Effect of Shaker Exercise on Dysphagia Level among Patients with Cerebral Vascular Stroke

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Abstract

Background: Dysphagia is one of the major post-stroke complications that can severely damage patient's quality of life and even endangers patients' lives. Shaker exercise is one of the indirect methods, behavioral swallowing techniques, may increase the swallowing speed and sensitivity. **The aim of the study** was to evaluate the effect of Shaker exercise on dysphagia level among patients with cerebral vascular stroke. **Study design:** A quasi-experimental design was utilized to achieve this aim. **Setting:** This study was conducted at Neurology Ward, Stroke ICU and Intermediate Neurological ICU affiliated to Ain Shams University Hospital, Cairo. **Sample:** A purposive sample included 68 patients. **Tools of data collection:** Data were collected using three tools: 1- Structured Interviewing Questionnaire, 2- Clinical data tool, 3- Gugging Swallowing Screening (GUSS) scale. **Results:** There was a highly statistical significance difference in GUSS score of dysphagia level among patients pre and post implementation of Shaker exercise ($P<0.001$). **The Conclusion**: Dysphagia exercise therapy as Shaker exercise was an effective measure in enhancing the swallowing ability among stroke-induced dysphagia patients. **Recommendation**: Replicate the study on a larger group; selected from different geographical areas in Egypt to obtain more generalized findings in relation to current study.

Key words: Shaker exercise, Dysphagia, Cerebral vascular Stroke.

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Introduction

Stroke is a medical condition which affects the arteries leading to destruction in the brain tissues. Stroke is the fifth reason of death and a chief cause of inability. It can be caused either by a clot blocking the stream of blood to the brain (called an ischemic stroke) or by a blood vessel splitting and inhibiting blood flow to the brain (called a hemorrhagic stroke). The signs of stroke comprise sudden numbness or feebleness in the face, arm, or leg. Sudden disturbance walking, dizziness, lack of balance, or coordination. Sudden disruption, upset speaking and dysphagia **(Centers for Diseases control and prevention, 2020).**

Cerebral lesions can disturb volitional swallowing functioning during the oral stage. This trouble might influence patient's quality of life, in addition to lead to malnourishment, dehydration, and aspiration pneumonia. Ordinarily, aspiration causes a vicious cough, but a stroke can decrease sensation. In this state silent aspiration may be happened. Severe aspiration pneumonia is life- menacing, and perhaps lead to death. Stroke induced dysphagia was naturally determined, but 30% of stroke patients demanded continued parenteral nutrition or percutaneous endoscopic gastrostomy **(American Stroke Association, 2020).**

Patients with stroke induced dysphagia ordinarily show diminished force of the oropharyngeal muscles like the tongue and suprahyoid muscles, that leading to not only oral dysfunction but also aspiration in the pharyngeal phase **(Santhosh, 2017).** Additionally, deficiency of the suprahyoid muscles straightly affects hyolaryngeal movements producing pharyngeal dysphagia, which can cause pharyngeal residue and aspiration (**Park et al., 2019)**

Diagnostic modalities contain history and physical examination through early screening and identification of swallowing process by nurses to evade reverse health consequences as aspiration, pneumonia, dehydration, malnourishment, weight loss, and tendency to death. There are a great number of therapeutic approaches for dysphagia, centered on the type of debit in the patient. Swallow studies usually define when aspiration happens in relation to the transit of the swallowed material through the oropharynx **(Bragg et al., 2017).** Rehabilitation of the swallow at current be

contingent on the strengthening of hyoid musculature. This has taken numerous approaches, with inconstant effect. Tongue strengthening exercises have been revealed to benefit and promote swallowing safety after stroke. Exercises that work straightway on the hyoid musculature as the Shaker exercise motivates the suprahyoid muscles and donates to the rise in muscle stimulation **(Smithard, 2016).**

