

## Effect of Swallowing Exercise Training on Dysphagia and Quality of Life among Patients Following Cerebrovascular Stroke

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### Abstract

**Background:** Stroke patient usually exposed to dysphagia, these patients may be recovered within several weeks but prolonged dysphagia can cause severe complications such as malnutrition, pneumonia, and dehydration. Also, it affects patient's quality of life and mental health. So, **the aim** was to evaluate the effect of swallowing exercise training on dysphagia and quality of life among patients following cerebrovascular stroke. **Subjects & Method,** this study was utilized a quasi-experimental research design, conducted at Neurological Department at International General Hospital at Mansoura city, Egypt. Study sample comprised of 60 patients, was classified into 2 equal groups, study group who performed swallowing exercise training, control group who received ordinary routine hospital care. Four tools had been used in this research, Tool I Structured Interviewing Questionnaire; it consisted of two parts; Part I: Demographic Data Sheet, Part II: Medical Health Profile. Tool II Gugging Swallowing Screen Scale. Tool III Functional Oral Intake Scale and Tool IV Quality of Life Scale for stroke patient. **Results:** illustrated that there was highly statistically significant difference in swallowing ability levels and quality of life mean score after implementing swallowing exercise training among patients in study group than control group ( $p < 0.001$ ). **Conclusion,** Swallowing exercise training had highly statistically significant effective role on improving swallowing ability levels and quality of life for patients following cerebrovascular stroke. **Recommendation:** swallowing exercise is recommended to be used for dysphagic patients following cerebrovascular accident as apart od medical management.

**Keywords:** Cerebrovascular Stroke, Dysphagia, Quality of life, Swallowing Exercise Training.

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### Introduction

Cerebrovascular accident is one of the most leading causes for morbidity and mortality all over the world. It's a chronic health condition that affect negatively on quality of life, and it caused by disruption of blood supply to any section of brain (Bhuvaneshwari, & Somiya, 2020). Cerebrovascular accident can effect on many body functions such as motor activity, swallowing, sensation, communication, and intellectual.

Dysphagia results from weakness into both oral and throat muscles causing trapping of food or liquids on trachea, it manifested by excessive coughing, drooling, choking during eating and difficult in speaking or hoarseness. The prevalence of dysphagia in stroke patient ranged between 14%-94% and some cases may recover spontaneously (Mourao, Lemos, Almeida, Vicente, & Teixeira, 2016).

Dysphagia leading to some medical complications, such as increased hospitalization, risk of aspirated pneumonia, and morbidity. It is associated with poor psychosocial health outcomes such as reduced nutrition, hydration, and quality of life (Choy, Pourkazeml, Anderson, & Bogaardt, 2022).

Nurses had a basic role during treatment of swallowing disabilities, because of no pharmacological treatment for oropharyngeal dysphagia. Swallowing exercise is considering the essential management for dysphagia to reestablish normal oral feeding and prevent its complication. After complete evaluation of swallowing disability, swallowing rehabilitation program should be started (Abo Elfetoh, & Karaly, 2018).

### Significant of the study

Dysphagia is a dangerous potential condition. Most of people believe that ability of swallowing is granted, but complications related to swallowing have a harmful effect on

person's quality of life. Although these dangers, it's easily to overcome when prioritizing care for patients. Swallowing exercises remains the main rehabilitation strategy for dysphagia because it cans strength muscles, and improves functional and physiological changes in swallowing abilities. So that this study was implemented to evaluate effectiveness of swallowing training exercise on dysphagia levels.

### **Aim of the study**

Evaluate the effect of swallowing exercise training on dysphagia and quality of life among patients following cerebrovascular stroke.

### **Specific objectives:**

To assess Dysphagia levels before and after implementation.

To find outcome of swallowing exercise training on quality of life among stroke patients.

### **Research Hypothesis:**

Stroke patients suffering from dysphagia, who implement swallowing exercise training will have an improvement in swallowing ability level and quality of life than patients in control group.

