times a day, while lying down, perform isometric and isokinetic head lift exercises to look at your toes. Contracting the suprahyoid muscles "contributes to the upward and forward movement of the larynx and hyoid bone, resulting in the opening of the upper esophageal sphincter according to the exercise's method.
- Following the performance of the exercise, an observational checklist was used to assess swallowing capacity during the swallow trial also filled by the researchers to determine the swallowing ability within 15 minutes during each observation. The observation was performed 2 times (two weeks, and one month).
- Shaker exercise (head lifting exercises) was used for one month. The patient was asked to repeat the exercise to ascertain that they have understood the proper way of performing it.
- Daily telephone conversation was used to supervise and follow up patients in the study sample. Patients were urged to undertake shaker exercises on a regular basis after two weeks of meetings and rejuvenating activities with the participants. They were instructed to gradually increase the number of exercises according to each patient's ability at follow-up appointments, and they were followed up again after one month.

C-Evaluation phase:

This phase aimed to evaluate the effect of Shaker's swallowing exercises on swallowing ability among dysphagic patients with cerebrovascular accident after two weeks and one month by using the same tools used pre-test (I ,II & III).

4-Statistical design:

Data were collected and entered onto a computer, where it was analyzed using IBM Statistical Package for Social Sciences (SPSS) version 20. (Armonk, NY: IBM Corp). Number and percent were used to describe qualitative data. The normality of the distribution was checked using the Kolmogorov-Smirnov test. Range (minimum and maximum) were used to describe quantitative data. The significance of the acquired results was assessed at a 5% level. The tests that were used were 1 - Chi-square analysis to compare categorical variables between distinct groups 2 - When more than 20% of the cells have an anticipated count of less than 5, use Fisher's Exact or Monte Carlo adjustment for chi-square. 3 - The t-test for students to compare two groups of people who have regularly distributed quantitative variables Friedman test. To compare two quantitative variables with improperly distributed distributions and Post Hoc Test (Dunn's) for pairwise comparisons.

Results:

Table (1): Illustrated that the majority of the studied patients (66.0%) their age was< 50 with mean age (48.33 ± 6.21), (60%) of them were male, (40%) of them had secondary education, (68%) were living in urban areas. More than two-third of them (68%) were working.

Table (2): Showed distribution of the studied dysphagic patients regarding health relevant, it was observed that (66.0%) of them were having

previous cerebrovascular stroke, (80%) of them complained from ischemic dysphagia. Concerning Affected side in the dysphagic patients (68%) of them reported stroke affected right hemisphere, 58% were complained from dysarthria and (76%) of them were swallowing semisolid food.

Table (3) Illustrates an improvement with highly statistically significant differences detected between dysphagic patients' knowledge regarding Shaker swallowing exercise pre, post two weeks, and one-month post- implementation (P<0.001).

Table (4) showed that, the mean score of the studied dysphagic patients' total knowledge score regarding Shaker swallowing exercise was (3.13±2.05) before implementation which improved to (12.45±1.36) after two weeks and become (10.40±2.32) after one month of implementation with highly statistically significant differences regarding Shaker swallowing exercise (p=0.000).

Figure (1) demonstrated the total knowledge level of the studied dysphagic patients in pre and post implementation. It was observed that (82%) of the studied dysphagic patients had unsatisfactory knowledge level about Shaker swallowing exercise pre- and decreased to become (16%) in post- two weeks of implementation. Reversely, (16%) of the studied dysphagic patients had satisfactory knowledge level regarding Shaker swallowing exercise pre-implementation compared to (84 %) of them in the post-two weeks of implementation. While, post-one month of implementation (88%) of the studied dysphagic patients had satisfactory knowledge level regarding Shaker swallowing exercise.

Table (5) illustrates that there was a highly statistically significant differences and an improvement detected between dysphagic patients' reported practices regarding Shaker swallowing exercise pre, post two weeks, and one-month post- implementation (P<0.001).

Table (6) showed that, the mean score of the studied dysphagic patients' total practices score regarding Shaker swallowing exercise was (2.10±1.04) before implementation and increased to (8.43±1.34) after two weeks and become (7.30±2.30) after one month of implementation with highly statistically significant differences regarding Shaker swallowing exercise with (p=0.000).