Non-invasive Shaker exercise (also called the head lift) was established to expand the duration and width of upper esophageal sphincter opening. In the process, eradicate aspiration in patients with remainder in the pharynx after the swallow because of penurious upper esophageal sphincter opening thorough deliberate approach to plan and assess this exercise by means of two portions isometric and isokinetic type of exercises **(Babu et al., 2017).** The isometric strengthening part of the Shaker exercise involves three head lif**ts** held for 60 second with a 60 second repose period between each of the three held head lifts. Isometric exercise is determined as resistance without movement. Tension promotes in the muscle; however, the muscle does not shorten or lengthen. Efficient isometric contractions should be achieved until the exerciser experiences muscle fatigue and then the exercise should be repetitive numerous times for extreme benefit **(Poorjavad et al., 2019).**

Likewise, the isokinetic part of the Shaker exercise involves 30 sequential head lifts done without ‘‘holding’’ the head lift, as defined in the isometric part. The rapidity of the repeated head lifts is preserved relatively persistent. Isokinetic exercise benefit is attained when the muscle shortens against an compliant resistance. The resistance matches the shortening force and is created by the muscle throughout the full range of motion. The slower the rapidity of the isokinetic motion, the better the strength gains will be **(Shin et al., 2019).**

Significance of the study:

The incidence and prevalence of stroke in Egypt are high as conducted by **Abd-Allah et al., (2019)** as dysphagia has a prevalence of about 50% up to 80% in stroke stayers and causes several complications such like dehydration, weight loss, malnourishment and is related to social and psychological burden that decrease quality of life for patients, family, and caregivers. In particular, aspiration is identified to happen in about 19.5% to 42% of acute stroke patients and aspiration pneumonia is a severe complication because it can lead to death. Therefore, dysphagia rehabilitation is not only vital for safe swallowing, it can also diminish morbidity and mortality, decrease length of hospitalization, and healthcare expenditures.

Dysphagia happens in about 51-78% of stroke patients and if unknown may result in pulmonary complications such aspiration pneumonia with incidences of 13%-33% **(Warda & Ebrahim, 2018).** Therefore, effective and competent management is essential. Behavioral therapy for swallowing rehabilitation centered on suprahyoid muscles strengthens that placed below the chin. Shaker exercise, rouses the suprahyoid muscles which play a very central role in normal swallowing. The contraction of these muscles in the pharyngeal phase jerks the hyoid bone forward and upward, causing direct and indirect mechanisms of airway safety and opening of the upper esophageal sphincter **(Abd-Allah et al., 2019).**

Carrying out regular exercises has been revealed to improve daily swallowing function and reduce health care costs. The dated of hospitalization was found to be 8.8 days for those individuals with dysphagia versus 5 days for those without dysphagia. Even though the precise healthcare costs of dysphagia. So the present study was directed to evaluate the effect of Shaker exercise on the level of dysphagia among stroke patients **(Kusumaningsih et al., 2019).**

Aim of the Study:

The aim of the current study was to evaluate the effect of Shaker exercise on dysphagia level among patients with cerebral vascular stroke through the following:

1 -Assessing dysphagia level among patients with cerebral vascular stroke pre implementation of Shaker exercise.

2- Implementing Shaker exercise for patients with dysphagia.

3- Evaluating the effect of Shaker exercise on dysphagia level of patients with cerebral vascular stroke after implementation.

Research Hypothesis

The current study hypothesized that:

- Patients who performed Shaker exercise will have a significantly improvement of dysphagia level post implementation compared to pre implementation.

Subjects and Methods

A- Research design:

A quasi experimental design pre/posttest one group design was utilized in this study. Quasi-experimental research design inspects whether there is a contributing relationship between independent and dependent variables. The mark of a quasi-experimental design is an involvement in the lack of randomization, eases the search for knowledge and inspection of causation in situations in which wide-ranging control is not probable (**Rogers & Révész, 2020).** The pre-test/post-test' research design includes the measurement of relevant results both before exposing the sample to a provocation of some type and after exposure to the provocation. By constructing an experiment in this mean, a researcher can estimate alteration in targeted results as a function of existence exposed to the stimulus **(Braddock, 2019)**.

B- Setting:

The study was conducted at the Neurology department, Stroke ICU and intermediate neurological ICU affiliated to Ain Shams University Hospital, Cairo. Neurology Ward includes 20 beds, Stroke ICU includes 11 beds and intermediate neurological ICU includes 6 beds located on the hospital's 2nd floor.