Operational Definition of Dysphagia:

A difficult of swallowing to liquid or semisolid or solid materials which assessed through direct and indirect swallowing test to determine its level.

### **Subjects and method**

#### **Research design:**

A quasi-experimental design was utilized in this study. This design is important to the nature of the study, having one or more group subjects observed on pre and post implementation (Creswell, 2012).

#### **Setting:**

This study was conducted at Neurological Department at International General Hospital, Mansoura City, Egypt. This setting was selected because a highly admission rate of cerebrovascular stroke patients. It is one of the largest medical setting, Affiliated to the

Ministry of Health in the Dakahlia Governorate and provide many citizens in the governorates of Dakahlia, and other patients from different places in the country.

#### **Sampling:**

A purposive sample was used, subjects were selected through a non-probability sampling technique. The study comprised of 60 patients of both sexes. They divided into 2 equivalent groups, study group which consisted of 30 adult participants who applied for them different swallowing exercise training and control group that consisted of 30 adult patients, who received ordinary hospital care for dysphagia. Patients selected according to the following criteria;

#### **Inclusion criteria**

- Aged from 20 to 60 years.
- Both sexes.
- Newly diagnosed (1-2 days) stroke with symptoms of dysphagia.
- Patients who were conscious and cooperative.
- Able to understand and follow instruction (No aphasia or dysphasia).
- Capability of sitting posture.

#### **Exclusion criteria**

- Patients who had other disease that cause dysphagia problem.
- Patients who had sever cognitive disorder.
- Patients who diagnosed with pneumonia.
- Refuse to participate in the study.
- Sample size calculation:

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

#### **Tools and data collection:**

Four tools were used in this study as following;

**Tool I:** Structured Interviewing Questionnaire: the researchers created this tool based on recent literatures (Yousef, El-Deeb, & Rady, 2020; Elsaid, & Shabaan, 2019) and it involved two parts;

**Part I:** Demographic Data Sheet: It used for collection of personal data such as sex, age, occupation, marital status, and educational level.

**Part II:** Medical Health Profile; This part included data such as causes of stroke, site of affection, past medical history, consistency of diet, and symptom related to dysphagia.

**Tool II;** Gugging Swallowing Screen (GUSS); this tool was adopted from (**Trapl, Enderle, Nowotny, Teuschl, Matz, Dachenhausen & Brainin, 2007**) to assess levels of dysphagia. It consisted of 2 sections, section I included indirect swallowing test and section II involved direct swallowing test. The evaluation of GUSS for dysphagia was (20) indicated for no dysphagia, (15-19) referred to slight dysphagia with aspiration, (10-14) indicated to moderate dysphagia with aspiration risk, and (0-9) referred to severe dysphagia with high risk of aspiration.

**Tool III;** Functional Oral Intake Scale (FOIS); this tool was adopted from (**Crary, Carnaby, & Groher, 2005**). It included 7-point scale which describes feeding ability and different states of NG feeding. The level from 1-3 referred to tube dependent, while the level from 4-7 referred to total oral intake with different in consistency of supplements.

**Tool IV:** Quality of Life Scale for stroke patient (QOLSS); this tool was adopted from (**Williams, Weinberger, Harris, Clark, & Biller, 1999**). It used to assess quality of life for stroke patient, it included 12 parameters "energy, personality, family roles, self-care, language, mobility, vision, mood, social roles, thinking, upper extremity function, and work or productivity".

Scoring for each parameter items ranged from 1-5, as indicated;

Score	Description
1	Total help _ Couldn't do it at all_ Strongly agree
2	A lot of help _ A lot of trouble_ Moderately agree
3	Some help _ Some trouble_ Neither agree nor disagree
4	A little help_ A little trouble_ Moderately disagree
5	No help needed_ No trouble at all_ Strongly disagree

**Validity of the tools:** The content validity of the tools was tested through a jury of 5 experts into Medicine and Nursing Faculty Staff 2 neurological professors at Faculty of Medicine and 3 professors at Faculty of Nursing, Mansoura university to ensure sentence clarity and content appropriateness and any required adjustment was done.