Figure (2) portrayed the total reported practices level of the studied dysphagic patients in pre and post implementation. It was observed that (85%) of the studied dysphagic patients had inadequate reported practices level about Shaker swallowing exercise pre- and decreased to become (13%) in post- two weeks of implementation. Reversely, (15%) of the studied dysphagic patients had adequate reported practices level regarding Shaker swallowing exercise pre-implementation compared to (87 %) of them in the post-two weeks of implementation. While, post-one month of implementation (90%) of the studied dysphagic patients had adequate reported practices level regarding Shaker swallowing exercise.

Table (7): Showed that (46%) of the dysphagic patients always had apraxia of swallow pre implementation of swallowing exercise whilst, (90.0%) didn't have it post 1 month with a statistically significant difference post 2 weeks and post one month. (32%) of patients always had oral residue pre implementation of swallowing exercise, and post one month (86%) of them didn't have it with a statistically significant difference between pre and post 1 month (p=<0.001). As for coughing and throat clearing, (74%) of patients always had it pre, after 1month, 84% didn't have it among the studied patients with a statistically significant difference between pre, post 2 weeks and post one month (p= <0.045*). Concerning reduced laryngeal elevation, (86%) of patients never had reduced laryngeal elevation post-one month. In relation to multiple swallows per bolus, (38%) of patients always had it pre implementation while, (68%) of them didn't have it post 1 month.

Table (8) revealed the effectiveness of the swallowing exercises among the cerebrovascular accident dysphagic patients regarding their swallowing ability. The pretest mean was (52.43 ± 10.023). The posttest mean was (78.04 ± 8.46).

Table (9): Demonstrates a highly significant positive correlation found between dysphagic patient's total knowledge, practices, and swallowing ability. The correlation revealed significant positive linear correlations between knowledge- practices ($r = 0.293$, $p < 0.01$) knowledge- swallowing ability ($r = 0.322$, $p < 0.01$) and practices- swallowing ability ($r = 0.331$, $p < 0.01$).

Table (1): Distribution of the studied dysphagic patients regarding their demographic data (n=50):

Demographic data	No.	%
Age in years		
< 50	33	66.0
≤ 60	17	34.0
Gender		
Male	30	60.0
Female	20	40.0
Mean ±Stander deviation	48.33 ± 6.21	
Educational level		
- Illiterate	5	10
- Read and write	10	20
-Secondary education	20	40
-University education	15	30
Residence		
Urban	34	68.0
Rural	16	32.0
Occupation		
Working	34	68.0
Manual working	12	24.0
Not working	4	8.0

Table (2): Distribution of the studied dysphagic patients regarding their health relevant data (n=50):

Medical data	No.	%
Previous cerebrovascular stroke		
Yes	33	66.0
No	17	34.0
Type of stroke		
Ischemic	40	80
Hemorrhagic	10	20
Affection side		
Left hemisphere	16	32.0
Right hemisphere	34	68.0
Pattern of speech		
Dysarthria	29	58.0
Receptive aphasia	17	34.0
Expressive dysphasia	4	8.0
Consistency of diet		
Liquid	12	24.0
Semisolid	38	76.0

Table (3): Percentage distribution of the studied Dysphagic patients' knowledge regarding Shaker swallowing exercise pre, post two weeks, and one-month post- implementation (n. =50)

Dysphagic patients 'knowledge	Pre-implementation		Post- two weeks of implementation		Post- one month implementation		F	P-value
	No	%	No	%	No	%		
Overview of stroke								
Correct	26	52.0	49	98.0	45	90.0	113.4	<0.001**
Incorrect	24	48.0	1	2.0	5	0.0		
Effects of stroke on swallowing								<0.001**
Correct	29	58.0	48	96.0	46	92.0	130.5	
Incorrect	21	42.0	2	4.0	4	8.0		
Definition of dysphagia								<0.001**
Correct	27	54.0	47	94.0	45	90.0	120.7	
Incorrect	23	46.0	3	6.0	5	10.0		
Levels of food consistency given to the dysphagic patient								<0.001**
Correct	32	64.0	49	98.0	46	96	105.3	
Incorrect	18	36.0	1	2.0	4	4.0		
Types of food should be avoided for patients with dysphagia								<0.001**
- Correct	19	38.0	46	96	46	92.0	96.8	
- Incorrect	31	62.0	4	4.0	4	8.0		
Steps of feeding the dysphagic patients								<0.001**
Correct	30	60.0	47	94.0	45	90.0	85.9	
Incorrect	20	40.0	3	6.0	5	10.0		
Definition of Shaker exercise								<0.001**
Correct	22	44.0	46	96.0	47.0	94	102.8	
Incorrect	28	56.0	4	4.0	3.0	6.0		
Benefits of Shaker exercise								<0.001**
Correct	19	38.0	46	96	46	92.0	197.3	
Incorrect	31	62.0	4	4.0	4	8.0		
How to perform Shaker exercise								<0.001**
Correct	28	56.0	49	98.0	47	94.0	88.9	
Incorrect	22	44.0	1	2.0	3	6.0		