C- Subject:

Over six consecutive months; A purposive non-probability/non-randomized sample of sixty-eight adult patients from both genders hospitalized in Neurology Ward, 4 patients extract from the study during follow up phase. Hence 64 patients stay until finishing the study. The study was from May 2019 to October 2019. The sample size was specified statistically based on power analysis bearing in mind the total number of patients (872 patients) with stroke during the year (2018).

The sample size calculation done based on power analysis:

Type I error (α) = 0.05
Type ΙΙ error (B) = 0.2
With power of test: 0.80
(I-B) 80 %
Confidence interval = 95%

Using the following equation:

$$n = \frac{N \times p(1-p)}{\left[\left[N-1\times\left(d^2 \div z^2\right)\right] + p(1-p)\right]}$$

Nxp(1-p)	=(872*(0.2*(1-0.2)))/
N-1	=(872-1)*
d2/z2	=0.0025 / 3.8416+
p(1-p)	=0.2*(1-0.2)
N	=100

Inclusion criteria:

The study sample was nominated according to the following criteria:

- Patients newly diagnosed with stroke first time.
- Have swallowing dysfunction for liquid, soft/hard food or both.
- Patients who are conscious, cooperative and obeys commands.

Exclusion criteria:

- Communication problems.
- Head / neck problems.
- Cervical spine injury.
- Any psychiatric disease or mental disabilities.

D-Tools of data collection

I- Structured Interviewing Question-naire: it was written in Arabic language to assess demographic characteristics of the patients, it included age, gender, marital status, educational level, occupation and special habits.

II- Patients' clinical data: This tool was written in English language after reviewing the current correlated literature **(Smithard, 2016)** and was reserved from the patients' medical records included stroke type, affected brain region, affected body part, co-existing diseases, laboratory investigations, body mass index and type of meal.

III- Gugging Swallowing Screening (GUSS) scale: It was adopted from **Trapl, (2007)** to assess swallowing ability and level of dysphagia. The GUSS test is simple and

easy to use, which means good predictor ability for screening aspiration risk and grade the severity of dysphagia (**Abdelhamid & Abo-Hasseba, 2017).**

The GUSS test is divided into two parts: **part 1**, the preliminary assessment (indirect swallowing test) contains one subtest with a maximum of 5 points and **part 2**, the direct swallowing test which contains of 3 swallowing sub items specifically semisolid diet, liquid diet and solid diet with a maximum of 15 points. These 4 sub items must be done consecutively. A point system was chosen in which higher numbers denote better performance, with a maximum of 5 points that can be extended in each sub item. This maximum must be achieved to continue to the next sub item, with sum 20 scores (part 1 besides part 2). The highest potential score is 20, with a score of 14 representing risk of aspiration.

Score and interpretation of GUSS scale on level of dysphagia as follows:

20	No Dysphagia minimal risk of aspiration
15-19	Slight Dysphagia low risk of aspiration
10-14	Moderate dysphagia risk of aspiration
0-9	Severe dysphagia high risk of aspiration

Tools validity and reliability

Validity: assessing face and content validity of the recommended tools through a jury of five experts 4 professors of Medical Surgical Nursing in addition to 1 professor of Neurology, who revised the instrument, for clarity, relevance, comprehensiveness, understanding, and easiness for administration, no modifications were essential.

Reliability: Alpha Cronbach test was utilized to measure the internal consistency of the study tool. In which Gugging Swallowing Screening test was reliable at (93.3%).

Preparatory phase:

Administrative design: The necessary authorized consents were gotten from the administrators of the Ain Shams University Hospital. Letters of request were delivered to them from the Faculty of Nursing at Ain Shams University clarifying aim of the study and its expected outcomes. **Ethical considerations:** In order to protect patients' rights in field of the study, before the preliminary interview, a verbal consent was available from each patient after being acquainted about the nature, purpose and benefits of the study. Patients were also, acquainted that participation is voluntary and could draw at any time without giving reasons. Confidentiality" by asserting that the personal information will be saved confidential after being shared with the researchers and reassured patients that the data would be used only for the research purpose. Moreover, the intervention used in the present study is safe and not causing any hurt to participants.

