

Impact of Prehabilitation Swallowing Exercises on Swallowing Difficulty and Quality of Life among Patients with Head and Neck Cancer

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Abstract:

Background: Head and neck cancer (HNC) and its treatment could leave devastating side effects and impact patients' quality of life. Exercise prior to treatment could improve deglutition and quality of life. **Aim:** Evaluate impact of prehabilitation swallowing exercises on swallowing difficulty and quality of life among patients with head and neck cancer. **Research design:** A quasi-experimental research design (study/ control). **Sample:** A purposeful sample of 60 patients from both sexes with head and neck cancer, patients were randomly assigned into two equal groups, 30 patients for each group. **Setting:** Clinical Oncology Department, Radiotherapy Unit at Main Assiut University Hospitals and South Egypt Cancer Institute - Assiut University. **Tools:** **Tool (I):** Patient's assessment questionnaire, **Tool (II):** Sydney Swallow Questionnaire. **Tool (III):** MD Anderson Dysphagia Inventory questionnaire. **Results:** Majority of study group (90 %) and nearly two thirds (63.3%) of control group had mild swallowing difficulty with significant difference (p value 0.02*) & after 6 months nearly two thirds (60%) of study group had mild swallowing difficulty in comparison to highest percentage (70%) of control group had severe swallowing difficulty with highly significant difference (p value 0.001**). There was significant difference between both groups regarding domains of quality of life after implementation of the prehabilitation swallowing exercises (p value 0.001**). **Conclusion:** The study results elucidated that prehabilitation swallowing exercises for HNC patients resulted in significant improvement in swallowing function and quality of life. **Recommendations:** Nevertheless, prehabilitation swallowing exercises are crucial for HNC patients to reduce swallowing difficulty and improve quality of life.

Keywords: *Head and Neck Cancer, Prehabilitation Swallowing Exercises, Swallowing Difficulty, & Quality of Life.*

Introduction:

The death and morbidity rates associated with head and neck cancer (HNC) are high. The most recent estimates from GLOBOCAN (2020) place HNC as the seventh most common cancer worldwide, with an estimated 890,000 new cases (approximately 4.5 percent of all cancer diagnoses) and 450,000 deaths annually (approximately 4.6 percent of all cancer-related deaths). The incidence comprises about 380,000 cases of lip and oral cavity cancer, 185,000 cases of larynx cancer, 133,000 cases of nasopharynx cancer, 98,000 cases of oropharynx cancer, 84,000 cases of hypopharynx cancer, and 54,000 cases of salivary gland cancer. Each year, there are more than 660,000 new cases and 325,000 deaths related to these cancers (Sung et al., 2021).

According to El-Mahdy et al. (2023), head and neck cancer is a broad category of cancers that impact the upper aero-digestive tract, including the naso-, oro-, and hypopharynx, larynx, nasal cavity, oral cavity, tongue, tonsils, oesophagus, middle ear, salivary glands, and others. Squamous cell carcinoma is the most prevalent histology, despite the existence of

many other types. According to Mody et al. (2021) the main risk factors are alcohol addiction, tobacco use, and oncogenic viruses like Epstein-Barr and human papillomavirus.

Swallowing function, nutritional balance, physical function, and health-related quality of life (HRQOL) all significantly could be impacted by head and neck cancer. Approximately 60% to 75% of patients experience swallowing dysfunction, a common and debilitating symptom that arises throughout the course of the illness. Tumor destruction, surgical resection scarring, and side effects from chemotherapy and radiation therapy are the primary causes of this result (Chiu et al., 2022).

Prehabilitation is the process of evaluating a patient's baseline function both physically and psychologically, identifying dysfunction, and implementing targeted physical and psychological interventions to lessen the incidence or severity of the patient's dysfunction from the moment of the acute cancer diagnosis to the administration of treatment (such as surgery, radiation, etc.) during the continuity of the care process. Prehabilitation, which is started

prior to the start of chemotherapy and radiation therapy (C/RT), attempts to enhance a patient's quality of life (QOL) by lowering the frequency and severity of present-day and long-term impairments caused by the tumor or the treatment (Loewen et al., 2021).

The study of swallowing interventions had seen an increase in interest in recent years. Prehabilitation exercises had been shown an improvement in functional swallow outcomes and quality of life parameters while the prophylactic exercises which performed immediately after, or prior to the CRT intervention had been described as potentially beneficial (Wall et al., 2017).

However, in most medical facilities, supportive care for earlier dysphagia management in rehabilitation departments still has a supporting role in HNC diagnosis. In HNC patients receiving chemotherapy or radiation therapy, swallowing exercises could improve the quality of life related to dysphagia, reduce muscle atrophy, and improve swallowing function after treatment (Baudalet et al., 2023).

Both active and passive exercises are part of the swallowing exercise program. Active exercises include bulging the cheek or mouth, knocking the teeth, performing swallowing actions, stretching and rolling the tongue. The majority of passive exercises involve movements of the jaw, tongue, and throat, such as Mendelsohn swallowing and Masako maneuvers. Depending on the specific requirements of each patient, a standard swallowing exercise consists of four to five steps (Loewen et al., 2021).

Nurses should be knowledgeable about managing patients with head and neck cancer, as well as the phases of swallowing and swallowing difficulties, as they are the best source of information for questions and concerns regarding patients' medical problems. Specialist nurses can be crucial in supporting the administration of oropharyngeal swallowing exercises, such as swallowing maneuvers, tongue exercises, and jaw exercises, to help patients with HNC to manage and improve the side effects of multidimensional treatment, enhance HNC complications, and improve their quality of life (Banda et al., 2021).