-Chi-square test * statistically significance p<0.05 (**) highly statistical significance at p < 0.001

Table (4): Percentage distribution of the studied dysphagic patients' total knowledge score regarding Shaker swallowing exercise pre, post two weeks, and one-month post-implementation (n=50)

Items	Pre-implementation	Post two weeks implementation	Post- one month implementation	t	P-value
Total knowledge score Mean± SD	3.13±2.05	12.45±1.36	10.40±2.32	**19.28**	**0.000****

(**) statistically significant at p ≤0.05 (**) highly statistical significance at p < 0.001

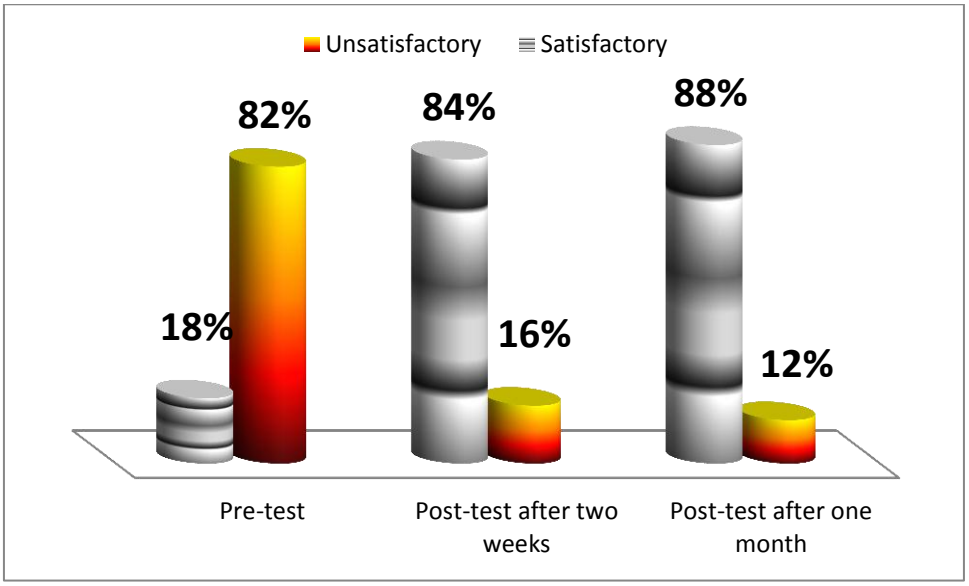

Figure (1): The total knowledge level of the studied dysphagic patients regarding Shaker swallowing exerciser, post two weeks, and one month of implementation

Table (5): Percentage distribution of the studied Dysphagic patients' reported practices regarding Shaker swallowing exercise pre, post two weeks, and one-month post- implementation (n. =50)

Dysphagic patients practices	Pre-implementation		Post- two weeks of implementation		Post- one month implementation		F	P-value
	No	%	No	%	No	%		
Definition of Shaker exercise							92.58	<0.001**
Correct	17	34.0	44	88.0	46.0	92		
Incorrect	33	66.0	6	12.0	4.0	8.0		
Benefits of Shaker exercise							97.73	<0.001**
Correct	15	30.0	43	86	47	94.0		
Incorrect	35	70.0	7	14.0	3	6.0		
Technique Shaker exercise							89.29	<0.001**
Correct	13	26.0	46	92.0	45	90.0		
Incorrect	37	74.0	4	8.0	5	10.0		

-Chi-square test * statistically significance p<0.05 (**) highly statistical significance at p < 0.001

Table (6): Percentage distribution of the studied dysphagic patients' total reported practices score regarding Shaker swallowing exercise pre, post two weeks, and one-month post-implementation (n=50)

Items	Pre-implementation	Post two weeks implementation	Post- one month implementation	t	P-value
Total practices score Mean± SD	2.10±1.04	8.43±1.34	7.30±2.30	**39.34**	**0.000****

(**) statistically significant at p ≤0.05 (**) highly statistical significance at p < 0.001