- **Pilot Study:**

Once permission was approved to go ahead with the suggested study, a pilot study was executed before starting data collection on 7 of targeted patients (10% of the total number of the study sample) from the previously mentioned setting according to the inclusion criteria and excluded from the main sample to assess feasibility, the clarity, applicability of the tools, and calculate the time required to gather data to identify any possible obstacles that might face the researchers and restrict with data collection.

The study analysis of feasibility exposed that the patient's dysphagia level before shaker exercise was different after exercise. A pilot study also exposed that 60 seconds duration and three sets of 30 times of Shaker exercise were convenient for improving swallowing ability as verbalized by patients.

I- Implementation phase

Field work: The study was achieved from the beginning of May 2019 to October 2019, for patients accomplished inclusion criteria having swallowing difficulty. It was based on revising latest and related literatures regarding to Shaker exercise and stroke. The researchers were available in the morning shift at Neurology department, Stroke ICU and Intermediate Neurological ICU for three days/week. Purpose of the study was simply clarified to patients who agreed to participate in the study prior to data gathering. Data gathering was done by the researchers using the same tools for the same patient before and after the intervention (performing Shaker exercise).

The baseline assessment: The first time the researchers met the participants reflected the baseline measure. Data gathering were acquired

from participants in the previous mentioned settings which included demographic questionnaire, clinical data and Gugging Swallowing Screening (GUSS) scale. During the first interview, the researchers evaluate their swallowing condition (The first time for measurement without any intervention).

The researchers demonstrated shaker exercise for every patient individually using reinforced pictures and videotape beside hospital routine care to upkeep neck muscles with the aim of restoring oral intake and opening of the upper esophageal sphincter hence, hearten swallowing function **(Babu et al., 2017)**.

The researchers demonstrated the Shaker exercise and encourage participants to re-demonstrate the following steps and educated them that Shaker exercise must be performed three times per day.

Part I:

- Laying flat on back on the floor or bed.
- Holding the head off the bed looking at the feet for one minute.
- Don't elevating the shoulders off the bed when lifting head.
- Calming for one minute and repeating two more times.

Part II:

- Elevating the head up and forward and looking at the feet thirty times.
- Do not sustaining these head lifts or elevating the shoulders.

For engaged a thorough and considerate approach to the plan and assessment of this exercise the patient lies flat and, reserving the shoulders on the bed, raising the head to look at the toes. The patient keeps this position (the goal is 60 seconds) and then repeats these 2 more times. The second part of the exercise is a repetitive movement. In the same preliminary position, the patient elevates the head to look at the chin, lowers the head back to the bed and then repeats this 30 times. Three sets of 30 are the goal **(Babu et al., 2017).**

Evaluation phase:

The researchers assessed effect of shaker exercise on patients swallowing abilities by matching the results pre, post1 and post 2, the 2nd measurement (post1) after three days of administering Shaker exercise by using Gugging Swallowing Screening, after the first intervention then the 3rd measurement (post 2) after another four days, a week from baseline reading.

Statistical Design:

The data was coded and tabulated using a personal computer. Statistical Package for Social Science (SPSS) version 20 was used. Data was presented using descriptive statistics in form of frequencies and percentage. T- test was utilized as an inferential statistic was used to examine the effects of shaker exercise on the swallowing abilities at 3 times: before, post 1, and post 2, chi-square test was used to recognize relationship between qualitative variables and paired-t test also was used. Statistical significance was considered at P-value ≤ 0.05.

Results

Table (1): Number and percentage distribution of the patients' demographic characteristics (n=64)

Demographic characteristics	N	%
Age		
20- < 35	4	6.2
35- <45	11	17.2
45- <60	21	32.8
60 or more	28	43.8
Mean ± SD	**41.37±6.82**	
Gender		
Male	36	**56.2**
Female	28	43.8
Marital status		
Single	16	25.0
Married	48	**75.0**
Education Level		
Illiterate	19	**29.7**
Read & write	30	46.9
bachelor degree	15	**23.4**
Occupation		
Unemployed	13	20.3
need physical effort	32	**50.0**
need mental effort	19	29.7
Residence		
Rural	23	35.9
Urban	41	**64.1**
Special habits		
No	35	54.7
Smoking	22	**34.4**
Alcoholism	2	3.1
Drug abuse	5	**7.8**