**Reliability:** was between (0.844 - 0.846) for GUSS through using Cronbach's alpha (Umay, Gurcay, Bahceci, Ozturk, Yilmaz, Gundogdu, Ceylan, etal, 2018), reliability for FOIS ranged from 0.83 to 0.90 (Kunieda, Ohno, Fujishima, Hojo, & Morita, 2013) and tool IV reliability by using Cronbach's alpha was  $\alpha = 0.96$  (Mahmoodi, Safari , Vossoughi , Haghghi , Sarvestani , Ghaem, & Haghghi, 2015).

**Pilot study:** Tools have been tested for feasibility, applicability, clarity through application of pilot study on (10%) 6 of subjects not included in the actual study and the adjustment had been done based on results of pilot study.

**Filed work:** Frame work for this research passed with three phases, started with control group then study group as the following:

- **Assessment Phase:** Started with researchers interviewing patients, and explaining the aim of study. Researchers, meeting about 5 to 2 patients per day during the morning shift, four days a week for six months. Individualized patient interview. Each interview took approximately 25-30 minutes to complete tools.

- **Implementation Phase:** Swallowing exercise training sessions for the study group were done by interviewing each patient individually and privately for 20-35 minutes/session. The researchers provide the patients with a detailed explanation of the swallowing exercises through three sessions:

- **First Session:** Teach the patients swallowing exercises such as yawn, effortful swallowing.

- **Second Session:** Teach patient lollipop swallowing, and tongue range of motion exercise.

- **Third Session:** re-demonstration of swallowing exercises by the study group.

- The study group performed dysphasia exercises 3 times per day for one month.
- Asked study group to follow instructional video played back on a smart phone accompanied with explanation and clarification from researcher.
- Telephone follow up was used for patients in the study sample. Patients were advised to follow swallowing exercises as a regular routine, also they were guided to gradually increase the number of exercises according to each patient's ability.
- Only routine hospital care was applied for control group which includes oral care, and nasogastric feeding.
- **Evaluation Phase:** After one month posttest had been done for both groups by using the (tool II, III, and IV), aimed to determine effect of swallowing exercise training on swallowing ability and quality of life.

**Ethical considerations:** Acceptance from administrator of hospital obtained to conduct this study, consent from participants was obtained before logging into this study with emphasizing that their participation was voluntary and withdrawal can occur at any time. Also, approval from Research Ethics Committee of Faculty of Nursing obtained with reference No. (p.0223) for conducting this study.

**Statistical analysis:** Through using SPSS software version 22, collected data has been organized and tabulated. The categorical variables were represented as frequency and percentage. Continuous variables were presented as mean and standard deviation (SD). As normality distribution was rejected ( $p < 0.05$ ), Wilcoxon signed rank test was utilized to test difference of non-parametric continuous variables between paired groups. Mann-Whitney U test was used to test the difference between two means of non-parametric continuous variables. A Chi square test was used to test differences between unrelated groups regarding categorical variables. Statistically significant was considered at  $p\text{-value} \leq 0.05$  &  $0.01$ .

## Results

**Table (1):** No significant difference was observed between study and control groups

regarding demographic data, about patient's age (63.3%) for control group aged between (50<60 years) while in study group (60%) was between (40<50 years). Married participants represented (100% & 93.3%) in control and study groups respectively. Regarding gender male participants in control group was 70% and 66.7% in study group. About (70% & 56.7%) of research participants had a work in control and study groups respectively. Moreover (43.3% & 53.3%) in control and study groups respectively obtained university and secondary school.

**Table (2)** concerning past medical history, 36.7% in control group and 40% in study group were suffering from hypertension. Liquid diet was used by 83.3% in control group and 76.7% in study group. About symptoms of dysphagia was (46.7%) of patients had drooling in control group and (43.3%) had choking in study group. Ischemic stroke represented (70%) in control group and (76.7%) in study group. Right affection represented 63.3% of patients in control group while left affection represented 60% of patients in study group.

