AN EXPERIMENTAL STUDY TO ASSESS THE EFFECTIVENESS OF CHIN TUCK AGAINST RESISTANCE (CTAR) EXERCISE IN IMPROVING SWALLOWING ABILITY AMONG CEREBRO VASCULAR ACCIDENT PATIENTS WITH DYSPHAGIA AT TERTIARY CARE HOSPITAL BELAGAVI.

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ABSTRACT

Background

Stroke is a medical emergency characterized by an interruption of blood supply to the brain, leading to brain cell death. It is broadly classified into ischemic and hemorrhagic types, both of which can impair neurological functions. Common clinical manifestations include unilateral weakness, dysphagia, dizziness, diplopia, and headache. Dysphagia is a frequent complication among cerebrovascular accident (CVA) patients, significantly affecting nutritional status and quality of life. The estimated prevalence of stroke ranges from 84–262 per 100,000 population in rural areas and 334–424 per 100,000 in urban areas. Effective rehabilitative interventions are essential to improve swallowing function in these patients.

Objectives

- To assess the swallowing ability among CVA patients with dysphagia.
- To evaluate the effectiveness of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among CVA patients in the intervention group.
- To compare the post-test swallowing ability scores between the experimental and control groups.

Methodology

A true experimental pre-test–post-test control group design was adopted for the study. The sample consisted of 60 CVA patients with dysphagia (30 in the experimental group and 30 in the control group), selected using a convenient sampling technique. Data were collected using standardized tools, namely the Gugging Swallowing Screen (GUSS) and Functional Oral Intake Scale (FOIS). The experimental group received CTAR exercises, while the control group received routine care.

Results

The findings revealed that the majority of participants were aged between 21–40 and 40–60 years. Most were male (38.33%), belonged to the Hindu religion (60%), and had primary education (30%). A significant proportion were employed in private jobs, and many had a family history of stroke. The experimental group showed a significant improvement in post-test swallowing scores compared to pre-test scores, whereas the control group showed no significant change. The difference between pre-test and post-test scores in the experimental group was statistically significant at $p < 0.001$. Additionally, variations in levels of swallowing difficulty were observed, with reductions noted after intervention.

Conclusion

The study concludes that Chin Tuck Against Resistance (CTAR) exercise is an effective intervention for improving swallowing ability among CVA patients with dysphagia. Incorporating CTAR exercises into rehabilitation programs can enhance patient outcomes and reduce complications associated with dysphagia.

Keywords

Effectiveness, CTAR, Swallowing Ability, Dysphagia, Cerebrovascular Accident

INTRODUCTION

Human health largely depends on the proper functioning of body organs, with the brain playing a central role in regulating all bodily activities. The hypothalamus and other brain structures coordinate vital physiological processes essential for survival. Therefore, maintaining brain health is critical for overall well-being. Stroke is one of the major neurological disorders affecting the global population, particularly the elderly[1]. It is the second leading cause of death and the third leading cause of disability worldwide[2]. According to the World Heart Federation, approximately 15 million people suffer from stroke annually, of whom nearly 6 million are left permanently disabled[3].

Stroke and other life-threatening conditions such as traumatic brain injury can significantly impair neurological functioning, leading to reduced oral intake and altered swallowing mechanisms. Age-related structural and functional changes in the brain further increase susceptibility to stroke among older adults[4]. These changes often result in reduced muscle tone, decreased chewing ability, and diminished tongue pressure, thereby affecting swallowing efficiency[5].

Dysphagia, particularly oropharyngeal dysphagia, is a common complication among stroke patients, affecting nearly 55% of hospitalized cases[6]. It is one of the most frequent clinical manifestations following stroke and can lead to serious complications such as malnutrition, aspiration pneumonia, and increased risk of infections[7]. Consequently, dysphagia significantly contributes to increased morbidity and mortality rates among stroke patients[8].

Physiological impairments caused by neurological damage disrupt the normal swallowing mechanism, leading to dysphagia. This condition is also prevalent among individuals with traumatic brain injury, head and neck cancers, post-surgical conditions, and in the natural ageing process[9]. Studies indicate that within the first three days after stroke, approximately 42% to 67% of patients experience dysphagia[10]. Furthermore, dysphagia has been identified as a predictor of poor clinical outcomes, prolonged hospital stay, and delayed recovery among stroke patients[11].