Table 1 clarifies that, 17.2% of the patients their age ranged from 20 to 35 years old and 43.8% of them were more than 60 years old. Regarding gender of the studied patients, 56.2% of them were males and 75% of them were married. 29.7% of the studied patients were illiterate and 23.4% of them were high education. In relation patients' occupation 50.0% were working a job required physical effort, also 64.1% of them resided in urban areas. According to patients' special habits, this table shows that, 34.4% of patients under the study were smokers and 7.8% of them were drug addicts.

Table (2): Number and percentage distribution of the patients' clinical data (n=64)

Clinical data	N	%
Stroke type		
Hemorrhagic	19	29.7
Ischemic	45	70.3
Affected brain region		
Left	23	35.9
Right	35	54.7
Both	6	9.4
Affected body part		
Left side	21	32.8
Right side	31	48.4
Sensory affection	12	18.8
Past history		
Hypertension	53	82.8
Diabetes mellitus	34	53.1
Hyperlipidemia	32	50.0
Heart disease	25	39.1
Others	8	12.5
Body mass Index		
<18.5	14	21.9
18.5- 24.9	39	60.9
25- 29.9	11	17.2
Mean ± SD	22.7 ± 3.86	
History of aspiration	64	100.0

Table 2 shows that, 70.3% of the patients had ischemic stroke and 29.7% of them had hemorrhagic stroke. Regarding affected brain region among the studied patients, 54.7% of them had right brain region affection, also, 48.4 % of them had right side affection. In relation body mass index, the current result reveals that, 60.9% of the patients were normal weight and 17.2% of them were overweight and 100% of them exposed to aspiration.

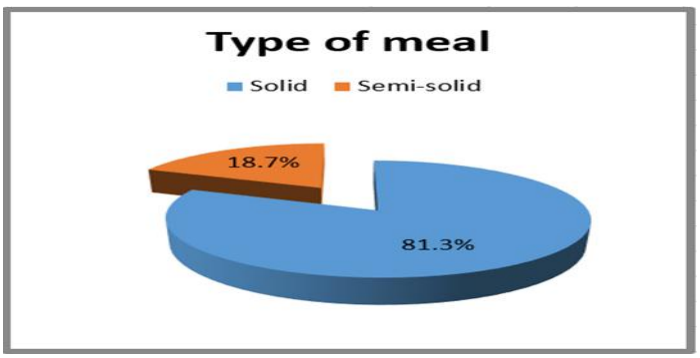

Figure (1) Percentage distribution of the patients' types of meal.

Figure (1) represents that, 81.3% of the studied patients eat solid meal with difficulty, and 18.7% eat semi-solid.

Table (3): Number and percentage distribution of the patients' laboratory investigations (n=64)

Laboratory investigations	N	%
Sodium		
Normal	17	26.6
Hyponatremia	33	51.6
Hypernatremia	14	21.9
Potassium		
Normal	35	54.7
Hypokalemia	21	32.8
Hyperkalemia	8	12.5
Magnesium		
Normal	42	65.6
Hypomagnesaemia	19	29.7
Hypermagnesaemia	3	4.7
Calcium		
Normal	46	71.9
Hypocalcemia	14	21.9
Hypercalcemia	4	6.3

Table 3 reveals that, 51.6% of the patients had hyponatremia and 32.8% of them had hypokalemia, while 65.6% of the patients had normal serum magnesium and 71.9% had normal calcium level.