Patients' actual and potential responses to their management and treatment of cancer, as well as their rehabilitation help them to back into daily life, as all parts of the nursing care aim to provide such actions to patients with head and neck cancer. It is recognized that in order to support the patients, essentially, they should be provided with skilled and coordinating nursing care. More expert assistance is required for lifestyle counseling, social, psychological support, and medical care. During the first post-treatment phase, a useful self-management after care intervention led by a nurse could potentially address these needs (Braat et al., 2022).

Significance of the study

Squamous cell carcinoma (SCC) of head and neck (HNSCC) is a common neoplasm with a rising incidence worldwide. Globally, about 8% of newly diagnosed cases of cancers were of head and neck SCC and responsible for 10.2% of cancer deaths (Sung et al., 2021). The prevalence of HNC and its various types has grown in Egypt in recent years (El din Moawad et al., 2023). In Egypt, head and neck cancer, predominantly squamous cell cancer, represented about 2.68% of all cancer burdens and was responsible for 2.22% of all cancer deaths (Ibrahim & Shash, 2022). One of the most prevalent and crippling effects of HNC and its treatment is difficulty swallowing, which has terrible consequences for one's quality of life and overall health. Although HNC treatments are always being improved to reduce adverse effects, dysphagia must be detected early to avoid complications and allow for prompt rehabilitation. Due to the multifaceted nature of swallowing, it's critical to comprehend how prehabilitation swallowing exercises can maintain and improve swallowing function and quality of life in those patients.

Operational definition:

Prehabilitation; is the phase of the continuum of care that takes place between the time of cancer diagnosis and the initiation of acute treatment, such as surgery, radiation therapy, etc. (Silver & Baima, 2013).

Aims of the study:

The aim of this study was to evaluate the impact of prehabilitation swallowing exercises on patients with head and neck cancer through the following;

1. Assessing swallowing difficulty for patients with head and neck cancer.
2. Assessing quality of life for patients with head and neck cancer.
3. Developing, implementing and evaluating the impact of prehabilitation swallowing exercises on swallowing difficulty and quality of life among patients with head and neck cancer.

Hypotheses: The following research hypotheses were incorporated:

H1: Swallowing difficulty would be significantly reduced among patients with head and neck cancer post implementation of the prehabilitation swallowing exercises.

H2: Quality of life would be significantly improved among patients with head and neck cancer post implementation of the prehabilitation swallowing exercises.

Patients and Method:

Research design:

This study used a quasi-experimental research design in order to accomplish its goal. This design, which involves observing one or more group subjects both

before and after the intervention is implemented, as it is crucial to the study's purpose.

Setting:

This study was carried out at the radiotherapy unit and clinical oncology department of one of Assiut main university hospitals. Additionally, the South Egypt Cancer Institute at Assiut University which was established with the goal of providing patients in eight governorates in Upper Egypt with free, high-quality, and modern medical care. Since these departments were focused on admitting specific patients, a large number of patients visited them, so it was chosen as study settings.

Sample:

A purposeful sample of sixty adult patients with head and neck cancer were recruited for the study. The sample was randomly and alternately split into two equal groups: the study group (n = 30 patients) received routine hospital care along with the rehabilitation swallowing exercises, and the control group (n = 30 patients) received routine hospital care only. The homogeneity of the study and control groups' samples was preserved. The patient groups that would constitute the study and control sample for this research included patients with HNC undergoing chemotherapy or radiation therapy, patients who gave their consent to participate in the study after being made aware of its purpose, patients who were between the ages of 18 and 65 years old, patients who could understand the information provided, and patients who had not any problem preventing verbal communication. Potential participants were excluded who had previous history of HNC and/or head or neck radiation therapy or surgical treatment, or of dysphagia due to other causes than cancer.

Sample size:

Sixty cases were determined by using G Power software. Estimated the sample size to test the two-tailed differences between two independent means. Used "error 0.05", "effect size 0.8", and "power 95%."

Tools:

To fulfill the study's objectives, three data collection tools were employed.

Tool (I): Patient's assessment questionnaire.

It was developed by the researchers to assess demographic and medical data of patients: It included two parts;

Part (1): Patient's demographic data: It included (6) items related to patients age, gender, occupation, marital status, residence and level of education).

Part (2): Patient's medical data included items related to family history of cancer, time since diagnosis, tumor T stage, and type of carcinoma and tumor site).

Tool (II): Sydney Swallow Questionnaire (SSQ):

It was developed by Wallace et al., (2000) and adopted by the researchers, to evaluate swallowing difficulties.

Scoring system

It was seventeen questions on the visual analogue scale format of the questionnaire. The line had a grade ranging from 0 to 100. Every question has a score ranging from 0 to 25, 50, 75, and 100.

The total score was 1700. Every patient indicated a grade that reflected how difficult it was for them to swallow. The scoring system was divided as follows: Mild swallowing difficulty (0-566.66); moderate swallowing difficulty (566.67-1133.33) and severe swallowing difficulty (1133.34-1700)

The Sydney Swallow Questionnaire was a valid and dependable tool for assessing the degree of dysphagia on an individual basis. It demonstrated reliable test-retest reliability (intra-class correlation coefficient = 0.99) and excellent internal consistency (Cronbach's α = 0.924).

Tool (III): The MD Anderson Dysphagia Inventory (MDADI) questionnaire:

This questionnaire was developed by (Chen et al., 2001) and adopted by the researchers. MDADI was created specifically to assess how dysphagia affects patients' quality of life when they have HNC. Twenty questions make up this questionnaire, which is divided into subscales for the global, emotional, functional, and physical domains. With the exception of questions E7 and F2, each question has five possible answers: strongly agree, agree, disagree, and strongly disagree. The answers range from 1 (strongly agree) to 5 (strongly disagree). The Global domain is displayed independently.

Scoring system; A Global Score and a Composite Score are obtained.