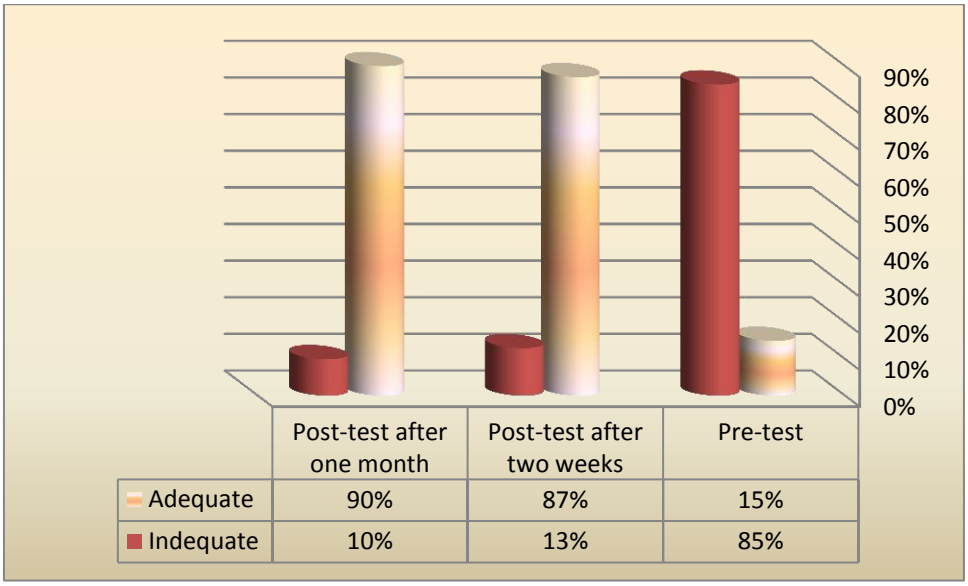

Figure (2): The total reported practices level of the studied dysphagic patients regarding Shaker swallowing exerciser, post two weeks, and one month of implementation.

Table (7): Frequency and percentage distribution and significance differences according to swallowing ability among the studied dysphagic patients pre, post two weeks, and post one-month

Dysphagic patients swallowing ability	No =(50)			P-value
	Pre (No/%)	Post two weeks (No/%)	Post one month (No/%)	
Apraxia of swallow				
Never	19(38.0)	37(74.0)	45(90.0)	<0.001*
sometimes	8(16.0)	4(8.0)	2(4.0)	19.430
always	23(46.0)	9(18.0)	3(6.0)	
Oral residue				
Never	30(60.0)	42 (84.0)	43(86.0)	<0.001*
Sometimes	4(8.0)	4(8.0)	6(12.0)	20.220
Always	16(32.0)	4(8.0)	1(2.0)	
Coughing/throat clearing				
Never	9 (18.0)	15 (30.0)	42(84.0)	0.009 *
Sometimes	4(8.0)	4(8.0)	2(4.0)	10.457
Always	37(74.0)	31(62.0)	6(12.0)	
Delayed pharyngeal swallow				
Never	20 (40)	25 (50.0)	37(74.0)	<0.004*
Sometimes	6(12)	7(14.0)	4(8.0)	(8.230)
Always	24(48)	18(36.0)	9(18.0)	
Reduced laryngeal elevation				
Never	38(76.0)	42(84.0)	43(86.0)	<0.001*
Sometimes	4(8.0)	4(8.0)	4(8.0)	20.123
Always	8(16.0)	4(8.0)	3(6.0)	
Multiple swallows per bolus				
Never				<0.008*
Sometimes	21(42.0)	27 (54.0)	34(68.0)	8.123
Always	10(20.0)	9(18.0)	6(12.0)	
	19(38.0)	14(28.0)	10(20.0)	

-Chi-square test * statistically significance p<0.05 ** statistically significance p<0.001

Table (8): Determination of overall swallowing ability score pre and post administration of exercises among the cerebrovascular accident dysphagic patient

Overall Swallowing Ability Score	Mini-Max Score	Pretest Mean ± SD	Posttest Mean ± SD	Paired 't' test	P-value
	0-100	52.43 ± 10.023	78.04 ± 8.46	16.63	**<0.001***

-Using Paired't'test ** statistically significance p<0.001

Table (9): Correlation between dysphagic patient's total knowledge, practices, and swallowing ability

Variable	Correlation coefficient	P-value
Knowledge- practices	0.293	<0.01
Knowledge- swallowing ability	0.322	<0.01
Practices- swallowing ability	0.331	<0.01

Correlation statistically significance p<0.05 ** statistically significance p<0.01

Discussion

Dysphagia, or paralysis of the throat muscles, is most commonly caused by stroke. This illness can cause difficulty swallowing, making it difficult to eat, drink, take medicine, or breathe (**Duarte, 2013**). Various swallowing training approaches have been created to solve the damaged process. Strengthening exercises, biofeedback stimulation, temperature, and taste stimulation are some of these ways (**Kim et al., 2017**).