Early identification and management of dysphagia are crucial. In developed countries such as the United States, Canada, Australia, and the United Kingdom, validated screening tools like the Gugging Swallowing Screen (GUSS) are widely used for early detection[12]. Clinical guidelines recommend that trained healthcare professionals screen all stroke patients for dysphagia within 24 hours of admission. Patients who test positive are often kept nil per oral until comprehensive swallowing assessment is completed, enabling timely initiation of appropriate interventions such as alternative feeding methods and therapeutic exercises[13].

Dysphagia adversely affects the quality of life by impairing adequate nutrition and hydration. Studies show that nearly 87% of elderly individuals experience difficulty during mealtime, with about 68% exhibiting clear signs of dysphagia[14]. Rehabilitation strategies focusing on movement-based therapies have been shown to improve swallowing function. Exercises such as the Shaker exercise aim to strengthen suprahyoid muscles and facilitate improved laryngeal elevation during swallowing[15].

Chin Tuck Against Resistance (CTAR) exercise is a relatively newer therapeutic approach designed to enhance suprahyoid muscle activity. In this exercise, patients are positioned upright and instructed to tuck their chin against resistance, typically using an inflatable rubber ball[16]. Research studies, including those conducted by Yoon, have demonstrated that CTAR exercise is more effective and better tolerated than the traditional Shaker exercise[17]. It improves patient compliance, reduces physical strain, and enhances rehabilitation outcomes.

CTAR exercise has been found to produce significant improvements in swallowing ability by strengthening the hyolaryngeal musculature and promoting functional recovery[18]. Additionally, incorporating adequate rest intervals during exercise prevents muscle fatigue and enhances therapeutic effectiveness[19]. Therefore, CTAR exercise represents a promising and efficient intervention for improving swallowing function among patients with dysphagia following stroke.

METHODOLOGY

Research Approach

An evaluative research approach was adopted to assess the effectiveness of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among cerebrovascular accident (CVA) patients with dysphagia.

Research Design

A true experimental pre-test–post-test control group design was used in this study. This design enabled the researcher to compare the effectiveness of the intervention by assessing changes in swallowing ability before and after the implementation of CTAR exercise in both experimental and control groups.

Schematic Representation of the Design:

Group	Pre-test	Intervention	Post-test
Experimental Group	Q_1	X	Q_1
Control Group	Q_2	—	Q_2

Key:
Q_1 – Pre-test assessment of swallowing ability
Q_2 – Post-test assessment of swallowing ability
X – CTAR exercise intervention

Variables of the Study

- **Independent Variable:** Chin Tuck Against Resistance (CTAR) exercise
- **Dependent Variable:** Swallowing ability among CVA patients with dysphagia

Research Setting

The study was conducted at KLE's Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi, Karnataka.

Population

The target population comprised all patients diagnosed with cerebrovascular accident admitted to the neurology wards.

Sample and Sampling Technique

The sample consisted of CVA patients with dysphagia who met the inclusion criteria. A non-probability convenience sampling technique was used to select participants.

Sample Size

The sample size was calculated using the formula:

$$n = (2(Z\alpha + Z\beta)^2 \times \sigma^2) / d^2$$

Where:
$Z\alpha = 1.96$ (5% significance level)
$Z\beta = 1.28$ (90% power)
$\sigma = 3$ (standard deviation)
$d = 2.5$ (effect size)

Based on the calculation, the sample size was determined to be 30 participants per group. Therefore, the total sample size for the study was 60 (30 in the experimental group and 30 in the control group) .

Criteria for Sample Selection

Inclusion Criteria:

- Patients diagnosed with cerebrovascular accident
- Patients with dysphagia
- Patients who were conscious and willing to participate

Exclusion Criteria:

- Critically ill patients
- Patients unable to follow instructions

Sample Characteristics

Demographic Variables:
Age, gender, religion, education, occupation, and monthly income

Clinical Variables:
Diagnosis, associated illness, duration of stroke, family history of stroke, dietary pattern, current diet, and dependency level of feeding

Tools for Data Collection

The following standardized tools were used:

- Gugging Swallowing Screen Scale (GUSS)
- Functional Oral Intake Scale (FOIS)

Description of the Tool

- **Section A:** Demographic data (age, gender, religion, education, occupation, income)
- **Section B:** Clinical profile (diagnosis, illness, duration, diet, feeding dependency)
- **Section C:** Functional Oral Intake Scale (FOIS), consisting of 7 levels assessing oral intake ability
- **Section D:** Gugging Swallowing Screen Scale (GUSS), consisting of 20 points including:
  - Preliminary assessment (5 marks): vigilance, cough, saliva swallow, drooling, voice change
  - Direct swallowing test (15 marks): semisolid, liquid, and solid swallowing

Validity and Reliability of the Tool

Content validity of the tool was established by 8 experts in the field of medical-surgical nursing. Necessary modifications were made based on their suggestions. Reliability was determined using the split-half method followed by Karl Pearson's correlation coefficient, which indicated that the tool was reliable .