Table (4) Difference between the patients' dysphagia symptoms & complications pre, post1 and post2 of the implementation of Shaker exercise (n=64)

Dysphagia symptoms & complications	Pre		Post 1 (three days later)		Post 2 (one week later)		Chi-square		
	N	%	N	%	N	%		X^2	P-value
Deglutition	55	85.9	13	20.3	8	12.5	t_1	55.341	<0.001*
							t_2	69.048	<0.001*
							t_3	1.424	0.233
Coughing	58	90.6	11	17.2	3	4.7	t_1	69.455	<0.001*
							t_2	94.739	<0.001*
							t_3	5.133	0.023*
Drooling	56	87.5	8	12.5	2	3.1	t_1	72.000	<0.001*
							t_2	91.933	<0.001*
							t_3	3.905	0.048*
Voice change	61	95.3	8	12.5	4	6.3	t_1	88.320	<0.001*
							t_2	101.556	<0.001*
							t_3	1.471	0.225

t_1=pre &post1 t_2=pre &post2 t_3= post1&post2 *p -value <0.001 significant
p-value>0.05 non-significant

Table 4 displays that, there were statistically significant differences regarding dysphagia items including deglutition, coughing, drooling and voice change pre and post 1 also, pre and post 2 of the implementations of the Shaker exercise p-value <0.001, while there were no statistically significant differences post1 and post 2 regarding deglutition and voice change.

Table (5) Difference between the patients' dysphagia level based on overall GUSS score pre, post1 and post2 of the implementation of Shaker exercise (n=64)

Dysphagia level		Pre		Post 1 (three days later)		Post 2 (one week later)	
		N	%	N	%	N	%
20: No dysphagia		0	0.0	3	4.7	7	10.9
15-19: mild dysphagia		0	0.0	39	60.9	44	68.8
10-14: moderate dysphagia		16	25.0	16	25.0	13	20.3
0-9: severe dysphagia		48	75.0	6	9.4	0	0.0
		t_1		t_2		t_3	
Chi-square	X^2	74.667		99.310		8.212	
	P-value	<0.001*		<0.001*		0.042*	

t_1=*pre &post1* t_2=*pre &post2* t_3= *post1&post2* *p -value <0.001 significant

Table 5 displays that, there were statistically significant differences regarding dysphagia level pre, post 1 and pre, post 2 of the implementation of the Shaker exercise p-value <0.001. Also, there were statistically significant differences regarding dysphagia level post 1, post 2 the implementation of the Shaker exercise p-value <0.05.

Table (6): Comparison between mean and standard deviation regarding patients' dysphagia level pre, post1 and post2 of the implementation of Shaker exercise (n=64)

Items	Dysphagia level		Paired t-test		
	Range	Mean ±SD		t	P-value
Pre	2-3	2.75±0.44	t_1	12.834	<0.001*
Post 1	0-3	1.39±0.73	t_2	18.647	<0.001*
Post 2	1-2	1.09±0.56	t_3	2.609	0.010*

**p -value <0.001 significant* t_1=*pre &post1* t_2=*pre &post2* t_3= *post1&post2*

Table 6 displays that, there were statistically significant differences between mean and standard deviation of patients' dysphagia level pre, post 1 (p-value = <0.001), pre and post2 (p-value <0.001) and post1, post 2 implementation of the Shaker exercise (p-value = <0.010).

Figure (2): Percentage distribution of patients' risk for aspiration pre, post1 and post2 of the implementation of Shaker exercise (n=64)

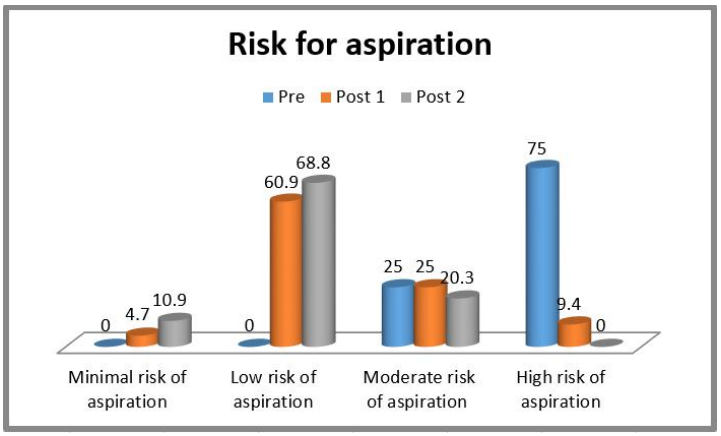

Figure (2) Clarifies that, there was a highly statistically significant difference in risk for aspiration in post 1 and post 2 implementation of the Shaker exercise (p<0.001*)