Every question, excluding E7 and F2:

Strongly Agree = 1 point, Agree = 2 points, No Opinion = 3 points, Disagree = 4 points and Strongly Disagree = 5 point

For E7 and F2, the following scores apply: 5 for strongly agreeing, 4 for agreeing, 3 for having no opinion, 2 for disagreeing, and 1 for strongly disagreeing.

First question (not numbered) for the global score The Global Score is a numerical value between 1 (very low functioning) and 5 (high functioning).

Composite Score: Nineteen numbered questions

To determine the total points, add the results of the 19 questions then calculate the mean point score after that divide the total points by 19. To calculate the final score: Multiplying the mean by 20.

The Composite Score ranges from 20 (extremely low functioning) to 100 (high functioning). A higher MDADI score indicates better day-to-day functioning and better day-to-day quality of life.

The scale's test-retest reliability showed satisfactory interclass correlation coefficients (ICC) for the composite score (ICC = 0.984) and subscale domains (emotional = 0.973, physical = 0.971, and functional = 0.956). The physical, functional, and emotional subscales had Cronbach's alpha coefficients of 0.945,

0.825, and 0.937, respectively (composite score = 0.975).

It was used three times: as a pre-test prior to the initiation of radiotherapy and chemotherapy, and then the post-test were done three and six months later.

Procedure; The current study proceeded using the following phases:

Preparatory phase

Administrative approval:

Official approval and administration permission was obtained from Clinical Oncology Department at Assiut University hospital / Radiotherapy Unit and South Egypt Cancer Institute - Assiut University to gather the needed data after study aim explanation.

Ethical Consideration:

All ethical guidelines for research were followed. The faculty of nursing's ethical committee approved the research proposal in December 2021. The clinical oncology department at Assiut University Hospital / Radiotherapy Unit, South Egypt Cancer Institute - Assiut University, and the dean of the faculty of nursing all provided formal permission and consent prior to the conduct of the pilot study and the main study after being informed of the nature and goal of the research. The patients under study had the right to discontinue the study at any time for any reason or they had the right to decline to participate from the start. Participants received guarantees that all of their data would be kept completely private. Before beginning data collection, the patients were informed of the study's purpose. Permission was obtained from them.

Pilot study

Ten percentage of the sample (6 patients) underwent it in order to evaluate the study tools' clarity and feasibility. It also estimates the time required to fill in the study tools. Patients from the pilot study sample were added to the entire study sample because no changes or modifications were required.

Fieldwork description

Prehabilitation swallowing exercises (brochure):

After examining the relevant literatures (Kumar et al., 2015), (Guillen-Sola et al., 2019), (Wall et al., 2020), (Royal Berkshire NHA Foundation Trust (2021) & (Hajdú et al., 2022) accessible resources, and patients' assessed needs from the pre-test, the researchers created a brochure with prehabilitation swallowing exercises in simplified Arabic, supported by photo illustrations. The swallowing exercises were beneficial in terms of strengthening and coordinating the swallowing muscles. The following were some of the prehabilitation swallowing exercises: mouth opening, jaw side-to-side, jaw undershot, Valsalva, Shaker exercise, Mendelsohn manoeuvre, Masako manoeuvre, tongue to cheek, tongue to mouth corners, resistance to tongue, gargle, yawn, and Effortful swallow. Patients were trained in these exercises and told to perform them at least three times a day, ten times for each, starting from the first week

of radiation treatment and continuing for six months following the end of radiation therapy.

Data collection for this study was carried out from (January 2022 to May 2023), during morning and afternoon shifts. The researchers attended Clinical Oncology Department at Assiut University Hospital / Radiotherapy Unit and South Egypt Cancer Institute - Assiut University. Every patient gave their consent to participate in this study due to ethical concerns.

Implementation phase

During the first meeting, the researchers gave the patients an introduction and described the purpose and nature of the study. The participants' consent was obtained. The investigators collected each participant's medical and demographic information using **Tool (I)** the patient assessment questionnaire. Every patient was also assessed using Sydney Swallow Questionnaire (**Tool II**) for evaluating swallowing difficulty and the MD Anderson Dysphagia Inventory questionnaire (**Tool III**) to determine the impact of dysphagia on quality of life.

Depending on the patients' response, the study tool filling process took an average of 20 to 30 minutes.

During the four sessions, the researchers train the chosen patients a thorough explanation of the prehabilitation swallowing exercises.

Depending on the appropriate time and level of readiness for sessions, the patients were split up into smaller groups.

There were four to five patients with head and neck cancer in each group.

Subject explanations varied according to participants' educational backgrounds.

First session: the researchers revised the prehabilitation swallowing exercises' objectives and their relation to swallowing function and quality of life at the start of this session. The first session took twenty to thirty minutes. During this session, patients were shown and given instructions on exercises as

- **Reaching tongue back and forth:** Patients were instructed to stick tongue out as far as possible, hold the stretch for 5 sec, keeping tongue in the middle, Relax, pull back tongue as far as patient can, scratching the back of throat with the back of tongue, holding for 5 sec, relax and repeat as many times as patient can, up to 10 times.
- **Tongue to cheek:** Patients were instructed to place the tip of the tongue in the right cheek, as far back in the mouth as they could, hold the stretch, then relax. Repeat the exercise, this time to the left, and then relax. The patients were instructed to repeat the exercise up to ten times, or as often as possible.
- **Tongue to mouth corners:** Patients were instructed to smile, place the tip of the tongue in the right corner of mouth. Then move it the left mouth corner, shift back and forth, practice moving the tongue faster from side to side, still being precise with the tip of the tongue to the

mouth corners and repeat as many times up to 10 times.