Pilot Study

A pilot study was conducted from 07/02/2022 to 14/02/2022 at the same setting after obtaining administrative permission. Ten CVA patients were selected. Pre-test assessment was conducted using GUSS and FOIS scales, followed by administration of

CTAR exercise for 7 days. Post-test was conducted on the 8th day. The pilot study findings indicated a significant improvement in swallowing ability after the intervention .

Procedure for Data Collection

Formal permission and ethical clearance were obtained from the concerned authorities. The main study was conducted from 14/02/2022 to 05/03/2022.

The data collection procedure included the following steps:

1. Obtained administrative permission from hospital authorities
2. Selected eligible CVA patients with dysphagia
3. Explained the purpose of the study to participants
4. Obtained informed consent
5. Conducted pre-test using GUSS and FOIS scales
6. Administered CTAR exercise to the experimental group for 7 days
7. Conducted post-test on the 8th day using the same tools
8. Data were analyzed and interpreted

RESULTS

This chapter presents the analysis and interpretation of data collected to assess the effectiveness of Chin Tuck Against Resistance (CTAR) exercise on swallowing ability among cerebrovascular accident (CVA) patients. Data were analyzed using descriptive and inferential statistics .

Section 1: Socio-Demographic Characteristics

Table 1: Distribution of Socio-Demographic Variables among Experimental and Control Groups (N = 60)

Variable	Categories	Experimental (f, %)	Control (f, %)	Total
Age	21–40	12 (40%)	11 (36.7%)	23
	41–60	11 (36.7%)	12 (40%)	23
	≥61	7 (23.3%)	7 (23.3%)	14
Gender	Male	20 (66.6%)	19 (63.3%)	39
	Female	10 (33.3%)	11 (36.6%)	21
Religion	Hindu	20 (66.6%)	16 (53.3%)	36
	Muslim	6 (20%)	10 (33.3%)	16
	Christian	4 (13.3%)	4 (13.3%)	8
Education	Primary & above (majority)	—	—	—
Occupation	Private/Daily wages (majority)	—	—	—
Income	< ₹15,000 (majority)	—	—	—
Family History	Yes	25 (83.3%)	19 (63.3%)	44

Description:
Most participants were aged 21–60 years, predominantly male, and belonged to the Hindu religion. A majority had a family history of stroke.

Section 2: Effect of CTAR Exercise within Groups

Table 2: Comparison of Pre-test and Post-test GUSS Scores (N = 60)

Group	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	p-value
Experimental	9.57 ± 2.66	17.67 ± 1.63	<0.001
Control	10.3 ± 2.25	11.27 ± 2.45	<0.001

Description:
The experimental group showed a significant improvement in GUSS scores compared to the control group.

Table 3: Comparison of Pre-test and Post-test FOIS Scores (N = 60)

Group	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	p-value
Experimental	2.8 ± 1.16	6.13 ± 0.68	<0.001
Control	3.17 ± 1.21	3.63 ± 1.19	<0.001

Description:
FOIS scores significantly improved in the experimental group, whereas only minimal improvement was observed in the control group.

Section 3: Association with Socio-Demographic Variables

Table 4: Association between Pre-test Dysphagia Levels and Socio-Demographic Variables in Experimental Group

Variable	χ^2 Value	p-value	Significance
Gender	17.41	<0.05	Significant
Religion	15.98	<0.05	Significant
Secondary Diagnosis	16.26	<0.05	Significant
Duration of Stroke	13.14	<0.05	Significant
Family History	13.10	<0.05	Significant

Description:
Significant association was found between dysphagia levels and selected variables in the experimental group.

Table 5: Association between Pre-test Dysphagia Levels and Socio-Demographic Variables in Control Group

Variable	χ^2 Value	p-value	Significance
Age	18.15	<0.05	Significant
Gender	13.71	<0.05	Significant
Religion	20.11	<0.05	Significant
Education	31.17	<0.05	Significant
Occupation	17.26	<0.05	Significant

Description:
Most socio-demographic variables showed significant association with dysphagia levels in the control group.

Section 4: Comparison between Experimental and Control Groups

Table 6: Comparison of Post-test FOIS and GUSS Scores between Groups (N = 60)

Parameter	Experimental (Mean ± SD)	Control (Mean ± SD)	p-value
FOIS	6.13 ± 0.68	3.63 ± 1.19	<0.001
GUSS	17.67 ± 1.63	11.27 ± 2.45	<0.001

Description:
Post-test scores were significantly higher in the experimental group, indicating the effectiveness of CTAR exercise.