Early dysphagia screening is critical for preventing future health difficulties and should be a top focus in healthcare practices. Nurses should be familiar with the signs and symptoms of dysphagia to recognize dysphagic patients (**Tanton, 2016).** Dysphagia is most commonly treated with a swallowing training program that includes compensatory exercises. Swallowing exercises help stroke patients adjust and make swallowing safer, as well as modify food textures to make food more manageable (**Lazarus et al.; 2014**).

The results of the present study revealed that more than two-thirds of the studied patients their age were with a mean age of 48.33 ± 6.21and three fifths of them were male. These findings are considered extraneous factors that might confuse the effect of swallowing training on swallowing ability. These findings are in line with **Ebrahiem et al., (2018)** who reported in the study entitled "Effect of swallowing training program on dysphagia following cerebrovascular stroke" that most of the studied patients were men. In men is higher than in women and its risk doubling with age above 60 years in both gender. That is due to the arteriosclerotic changes that occur in the brain with aging, this is accompanied with one or more of the modifiable risk factors of stroke (**Weber and Kelley, 2018).**

The present study illustrated that majority of the studied patients complained of ischemic dysphagia. This result is similar to **Paik & Wolff (2017)**, who found in their study about "Dysphagia management strategies" that ischemic stroke with dysphagia, was the most prevalent kind of stroke.

The present study illustrated that more than half of the studied patients were complained from dysarthria. These findings are in line with **Joundi (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. This is due to the pathology of stroke which affects the muscle control (**National stroke association, 2018)**

The results of the present study indicated that there was an improvement with a highly statistically significant difference between dysphagic patients' knowledge regarding Shaker swallowing exercise pre/post implementation. From the researchers' point of view, this result reflects the positive effect of Shaker swallowing exercise implementation, which meets the dysphagic patients' needs and provide them with sufficient knowledge.

Concerning the total knowledge level of the studied dysphagic patients in pre and post-Shaker swallowing exercise implementation,

the result of the current study revealed that the majority of the studied dysphagic patients had satisfactory knowledge levels regarding Shaker swallowing exercise post-implementation. From the researchers' point of view, this improvement emphasizes the fact that most patients have a strong desire to learn more knowledge about their conditions and show the effect of the Shaker swallowing exercise implementation.

As regard the total practices level of the studied dysphagic patients in pre and post-Shaker swallowing exercise implementation, the findings of the current study revealed that the majority of the studied dysphagic patients had adequate practices levels regarding Shaker swallowing exercise post-implementation. From the researchers' point of view, this improvement confirmed the improving patients' knowledge about their conditions reflected on their practices and emphasized the good effect of the Shaker swallowing exercise implementation.

Concerning swallowing ability, findings of the present study revealed that less than half of the dysphagic patients always had apraxia of swallow pre Shaker swallowing exercise implementation whilst, the majority didn't have it post 1 month of Shaker swallowing exercise implementation with a statistically significant difference post 2 weeks and post one month of Shaker swallowing exercise implementation as well as oral residue, coughing and throat clearing, reduced laryngeal elevation, and multiple swallows per bolus, also improved post one month of the Shaker swallowing exercise implementation.

From the researchers' point of view, a low level of dysphagia enhances patients` functional level of oral intake. This improvement could be due to the application of swallowing exercises. The swallowing exercises increased the range of movement and muscle strength and activation of the tongue, lips, and jaw, improved laryngeal elevation, swallowing initiation, and post swallowing residue which helped in improving the swallowing function, dysphagia, and reducing the risk of aspiration.

The current study findings are supported by **Susan& Jessica (2015**) in their study about " Efficacy of exercises to rehabilitate dysphagia " and indicated that the Shaker Head Lift, which included both isometric and isokinetic exercises, had no positive benefits after one week and required more time to strengthen the suprahyoid muscles and enhance the opening of the upper esophageal sphincter in dysphagia patients.