- **Resistance to tongue:** Patients were instructed to stick tongue out as far as patient can and press a spoon against the tip of tongue. Hold for 5 sec. Relax. Stick tongue out as far as patient can and press a spoon against the side of tongue. Hold for 5 sec. Relax. Repeat on the opposite side. Repeat as many times as he can, up to 5 times in all 3 directions.

Second session: The patients were instructed by the researchers to perform the swallowing exercises. This session took 20 to 30 minutes to complete.

- **Gargle:** Patients were instructed to look to the ceiling, then gargle for 3 sec, relax and repeat as many times up to 10 times.
- **Yawn:** Patients were instructed to open mouth wide, start yawning, like tired. Repeat as many times up to 10 times.
- **Mouth opening:** Patients were instructed to open mouth wide as much as patient can. Keep the stretch for 5 sec. Relax for 5-10 sec. Repeat as many times up to 10 times.

Third session: The patients were instructed by the researchers to perform the swallowing exercises. This session took 20 to 30 minutes to complete.

- **Jaw; side to side:** Patients were instructed to move the mandible slowly from side to side. Hold the stretch while counting to 5 in each side. Repeat as many times as possible up to 10 times to each side.
- **Jaw; undershot:** Patients were instructed to shoot the mandible forward to make undershot. Hold the stretch for 5 sec, relax and repeat up to 10 times.
- **Valsalva:** Patients were instructed to take a deep breath, hold breath. Do not try to hold breath with lips. Hold breath in the throat like, for instance, lift something heavy. Hold for 5 sec. If it is difficult: Sit on a chair, place both hands under the chair and pull upwards. Keep "lifting" while holding breath for 5 sec.

Fourth session: The patients were instructed by the researchers to perform the swallowing exercises. This session took between thirty and forty minutes to complete.

- **Head lift:** Patients were instructed to lie flat on back, preferably without a pillow under head. Lift head from the ground and look towards feet. Hold this position as long as patient can, up to 1 minute. Lay the head back and relax for 1 minute. Repeat twice more. Then: Lift head up once again before placing it back in the ground in one smooth movement. Repeat this movement as many times up to 30 times.
- **Mendelsohn:** Patients were instructed to swallow normally. Feel with fingers on neck how the larynx moves up and down. On next swallow, patients were instructed to feel the larynx move up and hold it as they using the muscles of throat. Try

not to lift larynx too early. Let it lift naturally and hold it for three seconds. Use the muscles in throat to keep it lifted, not fingers. Relax and complete the swallow and repeat as many times as possible up to 10 times.

- **Effortful swallow:** Patients were instructed to imagine as must swallow something large. Swallow with extra effort. The extra effort should be visible on neck when swallow and repeat as many times up to 10 times.
- **Supra-glottic swallow:** Patients were instructed to take a deep breath and hold it, take a bite or sip, swallow while still holding breath until all food or liquid is gone from mouth, cough right after swallow (on the exhale), swallow again, breathe then repeat these steps.
- **The shaker exercise:** The head is raised off of the floor or bed to look at the toes without raising the shoulders.
- At the end of each session, the researchers gave a summary that focused on the key themes.
- For each new group of study participants, these sessions were repeated.
- **Teaching strategies and resources:** The researchers used simple strategies such as role plays, lectures, discussions, and demonstrations. As part of the used media, the researchers created colored handouts, a PowerPoint presentation, and videos that explained the details of the exercises. They gave these materials to each participant.
- To make sure that the patients understood how to apply the exercises correctly, the researchers allowed the patients to complete the exercises they had learned while receiving guidance from them.
- During their hospital stay, patients are expected to follow the prescribed exercise regimen under the supervision of the researchers. For six months, patients were advised to practice swallowing exercises three times a day.
- The patients were urged by the researchers to continue performing the exercises they had learned on a regular basis without skipping sessions.
- The researchers planned a follow-up meeting to assess the impact of the prehabilitation swallowing exercises on swallowing difficulty and quality of life, three and six months after the exercises began.

Evaluation phase:

This phase was carried out twice: once after three months (during the posttest), and again after six months (during the second evaluation follow-up). During first evaluation the researchers take phone number of patient or relative and conducted phone call with patients to ascertain from adherence of patients with exercises and before time of follow up the researchers called them to remind them with time of appointments at hospital and emphasized on importance of follow up for proper evaluation.

It was conducted at the Clinical Oncology Department at Assiut University Hospital / Radiotherapy Unit and South Egypt Cancer Institute - Assiut University Hospital. Patients with head and neck cancer were assessed using the Tools II and III to determine how prehabilitation swallowing exercises affected their quality of life and ability to swallow.

Statistical analysis:

The data collected were examined, coded, tabulated, and ready for computer entry. Using computer