**Table (3)** this table showed that, a statistical significant improvement in levels of dysphagia among patients in study group than control group.

**Table (4)** According to this table, it's noticeable a significant difference in functional oral intake between patients in study and control groups after implementing swallowing exercise training where  $p$  value was (0.000). also, there was (40%) tube dependent with minimal oral intake among the patients in study group before swallowing exercise training, but (80%) of patients in study group became on total oral intake with no restrictions after implementing swallowing exercise training

**Table (5):** As observed from this table, there was a significant improvement of patient's total quality of life in both groups between before and after where  $p$  value found ( $p=0.000$ ). Also there was a significant difference in most parameter of QOL in both study and control group such as (energy, family roles, language, mobility, self-care, social role, and work). In addition to a significant change into mood, thinking, vision into study group compared with control group. This indicated that swallowing training exercise has improved almost parameter of QOL.

**Table (1):** Frequency and Percentage distribution of demographic characteristics of patients in the study and control groups (N= 60)

Demographic data	Group				$\chi^2$	P
	Control group (N=30)		Study group (N=30)			
	No	%	No	%		
<b>Age (years)</b>						
▪ 40 - < 50 years	11	36.7	18	60.0	3.27	0.07
▪ 50 -< 60 years	19	63.3	12	40.0		
<b>Marital Status</b>						
▪ Married	30	100.0	28	93.3	2.06	0.15
▪ Widow	0	0.0	2	6.7		
<b>Gender</b>						
▪ Male	21	70.0	20	66.7	0.08	0.78
▪ Female	9	30.0	10	33.3		
<b>Occupation</b>						
▪ Work	21	70.0	17	56.7	0.64	0.42
▪ Not work	9	30.0	13	43.3		
<b>Educational level</b>						
▪ Read and write	5	16.7	9	30.0	5.27	0.07
▪ Secondary school	12	40.0	16	53.3		
▪ University	13	43.3	5	16.7		

$X^2$  value through Chi-square test.

\* Significant  $P \leq 0.050$

**Table (2):** Frequency and Percentage of medical data distribution of the patients in study and control groups (N=60):

Medical data	(Control group N=30)		Study group (N=30)		$\chi^2$	P
	No	%	No	%		
<b>Past Medical History #</b>						
▪ Recurrent stroke	3	10.0	0.0	0.0	0.00	1.00
▪ Cardiac disease	7	23.3	8	26.7	0.00	1.00
▪ Hypertension	11	36.7	12	40.0	0.00	1.00
▪ Diabetes mellitus	9	30.0	10	33.3	0.00	1.00
<b>Consistency of diet</b>						
▪ Liquid	25	83.3	23	76.7	0.42	0.52
▪ Semisolid	5	16.7	7	23.3		
<b>Symptoms of Dysphagia #</b>						
▪ Drooling	14	46.7	12	40.0	0.00	1.00
▪ Coughing	6	20.0	8	26.7	0.00	1.00
▪ Chocking	12	40.0	13	43.3	0.08	0.95
▪ Aspiration	6	20.0	6	20.0	0.00	1.00
<b>Causes of stroke</b>						
▪ Hemorrhage	9	30.0	7	23.3	0.43	0.56
▪ Ischemia	21	70.0	23	76.7		
<b>Site of affection</b>						
▪ Right hemisphere	19	63.3	12	40.0	3.27	0.07
▪ Left hemisphere	11	36.7	18	60.0		

# More than one response  $X^2$ value through Chi-square test. \* Significant  $P \leq 0.050$

**Table (3):** Comparison patients' levels of dysphagia in study and control groups before swallowing training exercise and after one month (N=30 for each group):

Levels of Dysphagia		Control group (N=30)		Study group (N=30)		$\chi^2 / p$	
		No	%	No	%		
Before swallowing training exercise	▪ Moderate Dysphagia	9	30.0	7	23.3	0.34	0.55
	▪ Severe Dysphagia	21	70.0	23	76.7		
After one month	▪ No Dysphagia	0	0.0	6	20.0	34.70	0.00**
	▪ Slight Dysphagia	7	23.3	23	76.7		
	▪ Moderate Dysphagia	23	76.7	1	3.3		

X<sup>2</sup> value through Chi-square test.