Discussion

Shaker exercise is a head lift exercise utilized to strengthen the suprahyoid muscles that are the agonistic swallowing muscles. Dysphagia commonly happens after stroke. Dysphagia is not only a cause for malnourishment, dehydration, aspiration and pneumonia after stroke, but also has an influence on stroke patients' quality of life. Treatment of dysphagia is very vital to decrease secondary complications. The chosen of the treatment election for patients with dysphagia should be centered on patient's condition, wanted and best available approach including Shaker exercise and other modalities **(Jong et al., 2020)**

Regarding patients' demographic characteristics, this study revealed that, the mean age of the patients was 41.37±6.82 this result might be due to increased incidence of dysphagia among middle age patients. This finding is inconsistent with **Hwangbo and Kim (2018),** in their study entitled **"**Effects of proprioceptive neuromuscular facility-ation neck flexion exercise and the shaker exercise on the activities of the suprahyoid muscles in chronic stroke patients with dysphagia" and found that, the mean age of studied patients was (60.13±8.98). Regarding the gender of studied patients, the existing study results exposed that, more than half of the patients were males, the incidence of stroke is higher in men than in women in all age classes because major stroke threat factors as history of cardiovascular diseases, diabetes and obesity are higher in men than women. This result is in agreement with **Bhuvaneshwari & Somiya (2020)** in study entitled "Effectiveness of dysphagia exercises on swallowing ability among patients with cerebrovascular accidents" and found that, more than half of the patients were male.

In relation to educational level, closely half of the studied patients were read and write, and more than one quarter was illiterate similar educational level, typical of a evolving country like Egypt. This result is similar to **Abdallah (2016)** in a study entitled "Factors affecting quality of life for patients with cerebrovascular stroke". Concerning occupation, the result of the recent study displayed that, half of patients worked in job required physical efforts. This result reflects the adverse significances that will happen resulted in younger patients' incapacity. This result is consistent with **Westerlind et al., (2017)** in a study entitled "Return to work after a stroke in working age persons; a six-year follow up" and found that, more than two thirds of patients with low socioeconomic status who worked in jobs need physical effort less often return to work 1 year after stroke.

Related patients' special habits, the result exposed that, more than one third of the patients were smokers. This result goes in the same line with **Marcel et al., (2016)** in their study entitled "Dysphagia in acute stroke: incidence, burden and impact on clinical outcome", and found that, about one third of the studied patients were smokers. This result reproduces the poor impact of smoking on the patients' health.

According to the type of stroke, this study exposed that, more than two thirds of the studied patients had ischemic stroke. This result is in covenant with **Elsaid & Shabaan, (2019)** in study entitled " Effectiveness of Exercises Based Dysphagia Therapy on Swallowing Ability for Patients with Cerebrovascular Accident" and found that, closely two thirds of the patients were ischemic stroke.

Regarding stroke location of the brain regions, the result presented that, about one third of patients had left side brain lesion while the minority of them had injuries in both sides. The result is in covenant with **Rofes et al., (2018),** who found that patients with swallowing disorders was similar for the right and left hemispheres also, the small number of patients with lesions in both hemispheres (8.5%).

Regarding past history, utmost of the patients had hypertension, followed in frequency by diabetes mellitus were a highest chronic disease concomitant with dysphagia in stroke patients due to these diseases are reflected a risk factor of stroke. These findings were comparable to **Shafaee et al., (2016)** who found that, the majority of stroke patients had hypertension monitored by hyperlipidemia and diabetes mellitus in their study entitled "Perception of stroke and knowledge of potential risk factors among Omani patients at increased risk for stroke". In relation to body mass index, this study discovered that, about one fifth of patients were underweight while, three fifths of them were

normal weight. There is no weight loss in more than tree fifths because the patients were newly detected and had no nutritional defects. This is in difference with **Aliasghari et al., (2019)** who found that, 34.4% of the studied patients were malnourished, 42.3% were at threat of malnutrition, and 23.3% were well nurtured.