This finding point to a possible beneficial effect of shaker exercise in the treatment of dysphagia in patients with cerebrovascular accident, this is because shaker exercise improves the contraction of the thyrohyoid muscle, strengthens the suprahyoid muscles, and aids the upward and forward movement of the larynx, thus opening the upper esophageal sphincter (UES) (**Antunes and Lunet 2013**). Furthermore, due to its proximity to the pharyngeal muscle, it enhances both infrahyoid and suprahyoid muscular activity, lowers pyriform sinus residue and backflow aspiration, and recovers oesphysiologic alterations in the suprahyoid muscles (**Logemann et al. 2011**).

The results of the current study are also similar to the results of **Chulay& Suzanne (2016)** who studied **"** Essentials of Critical Care Nursing Pocket Handbook, neurological concepts, cranial nerve function"**, and Carr& Shepherd, (2018)** who studied " Stroke rehabilitation guidelines for exercises and training to optimize motor skills "and found that return of swallowing to normal level after dysphagic cerebrovascular accident is associated with educating patients and family about howtousethecompensatoryposturesandhowtoperformoralmotorexercises.

Also, the results of this study are in accordance with **Kang et al, (2014)** who stated in their study about " The effect of bedside exercise program on cerebrovascular accident patients with dysphagia " that, a bedside exercise program showed an improvement in dysphagiaseverityal so appositive secondary effect showed improvement in mood state and quality of life of patients with acute cerebrovascular accident. Also, the results of the present study are supported by the results of **Robbins et al., (2016)** who found in their study entitled "Age-related differences in pressures generated during isometric presses and

swallows by healthy adults." that, four weeks of exercise decrease dysphagia severity inpatients with stroke. These findings can be linked to the shaker exercise since it reduced aspiration, decreased pyriform fossa residue, and helped with pharyngeal peristalsis due to the improved suprahyoid muscles **(Basiri, Vali, &Agah, 2017).**

These findings are in the same line with **(those Elfetoh&Karaly, 2018**) who studied the " Effect of swallowing training program on dysphagia following cerebrovascular stroke" and found that many patients had multiple swallows with biscuits due to delaying of oropharyngeal reflex and only a few patients had drooling resulting from poor muscle tone around the lips but after implementing of the swallowing shaker exercise, the results showed that more than half of the studied patients had an improvement in their swallowing level regarding different food consistencies. Also, these findings are supported by **Joundi (2017)** who reported in his study about the" Predictors and outcomes rehabilitation program of dysphagia screening after acute ischemic stroke" which include positioning, oral motor range of motion exercises, and adjusting bolus consistency for patients suffering from dysphagia following acute ischemic stroke to normal swallow (level7attheswallowing rating scale).

The results of the present study showed the effectiveness of the swallowing exercises among the cerebrovascular accident dysphagic patients regarding their swallowing ability which the post-test mean was increased, high, and significant. From the researchers' point of view, the application of swallowing exercises was effective among the cerebrovascular accident patients regarding their swallowing ability and improved swallowing ability of patients after application of the swallowing exercises by one month.

The present study is supported by **Jansi et al. (2013**), who conducted a study to assess the effectiveness of dysphagia exercises on swallowing ability among patients with CVA. The investigation results portray that the examination gathering's pre-test and a post-test mean score of circuitous swallowing ability was less in the pre-test mean score test which improved in the post-test. The investigation discoveries were steady with the outcomes drawn by **Kang et al., (2014)** who did a randomized preliminary bedside practice program comprising oral, pharyngeal, and laryngeal activities to improve the swallowing ability among patients with CVA. Patients who went to the activities program demonstrated a noteworthy improvement in their swallowing ability than the control group.

Similary, **Diana, et al., (2014)** conducted a study on "Effectiveness of Swallowing exercises on Swallowing Ability among Patients with Cerebrovascular Accident in selected Hospitals" and found that swallowing exercises were effective in improvement of swallowing ability among patients with cerebrovascular accidents.

The results of the present study showed a highly significant positive correlation found between dysphagic patient's total knowledge, practices, and swallowing ability. It is reflected that adequate knowledge can lead to positive practices resulting in improving in swallowing ability.

Conclusion:

Based on the study results, the current study findings concluded that Shaker's swallowing exercises were effective in improving swallowing ability among dysphagic patients with cerebrovascular accident.

Recommendation:

Based on the findings of the present study, the following recommendations were suggested: -

- All dysphagic patients with cerebrovascular accident should be given the swallowing exercises instructional leaflet, which contains a full explanation and illustrated photographs.
- Shaker's swallowing exercise is recommended to be used in clinical settings for dysphagic patients with a cerebrovascular accident in medical wards and the Neurological ward.
- Replication of the current study on a larger probability sample is recommended for generalized results.

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