Overall Finding:

The study findings clearly indicate that CTAR exercise significantly improves swallowing ability among CVA patients with dysphagia compared to routine care.

DISCUSSION

This chapter discusses the major findings of the study and compares them with findings from previous research. The present study was conducted to evaluate the effectiveness of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among cerebrovascular accident (CVA) patients with dysphagia in a tertiary care hospital, Belagavi. A true experimental design was adopted, and data were collected using standardized tools.

1. Findings Related to Socio-Demographic Variables

The present study revealed that most participants belonged to the age group of 21–60 years, with a higher proportion of males in both experimental and control groups. A majority of participants had a family history of stroke and belonged to the Hindu religion.

These findings are consistent with previous studies, which reported that stroke prevalence is higher among middle-aged and elderly populations. Similar findings were reported by Muthulakshmi et al., where the majority of participants were in the age group of 31–40 years, indicating that stroke-related complications such as dysphagia are common in this age group. Another study by Kim HH et al. also reported a higher prevalence among older adults, although no significant association was found between age and dysphagia severity .

2. Findings Related to Effectiveness of CTAR Exercise

The results of the study demonstrated a statistically significant improvement in swallowing ability among patients in the experimental group who received CTAR exercise. The mean GUSS score increased from 9.57 ± 2.66 in the pre-test to 17.67 ± 1.63 in the post-test, with a highly significant p-value (<0.001). Similarly, FOIS scores also showed marked improvement.

In contrast, the control group showed only minimal improvement in swallowing ability. This clearly indicates that CTAR exercise is effective in enhancing swallowing function among CVA patients with dysphagia.

These findings are supported by previous research. A study conducted by Yoon WL demonstrated that CTAR exercise significantly improves swallowing ability compared to conventional exercises such as the Shaker exercise. The study reported statistically significant improvements ($p < 0.001$), highlighting CTAR as a more effective and patient-friendly intervention .

3. Findings Related to Association between Variables

The study also examined the association between pre-test dysphagia levels and selected socio-demographic variables. In the experimental group, significant associations were found with variables such as gender, religion, duration of stroke, and family history. However, not all variables showed significant associations.

In the control group, most socio-demographic variables were significantly associated with dysphagia levels. These findings suggest that factors such as duration of stroke and associated conditions may influence the severity of dysphagia.

Overall Interpretation

The overall findings of the study strongly support the effectiveness of CTAR exercise in improving swallowing ability among CVA patients. The intervention was found to be simple, non-invasive, cost-effective, and easily implementable in clinical settings. The results also emphasize the importance of early assessment and rehabilitation in preventing complications associated with dysphagia.

CONCLUSION

The present study was conducted to evaluate the effectiveness of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among cerebrovascular accident patients with dysphagia.

Based on the findings, the following conclusions were drawn:

A considerable proportion of stroke patients experienced varying degrees of dysphagia ranging from mild to severe.
CTAR exercise was found to be highly effective in improving swallowing ability among CVA patients in the experimental group compared to the control group.
There was a statistically significant improvement in post-test swallowing scores among patients who received the intervention.
CTAR exercise is a safe, non-invasive, cost-effective, and practical method that can be incorporated into routine rehabilitation programs.

Overall, the study concludes that CTAR exercise is an effective therapeutic intervention for enhancing swallowing function and improving the quality of life among stroke patients with dysphagia.

Implications of the Study

Nursing Practice:
Nurses can incorporate CTAR exercise into routine care to improve swallowing ability and reduce complications such as aspiration and malnutrition.

Nursing Education:
Student nurses should be trained in the use of swallowing assessment tools like GUSS and FOIS, along with therapeutic exercises such as CTAR.

Nursing Administration:
Healthcare administrators can promote the use of CTAR exercise through training programs and clinical guidelines to enhance patient outcomes.

Nursing Research:
The study provides a foundation for further research in dysphagia management and rehabilitation among stroke patients.

Limitations

- The study was limited to a sample size of 60 participants.
- Extraneous variables such as demographic and clinical factors were beyond the control of the researcher.
- No long-term follow-up was conducted to assess sustained effectiveness.
- Recommendations
- Similar studies can be conducted with a larger sample size and in different settings.
- Comparative studies can be undertaken to evaluate CTAR exercise with other swallowing therapies.
- Long-term follow-up studies are recommended to assess sustained outcomes.
- Additional supportive therapies such as relaxation techniques and alternative interventions can be explored.

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