Concerning to type of meals the researchers found that about quarter of studied patients modified their meals to be semi solid which reflects a positive step from their side to harmonize with swallowing difficulty. Also the present study exposed that all studied patients have history of aspiration. This finding is because of complication of swallowing debility, which may be life-threatening, and perhaps lead to death. This is in covenant with **Warda & Ebrahim (2018)** who found that, the plurality of studied patients have history of aspiration as one of dysphagia associated health consequences among patients with acute stroke in their study entitled "Dysphagia Related health consequences among patients with acute stroke in Cairo, Egypt".

The existing study exposed that, regarding serum electrolytes among the studied patients, more than half of patients had hyponatremia and around one third of them had hypokalemia. This result may be due to lack of patient's capability to swallow normally as a result of their condition which reflected to be a cause of electrolytes disorders. This result goes in the same line with **Jingchuan et al., (2020)**, who found that, hypokalemia is the most mutual electrolyte disorder (50.2%) after intracerebral hemorrhage, followed by hyponatremia (19.8%).

In relation to Gugging swallowing screen including deglutition, coughing, drooling voice change among patients with dysphagia, the result of the present study revealed that, there was a statistically significant difference pre and post implementation of Shaker exercise in all Gugging swallowing screen items $p<0.001$. This result supports our hypothesis and clarifies the improvement of swallowing function associated with Shaker exercise. This result is consistent with **Abdel Hamid and Abo-Hasseba, (2017)** in a study entitled "Application of the GUSS test on adult Egyptian dysphagic patients", who found that GUSS test verified to be a valid, and consistent test to forecast the risk for aspiration and degree of dysphagia among the adult Egyptian patients.

The researchers assessed dysphagia level pre, post1 after three days and post 2 after another four days of administering Shaker exercise using Gugging Swallowing Screening scale, actually based on **Dejong (2016)**, in a study entitled "Is the Shaker exercise effective in rehabilitating swallowing function in individuals with dysphagia due to upper esophageal dysfunction? Critical review" and showed that, Shaker exercise has an immediate affirmative effect after the first intervention. The present study displayed greater improvement of dysphagia level post implementation of Shaker exercise ($p<0.001$). This result specifies the positive effect of Shaker exercise on swallowing muscles. The existing finding is in agreement with **Choi et al., (2017),** who studied "Effects of Shaker exercise in stroke survivors with oropharyngeal dysphagia" and found that, the experimental group exhibited greater improvement on both the swallowing function ($p<0.05$) compared with the control group, so, this results of this study advocate that Shaker exercise is an efficient exercise for recovery of swallowing function in stroke survivors with dysphagia.

Furthermore, there were a statistically significance differences between total dysphagia levels pre and post implementation of Shaker exercise among studied patients mean ±standard deviation was 2.75±0.44 with $p<0.001$. This finding is similar to **Kang, et al., (2012)** in their study entitled "The effect of bedside exercise program on stroke patients with dysphagia" and found that, implementation of exercise program including Shaker exercise significantly enhanced, compared to that of the controlled group and it could be a beneficial modality to restore the dysphagia patients.

Stroke leaves squeal in the shape of a neurological deficit that can affect the quality of life of patients. Nurses through nursing interventions play an vital role in improving the outcome of stroke patients **(Permata & Irawati, 2019)**. Appropriate nursing interventions as early dysphagia screening and swallowing ability assessment help to decrease the odds of Stroke-Associated Pneumonia **(Eltringham, et al., 2018).**

Conclusion

The current study concluded that:

There were a statistically significant differences regarding dysphagia items including deglutition, coughing, drooling and voice change pre, post 1 and post 2 of the implementations of the Shaker exercise p-value equal <0.001. There were statistically significant differences between mean and standard deviation of patients' dysphagia level pre, post 1 (p-value equal <0.001), pre and post2 (p-value equal <0.001) and post1, post 2 implementation of the Shaker exercise (p-value equal <0.010).

Recommendations

- Replicate the study on a greater group; selected from different geographical areas in Egypt to gain more generalized findings in relation to present study.
- Shaker exercise should be accomplished by patients who have swallowing problems to improve swallowing and eating capability.

Nursing implication of the study

It was found that Shaker exercise was valuable, easily to instruct patients and improves their swallowing function beside the medical treatment.

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