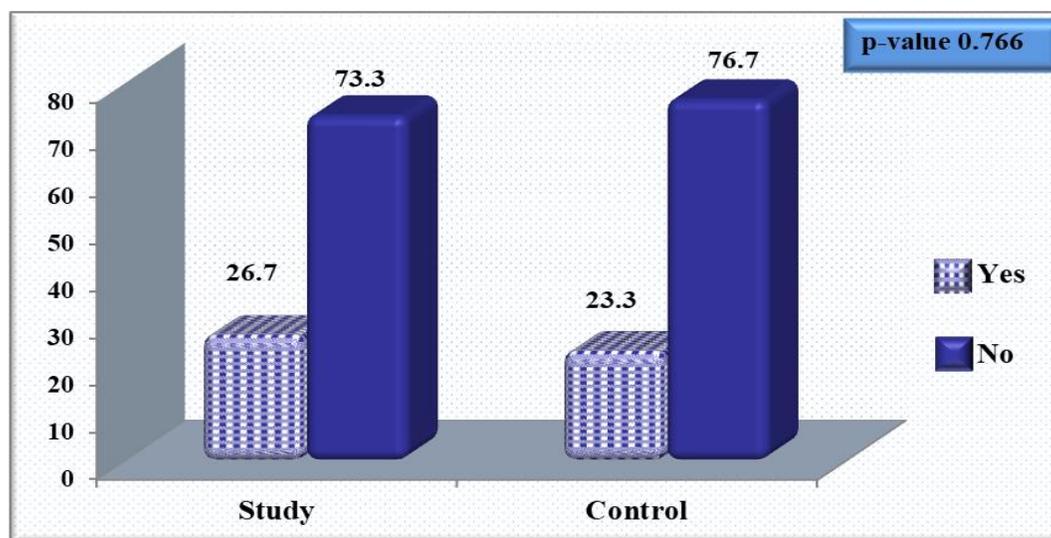
intervention SPSS version 22, Excel 2016, descriptive statistics (frequencies, percentages, means, and standard deviations) and analysis of variance (chi-square test P-Value <0.05) were performed. A two-tailed $p < 0.05$ was deemed statistically significant. The T-test was used to compare between categorical variables, while the Correlation Coefficient test was used to compare between continuous variables and reveal the association between scores. IBM SPSS 20.0 was used to conduct all of the analyses.

Results:

Table (1): Frequency and percentages distribution of the studied patient's demographic data among the study and control groups (N=60).

Socio-demographic data	Study group		Control group		p-value
	N	%	N	%	
Age / years :					
18 <30 yrs.	1	3.3	0	0.0	0.359
30<40 yrs.	6	20.0	6	20.0	
40<50 yrs.	4	13.4	10	33.3	
50<60 yrs.	6	20.0	4	13.4	
60- 65 yrs.	13	43.3	10	33.3	
Age (Mean±SD)	52.17±11.35		50.17±10.51		0.681
Gender:					
Male	21	70.0	22	73.3	0.774
Female	9	30.0	8	26.7	
Marital Status:					
Single	2	6.7	3	10.0	0.227
Married	25	83.3	18	60.0	
Divorced	2	6.7	6	20.0	
Widow	1	3.3	3	10.0	
Residence					
Urban	12	40.0	13	43.3	0.793
Rural	18	60.0	17	56.7	
Level of education:					
Illiterate	13	43.3	15	50.0	0.682
Primary school	9	30.0	6	20.0	
Secondary school	6	20.0	5	16.7	
University & higher education	2	6.7	4	13.3	
Occupational status:					
Employer	6	20.0	7	23.3	0.920
House wife	6	20.0	5	16.7	
Not work	18	60.0	18	60.0	
Smoking					
Yes	4	13.3	3	10.0	0.271
No	15	50.0	21	70.0	
Stopped	11	36.7	6	20.0	

Chi-square test



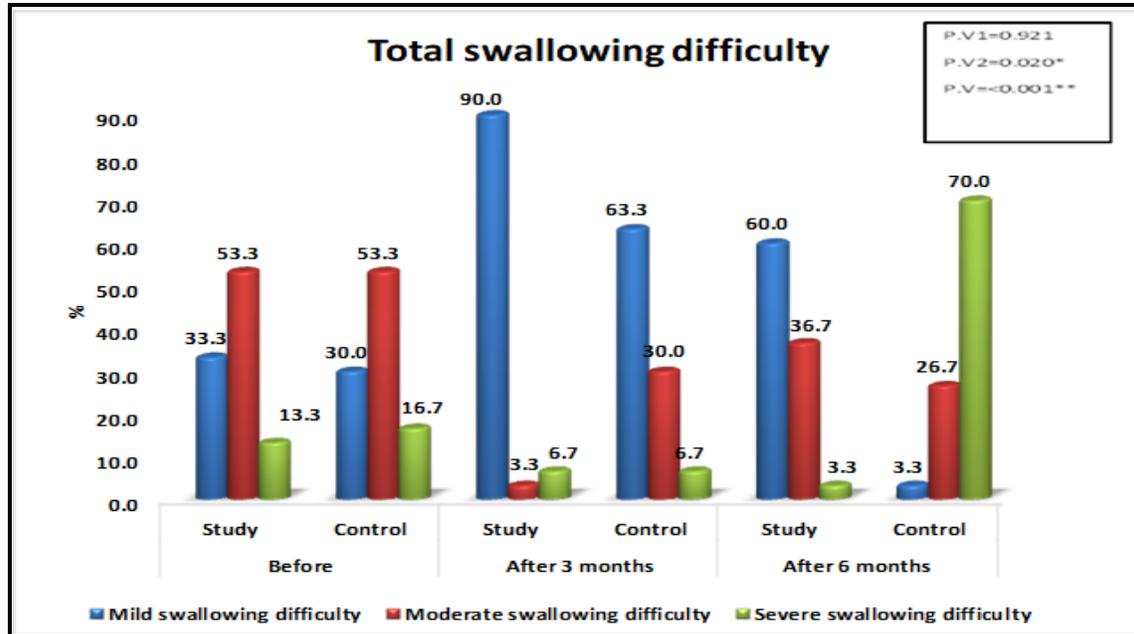
Chi-square test

Figure (1) Percentage distribution of the studied patients according to their family history of cancer among the study and control groups (N=60).

Table (2): Frequency and percentages distributions of the patients among the study and control groups (N=60) based on cancer characteristics.