\*\*Significant p <0.01

**Table (4):** Comparison patients' Functional Oral Intake in study and control groups before swallowing exercise training and after one month (N=30 for each group):

Functional Oral Intake Scale		Control group (N=30)		Study group (N=30)		$\chi^2 / p$	
		No	%	No	%		
Before swallowing exercise training	▪ No oral intake	13	43.3	18	60.0	1.66 / 0.19	
	▪ Tube dependent with minimal oral intake	17	56.7	12	40.0		
After One Month	▪ Total oral intake of a single consistency	4	13.3	0	0.0	21.28 / 0.000**	
	▪ Total oral intake of multiple consistencies requiring special preparation	12	40.0	2	6.7		
	▪ Total oral intake with no special preparation but must avoid specific food or liquid items	7	23.3	4	13.3		
	▪ Total oral intake with no restrictions	7	23.3	24	80.0		

\*\*Significant p <0.01

**Table (5):** Comparison patients' Quality of Life mean scores in study and control groups before swallowing exercise training and after one month (N=30 for each group):

Quality of Life parameters	Control group (N=30)			Study group (N=30)		
	Before	After	Z / P	Before	After	Z / P
	Mean±SD	Mean±SD		Mean±SD	Mean±SD	
▪ Energy	3.07±0.37	7.40±2.46	4.65/0.000**	3.07±0.37	13.93±1.10	4.75/0.000**
▪ Family roles	3.00±0.10	5.90±2.06	4.57/0.000**	3.00±0.10	12.34±1.49	4.78/0.000**
▪ Language	6.67±3.79	10.30±4.39	2.83/0.005**	6.77±3.68	23.28±2.27	4.74/0.000**
▪ Mobility	6.67±2.92	10.77±3.75	3.88/0.000**	10.40±4.28	27.59±2.54	4.71/0.000**
▪ Mood	7.87±4.57	10.50±4.66	1.90/0.06	8.20±4.72	20.97±3.69	4.63/0.000**
▪ Personality	4.33±2.77	4.33±2.77	0.00/1.00	4.33±2.77	4.33±2.77	0.00/1.00
▪ Self-care	5.00±0.20	9.80±4.44	4.20/0.000**	5.00±0.20	22.93±2.28	4.79/0.000**
▪ Social roles	5.00±0.20	10.40±3.96	4.47/0.000**	5.00±0.20	23.72±1.67	4.76/0.000**
▪ Thinking	3.80±2.07	5.03±3.01	1.78/0.07	3.60±1.83	14.14±1.27	4.82/0.000**
▪ Upper extremity function	10.10±3.53	10.10±3.53	0.00/1.00	23.03±2.18	23.03±2.18	0.00/1.00
▪ Vision	4.73±3.74	6.07±4.62	1.14/0.25	4.60±3.73	13.90±1.14	4.54/0.000**
▪ Work/Productivity	3.00±0.20	5.20±3.24	3.42/0.001**	3.00±0.21	14.07±1.03	4.76/0.000**
▪ Total quality of life	58.13±9.18	96.20±26.58	4.72/0.000**	61.97±9.11	224.90±6.54	4.70/0.000**

▪ Z value through Mann-Whitney test

## Discussion

Dysphagia is usually occurred for patients with stroke, these patients may be recovered with several weeks but prolonged dysphagia can cause severe complication such as malnutrition, pneumonia, and dehydration. Also, it affects patient's quality of life and mental health (**Kim, Park, Park, & Kim, (2020)**). So that the treatment of dysphagia focused on improving swallowing function of patients.