Current cancer characteristics	Study group		Control group		p-value
	N	%	N	%	
Onset of cancer diagnosis:					
<5 months	21	70.0	24	80.0	0.117
5 or more month	9	30.0	6	20.0	
Duration of cancer (Mean±SD)	4.57±4.48		5.80±12.92		0.069
Cancer site:					
Oral cavity	7	23.4	3	10.0	0.484
Oropharynx	0	0.0	1	3.3	
Nasopharynx	3	10.0	2	6.7	
Hypopharyngeal	4	13.3	6	20.0	
Larynx	15	50.0	18	60.0	
Paranasal sinuses	1	3.3	0	0.0	
Tumor T stage					
T1	1	3.3	0	0.0	0.119
T2	7	23.3	3	10.0	
T3	18	60.0	26	86.7	
T4	4	13.4	1	3.3	
Type of carcinoma					
Squamous cell	26	86.7	29	96.7	0.161
Adenocarcinoma	0	0.0	0	0.0	
Others	4	13.3	1	3.3	

Chi-square test



Chi square test for qualitative data between the two groups

*Significant level at P value < 0.05, **Significant level at P value < 0.01

Pv1 (between study and control group before intervention)

Pv2 (between study and control group after 3 months of prehabilitation swallowing exercises)

Pv3 (between study and control group after 6 months of prehabilitation swallowing exercises)

Figure (2): Percentage distribution of patients as regard to total swallowing difficulty based on Sydney swallowing questionnaire before, after 3 and 6 months post implementation of prehabilitation swallowing exercises (N= 60).

Table (3): Distribution of the studied patients according to their mean and SD of MD Anderson Dysphagia Inventory before, after 3 and 6 months post implementation of prehabilitation swallowing exercises (N= 60).

MD Anderson Dysphagia Inventory (MDADI)questionnaire	Group	Mean±SD	Mean DF	T	P. value
Before					
Global score	Study	2.17±0.75	0.20	1.09	0.279
	Control	1.97±0.67			
Physical	Study	19.37±5.17	0.10	0.09	0.931
	Control	19.27±3.52			
Emotional	Study	16.07±3.77	-0.20	-0.22	0.824
	Control	16.27±3.12			
Functional	Study	12.53±3.35	-0.27	-0.34	0.731
	Control	12.8±2.59			
Composite Score	Study	47.97±11.2	-0.37	-0.15	0.884
	Control	48.33±7.98			
Overall MDADI score	Study	50.13±11.63	-0.17	-0.06	0.949
	Control	50.3±8.12			
After 3 months					
Global score	Study	2.6±1.07	1.10	4.75	0.000**
	Control	1.5±0.68			
Physical	Study	20.53±5.54	3.47	2.69	0.009**
	Control	17.07±4.37			
Emotional	Study	17.73±4.62	2.90	2.74	0.008**
	Control	14.83±3.52			

MD Anderson Dysphagia Inventory (MDADI)questionnaire	Group	Mean±SD	Mean DF	T	P. value
Functional	Study	13.03±3.41	2.03	2.45	0.017*
	Control	11±2.99			
Composite Score	Study	51.3±12.67	8.40	2.88	0.006**
	Control	42.9±9.74			
Overall MDADI score	Study	53.9±13.12	9.50	3.15	0.003**
	Control	44.4±10.01			
After 6 months					
Global score	Study	3.7±0.99	1.30	5.34	0.000**
	Control	2.4±0.89			
Physical	Study	27.8±4.66	8.43	7.29	0.000**
	Control	19.37±4.29			
Emotional	Study	22.67±2.95	5.83	7.40	0.000**
	Control	16.83±3.15			
Functional	Study	16.77±2.73	3.73	4.77	0.000**
	Control	13.03±3.31			
Composite Score	Study	67.23±9.37	18.00	7.40	0.000**
	Control	49.23±9.46			
Overall MDADI score	Study	70.93±9.91	19.30	7.67	0.000**
	Control	51.63±9.59			

Independent T-test quantitative data between the two groups -
 *Significant level at P value < 0.05, **Significant level at P value < 0.01
 Pv1 (between study and control group before intervention)
 Pv2 (between study and control group after 3 months of prehabilitation swallowing exercises)
 Pv3 (between study and control group after 6 months of prehabilitation swallowing exercises)

Table (4): Correlations between the studied patients’ MDA dysphagia inventory score before, after 3 and 6 months among the study and control group and Swallowing difficulty (N=60).

MDA dysphagia inventory score	Total swallowing difficulty score			
	Study		Control	
	R	P	R	P
Before prehabilitation swallowing exercises	0.030	0.873	-0.133	0.484
After 3 months of prehabilitation swallowing exercises	-0.376*	0.041	-0.053	0.782
After 6 months of prehabilitation swallowing exercises	-.587**	0.001	-0.335	0.070

***Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).*

Table (1): Shows that the highest percentages of patients among the study and control groups were between the ages of 60 and 65 years old, with mean ages of 52.17± 11.35 and 50.17± 10.51, respectively. In terms of gender, the highest percentages of patients (70.3 percent among the study group and 73.3% among the control group) were males. Regarding marital status, the majority of the study group patients (83.3%) and nearly two-thirds (60.0%) of the control group patients were married. Patients in both categories who were illiterate and from rural areas made up the highest percentages. In both groups, the same proportion (60.0%) of patients was unemployed. As regards smoking, half of the patients (50.0%) in the study group and nearly three-fourths (70.0%) in the control group were nonsmokers. There was no statistically significant difference regarding the demographic variables that related to the group.

Figure (1): Demonstrates that, among the study and control groups, the highest percentages of patients (73.3% and 76.7%, respectively) did not have a family history of cancer.

Table (2): Presents that the majority of patients in the study group (70%) and control group (80%) had their head and neck cancer diagnosed within five months of the commencement of the disease. Concerning the site of cancer, laryngeal carcinoma affected half of the patients in the study group and nearly two-thirds (60%) of the patients in the control group. Regarding tumor stage, the majority of patients in the control group (86.7%) and nearly two-thirds of those in the study group (60.0%) both had T3 cancer. Squamous cell carcinoma was the most prevalent type of cancer among both groups of patients (study and control) (86.7% and 96.7%), respectively.

Figure (2): Demonstrates that, before prehabilitation swallowing exercises, more than half of patients (53.3%) among the study and control groups had moderate swallowing difficulty with no significant difference. After 3 months, the majority of patients in the study group (90%) and nearly two-thirds (63.3%) of the control group had mild swallowing difficulty, with a significant difference between both groups. After 6 months, nearly two-thirds (60%) of the study group patients had mild swallowing difficulties, in contrast to the highest percentage (70%) among the control group, who had severe swallowing difficulties, with a highly significant difference (p value 0.001).

Table (3): Presents that there was no significant difference between the study and control groups regarding the global, composite, and overall mean MDADI score before prehabilitation swallowing exercises (p values of 0.279, 0.884, and 0.949, respectively). While there was a significant difference between both groups regarding the global, composite, and overall mean after 3 months of post-implementation of the prehabilitation swallowing exercises (p = 0.000**, 0.006**, and 0.003**), respectively, and also in follow-up after 6 months (p = 0.000**).

Table (4): Shows a negative correlation between swallowing difficulty and MDA dysphagia inventory scores among the study group after 3 and 6 months of post-implementation of the prehabilitation swallowing exercise, whereas there were no correlations among the control group.

Discussion:

Over the past ten years, there had been an increase in interest regarding the use of prophylactic swallowing exercises for patients with head and neck cancer (HNC) receiving radiation therapy or concurrent chemotherapy and radiation therapy (RT/CRT). Preventing the weakening and atrophy of the swallowing muscles is the reasoning behind these preventive measures, according to **Baudelet et al., (2023)**. Despite aggressive surgery, radiation, and chemotherapy more than fifty percent of patients die, while survivors suffer from pain, dysphonia, and dysphagia. Among these functional impairments, dysphagia assumes particular significance. Notably, 45–88% of patients with HNC cancer endure dysphagia with pharyngeal residue, laryngeal penetration and aspiration. **Strüder et al., (2023)**.

The number of patients requiring management for dysphagia is also increasing. Furthermore, as survival rates had improved, there is a greater emphasis on optimizing long-term function, with prevention serving as a crucial strategy. Prehabilitation is a

specific example of this proactive strategy (**Loewen et al., 2021**).

According to the current study's demographic characteristics, among the majority of patients in both the study and control groups were found to be between the ages of sixty and sixty-five years old, with mean ages of 52.17 ± 11.35 and 50.17 ± 10.51 years respectively. Males made up the majority of the patients' gender. The present study's results were in line with an Egyptian study conducted by **Elkader et al., (2022)**, titled "Impact of nursing instructions on selected outcomes among patients with head and neck cancer." who noted that among the study and control groups' mean patient ages were 51.5 ± 10.9 and 51.8 ± 10.6 years, respectively, and that more than two thirds of the control group's members were male. According to **Samuel et al., (2019)** study, the majority of patients in both groups were male, with the mean age of the patients among the exercise group was 52.76 ± 9.65 and among the control group was 52.81 ± 10.48 . **Park et al., (2022)** provided additional support for these findings, stating that regardless of alcohol or tobacco use, men are far more likely than women to develop head and neck cancers. Males are more likely than females to display behavioral risk factors like smoking and alcohol use. But even after accounting for these variables, there was still evidence that men had a higher cancer incidence.

According to the current study, almost two thirds of patients in the control group and the majority of patients in the study group were married. Regarding level of education, nearly half of study group patients and half of control group patients were illiterate. This result was in line with **Abdel Gawad et al., (2020)**, who clarified that highest percentage of patients in both groups were married and illiterate patients.

Regarding residency, the current study found that the highest percent of the control group and the study group lived in rural areas. Regarding occupations, the current study revealed that the highest percent of both groups were not work. This was consistent with the findings of **Omar et al., (2022)**, who reported that the highest percent of patients were not work and were from rural areas. This runs counter to the findings of **Abdel Gawad et al., (2020)**, who found that workers patients made up the majority of both groups.

The study's findings regarding smoking habits made it clear that approximately three-quarters of the patients among the control group and half of the patients among the study group did not smoke. According to a study conducted in this regard by **Zebralla et al., (2021)**, who reported that almost, three-quarters of the patients did not smoke. **Felser et al., (2020)** finding of their study was concurred with the same findings, stating that 50% of patients did not smoke.

The results of the current study indicated that group-related demographic variables did not differ statistically. This indicates that the two groups were similar, which supported the idea that the patients under study were similar. This was consistent with the finding of a study done by **Elkader et al., (2022)** who reported no statistically significant differences were found between the two groups with regard to all of the demographic characteristics.

Regarding the family history of cancer, the majority of patients in the current study did not have a history of the disease in their families. This was corroborated in a study done by **Abdel Gawad et al., (2020)**, who reported that over two thirds of patients in both groups had no family history of cancer and over half of the groups did not report any other chronic diseases.

According to the results of the current study, most patients among both the study and control groups received positive diagnosis of head and neck cancer within five months of the illness's onset. This was consistent with the findings of **Nayak et al., (2019)**, who found that the majority of patients experienced illness for two to six months.

Based on the results of the current study, laryngeal carcinoma affected approximately two thirds of patients among the control group and half of the study group's patients. This finding is corroborated by the finding of a study done by **Omar et al., (2022)** who found that the majority of the patients under study had internal neck tumors (larynx tumors). While **El Din et al., (2014)** finding was concurred with the same results, indicating that the larynx was the most frequently affected site of malignancy among the patient group.