The research results indicated that less than three quarter of patients in control group aged between (50 < 60 years) and aged 40 < 50 years for patients in study group. This was in harmony with **Yousef, El-Deeb, & Rady, (2020)** who mentioned that more than half in both groups were over 50 years old. This may related to that prevalence of stroke increase with advanced age. Concerning marital status, married participants were the majority in study group and all participants in control group, this result is in the same line with **Elsaid, & Shabaan, (2019)** who reported that more than two third of study participants were married.

Regarding gender more than two third of participants were males, in same point with **Abo Elfetoh, & Karaly, (2018)** who reported that the largest proportion of participants were males. It may return to the fact that males are more risked for stroke than females. As regard to occupation the largest proportion in both groups were worked, also study carried out by **Yousef, El-Deeb, & Rady, (2020)** who found that above half of participants had work.

It's noticeable that less than half of patients in control group reached to university and above half in study group obtained secondary school, but **Elsaid, & Shabaan, (2019)** reported that above one third in control group had secondary school and almost one third in study group had secondary school.

In relation to past medical history, more than one third in each group were having hypertension; this is in same way with **Soliman, Oraby, Fathy, & Essam, (2018)** who found that hypertension and dyslipidemia were the most common risk factor for stroke. Also the largest proportion of participants had ischemic stroke, in the same line with **Kim, Park, Park, & Kim, (2020)** who found that major

cause of stroke was cerebral infraction. About consistency of diet, more than three quarter of patients in each group were taken liquid diet. This result is in agreement with **Abo Elfetoh, & Karaly, (2018)** who found that the majority used liquid diet.

About symptoms of dysphagia, the most incidence symptoms were drooling, and choking. In contrast with **Elsaid, & Shabaan, (2019)** who proved that most common symptoms of dysphagia were cough, weight loss and pain on swallowing.

Regarding site of affection above half of patients in control group had right affection while for study group had left affection. On the other hand **Jongprasitkul, & Kitisomprayoonkul, (2020)** found more than half had right hemisphere affection.

The finding showed that there was a significant change in levels of dysphagia after implementing swallowing exercise training between the patients in study and control groups.

This is in consistence with **Jansi, Porkodi, & Seethalakshmi, (2013)** who proved effect of implementing swallowing exercise training on direct and indirect swallowing test. This may related to performing swallowing exercise continuously strengthen swallowing muscles and improved oral-motor coordination.

Regarding FOIS, the presented results proved that there was a significant difference in FOIS after implementing swallowing exercises training, this is in agreement with **Jongprasitkul, & Kitisomprayoonkul, (2020)** who reported an improvement in FOIS after implementing swallowing exercise. Also **Kang, Park, Lee, Kim, Yoon, & Jung, (2012)** who illustrated that there was an improvement in FIOS for interventional group after implementing swallowing exercises. In additional to **Essay, (2018)** who noticed a significant improvement in FOIS after implementing swallowing exercise and positioning therapy.

Regarding quality of life, there was a significant improvement in total quality of life for both groups between before and after. In thinking, vision into study group compared with control group. On other hand **Kang, Park, Lee, Kim, Yoon, & Jung, (2012)** showed energy, family role, and mood in experimental group compared

with control group. Also **Bahcecl, Umay, Gundogdu, Gurcay, Ozturk, & Alicura, (2017)** who reported that swallowing and quality of life mean scores can be improved through early rehabilitation swallowing program.

### Conclusion

Based on the results of present research, there was a highly statistically significant improvement in dysphagia levels and QOL mean score after implementing swallowing exercise training among the patients following cerebrovascular stroke in study group than control group.

### Recommendations

According to results recommendations that are suggested included:

- Enrollment of swallowing exercise training into treatment plan for cerebrovascular stroke patients.
- Further studies which include multicenter studies and larger sample size.
- Health education programs for nurses to increase awareness on swallowing exercises.
- A similar study can be applied with a longer period for follow up.

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### Conflict of interest

No

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