Based on tumor stage, the current research revealed that almost two thirds of the study group's patients and the majority of patients in the control group had T3 cancer. This was in line with the finding of research conducted by **Mashhour et al., (2018)**, who supported the same finding and provided an explanation for the T3 cancer that was present in almost two thirds of study group patients and half of the control group patients.

The current study's findings indicate that squamous cell carcinoma was the most common type of cancer in both the study and control groups. This result was corroborated by the finding of a study done by **Yifru et al., (2021)**, who reported that the majority of patients had advanced stage HNC and squamous cell carcinoma. As well **De Araújo Gomes et al., (2020)** finding was concurred with this result, reporting that squamous cell carcinoma was the most common histological type of neoplasm among patients.

Regarding swallowing difficulty, the results of this study showed that over half of the patients in the

study and control groups experienced moderate swallowing difficulties with no statistically significant difference prior to prehabilitation swallowing exercises implementation. After three months, the majority of patients in the study group and nearly two thirds of the control group experienced mild swallowing difficulties; this difference was statistically significant. After six months, there was a significant difference as (p value of 0.001) between the percentage of study group patients who had mild swallowing difficulty and the highest percentage of control group patients who had severe swallowing difficulty. This was in line with the findings of a study titled as **"Swallowing exercises: will they really help head and neck cancer patients?"** Conducted by **Mashhour et al., (2018)**, and reported that there was not a significant difference in swallowing difficulty between any of the patients during the first visit. Although mild dysphagia was experienced by the majority of patients in both groups on their first visit. By the third visit, the control group had more cases of severe dysphagia (to thin and thick liquids, and soft and hard food) than the study group.

Additionally, the finding of a study done by **Omar et al., (2022)** who provided support for this outcome by reporting a decrease in swallowing difficulties following the implementation of swallowing exercises. According to the researchers, this might be explained by the impact of swallowing exercises performed prior to rehabilitation, which led to measurable improvements in swallowing function after treatment.

Regarding MD Anderson Dysphagia Inventory scores, when compared to the control group, the study's patients who engaged in pretreatment swallowing exercises showed improvement in composite MDADI mean scores and overall MDADI score overall at the follow-up. Additionally, a different analysis of the global, emotional, functional, and physical MDADI domains showed improvement in patient's quality of life, which is consistent with the findings of a study done by **Constantinescu et al., (2021)** study **"Adherence to home-based swallowing therapy using a mobile system in head and neck cancer survivors"**, which showed statistically significant improvements of the composite, emotional, and physical MDADI subscales.

As reported by patients after treatment, prehabilitation exercises could help preserving swallow-related quality of life (QOL). This is supported by multiple studies that found a significant statistical difference between the intervention and comparison groups at the middle and long-term outcome measurement point. The finding of a study

done by **Carmignani et al., (2018)**, who also consistent with the findings of **Abdel Gawad et al., (2020)**, who reported a statistically significant improvement among the study group's overall quality of life at the third week following the intervention compared to the control group.

The present study is supported by the finding of **Kumar et al., (2015)**, who found that the study group's quality of life (QOL) was statistically higher than that of the control group. They also found that the study group's patients had less fibrosis in their swallowing muscles and could chew a wider variety of foods, which improved their sense of satisfaction and self-worth. In these patients, mouth opening and swallowing times were significantly better. The results of the previous study were consistent with those of **Perry et al. (2016)**, who reported that pretreatment swallowing exercises could improve the quality of life for patients with HNC by increasing physiological reserve, decreasing disuse atrophy, and possibly delaying the onset of fibrosis. Furthermore, as demonstrated by **Hajdú et al., (2022)**, who reported a number of studies found that swallowing exercises during radiation therapy improve dysphagia and, consequently, quality of life. In an analysis comparing the intervention to non-active controls revealed a significant impact on mouth opening, QoL, depression, and anxiety.

And **Seth et al., (2023)** concluded that prehabilitation programs that involve exercise, nutrition, or psych education have shown potential benefits for enhancing the quality of life and reducing the mortality and morbidity of patients with HNC after treatment.

In disagreement with previous finding **Yifru et al., (2021)** who revealed that the composite MDADI mean scores were considerably low, indicating the severity of this problem in Ethiopia. The variation may be due to the fact that patients in Ethiopia lack access to early treatment and support since there is a single cancer center in the country that provides comprehensive cancer care.

According to the current study, there is a positive correlation between swallowing difficulty and the MD Anderson Dysphagia Inventory. This is because pre-habilitation exercises are expected to have a greater positive impact, with less severe dysphagia and a decrease in quality of life. These findings are in line with the study conducted by **Kumar et al., (2015)**, who reported that swallowing exercise significantly improves swallowing function and quality of life when it is started in the first week of chemotherapy and radiation and continued for six months. For patients with head and neck cancer, they could avoid a great deal of complications related to dysphagia and recurrent hospital stays.

Therefore, swallowing difficulties had an impact on patients' quality of life when they are unable to eat. So because they are unable to eat represents a social disability that negatively impacts physical, functional, emotional health and could result social isolation, lethargy, weight loss, and decreased physical activity. These patients struggle with frustration, insecurity, and low self-worth.

Conclusion:

The results of this study concluded that patients with head and neck cancer who continue to receive training in prehabilitation swallowing exercises have a significant improvement in their quality of life and swallowing difficulty.

Recommendations:

From the previously mentioned conclusion, the following recommendations could be inferred:

1. Patients should generally be trained in and prepared for the exercise intervention before undergoing CRT for HNC, as it enhances patient outcomes and supports rehabilitation across the board with negligible side effects.
2. A colorful booklet containing prehabilitation swallowing exercises ought to be included in standard cancer therapy protocols and be provided to all patients and nurses employ in the oncology department.
3. The study should be repeated with a larger probability sample collected from other geographic locations to generate more results that may be used broadly.

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