A STUDY TO ASSESS THE EFFECTIVENESS OF CHIN TUCK AGAINST RESISTANCE (CTAR) EXERCISE IN IMPROVING SWALLOWING ABILITY AMONG CEREBROVASCULAR ACCIDENT PATIENTS WITH DYSPHAGIA AT SELECTED HOSPITAL, COIMBATORE

By

SANTHOSH PRIYA . N

A Dissertation submitted to **The Tamil Nadu Dr.M.G.R. Medical University**, Chennai, in partial fulfillment for the requirement of the degree of

Master of Science in Nursing

Branch I Medical Surgical Nursing

2017

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CERTIFICATE

Certified that **A STUDY TO ASSESS THE EFFECTIVENESS OF CHIN TUCK AGAINST RESISTANCE (CTAR) EXERCISE IN IMPROVING THE SWALLOWING ABILITY AMONG CEREBROVASCULAR ACCIDENT PATIENTS WITH DYSPHAGIA AT SELECTED HOSPITAL, COIMBATORE** this is a bonafide work of **Ms. SANTHOSH PRIYA .N,** PSG College of Nursing, Coimbatore, and submitted in partial fulfillment of requirement of the degree of Master of Science in Nursing to **The Tamil Nadu Dr. M.G.R Medical University**, Chennai.

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ABSTRACT

A study to assess the effectiveness of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among Cerebrovascular accident patients with dysphagia at selected hospital, Coimbatore.

Background of the study: Stroke is a life changing event. Dysphagia can be seen in 65% of the patients with stroke. In order to improve the overall outcome after stroke it is essential that the swallowing and feeding performance need to be improved through Chin Tuck Against Resistance (CTAR) Exercise.

Objectives: The main objectives of the study was to evaluate the effectiveness of Chin Tuck Against Resistance(CTAR) exercise in improvement of swallowing ability among CVA patients of intervention group.

Research Methodology: The study was conducted in PSG Hospitals, Coimbatore and the research method adopted was Quasi- experimental Time series design. As per the inclusion criteria, 32 samples were selected by purposive sampling and were divided into intervention and comparison group. Pre test data was collected from both the groups by interview and observation method. Then from next day onwards Chin Tuck Against Resistance Exercise was administered for 8 consecutive days, 3 times a day to the CVA patients who belonged intervention group and the comparison group received the routine care. Post test assessment of swallowing ability among CVA patients was assessed using GUSS (Gugging Swallowing Screen) & FOIS (Functional Oral Intake scale) in both the groups after the exercise during their next feeding time for 8 consecutive days, 3 times a day.

Results: The study finding revealed that in the pre test assessment of swallowing ability among CVA patients showed all 16 (100%) patients in the intervention group were having severe dysphagia. After administration of CTAR exercises gradually at the end of eight days of observation mostly 9 (56.25%) of them progressed to mild dysphagia and 5 (31.2%) of them progressed to no dysphagia category. In the intervention group, on day 1 the CVA patients were having severe dysphagia with the post test mean score of 4.38, they progressed to moderate dysphagia at the end of 6 days with the mean score of 11.56 and at the end of day 8 they progressed to mild dysphagia with a mean score of 16.36 which is also statistically significant with a t value 17.347 at the level of $p<0.001$. Thus it concludes, in the intervention group CTAR exercise is effective in improving the swallowing ability among CVA patients with dysphagia.

Conclusion: Thus Chin Tuck Against Resistance Exercise was helpful in improving the swallowing ability among CVA patients with dysphagia.

Keywords:Effectiveness, Chin Tuck Against Resistance Exercise, CVA patients, Dysphagia.

LIST OF ABBREVATIONS

1.	CVA	-	Cerebrovascular accident
2.	CTAR	-	Chin Tuck Against Resistance exercise
3.	GUSS	-	Gugging Swallowing Screening scale
4.	FOIS	-	Functional Oral Intake Scale

CHAPTER I

INTRODUCTION

1.1 Background of the study:

"Trouble never comes in ones"

Stroke is a major health problem in both the developed and developing countries. It is the second most leading cause of death above 60 years. The world heart federation states that every year 15 million people suffer with stroke globally. In that nearly 6 million are left disabled. Life-threatening events such as Cerebrovascular accidents, head injuries, are frequently accompanied by other challenges, including the inability to maintain nutrition through normal oral intake and neurologic changes which may vary depending on the site and extent of the lesion as well as on the age at which the stroke occurs. Since the elderly population is most commonly affected by stroke, and may have more difficulty in compensating changes in muscle tone that reduce chewing and decrease tongue pressure **(Johnson, et al., 2014)**.

Dysphagia presents in approximately 55% of all acute stroke patients admitted to hospital. Among them the oropharyngeal dysphagia, which has an incidence that varies from 40% to 90%, thus becoming a common manifestation of stroke. The presence of dysphagia can itself cause serious consequences like malnutrition, aspiration pneumonia and prone to develop infections. Thus there is no doubt that the high incidence of dysphagia represents co-factor for mortality and morbidity **(Ekberg, 1982)**.

Dysphagia, an impairment of the swallowing mechanism due to physiological weakness, deficits of structure or neurological function. Dysphagia is common among the population who have experienced a stroke, traumatic brain injury, head and neck cancer, head and neck surgery or as a natural process of aging **(Ekberg, 1982; Park, et al., 2012; Shaker, et al., 2002; Johnson, et al., 2014)**.

Dysphagia is present in 42% to 67% of patients within the first 3 days of stroke. Dysphagia is also an independent predictor of poor outcome, prolonged recovery and lengthened hospital stay after stroke. Thus dysphagia among CVA patients invariably influence their prognosis **(Logemann, 1983)**.

Stroke guidelines are stressing early dysphagia detection using validated screening tools like GUSS. In Canada, the United States, the United Kingdom, and Australia, stroke guidelines insists that a trained clinician must be appointed to screen individuals admitted with stroke. Those patients with a positive dysphagia screen result should be kept "nil per oral" (NPO) and followed with a complete assessment of swallowing ability of patients within 24 hours. The premise is that earlier detection allows for earlier treatment which not only shortens the stroke recovery period, but also reduces the overall rehabilitation costs.

Dysphagia can adversely impact the quality of life, as well as negatively impact the person's ability to maintain adequate hydration and nutrition **(Logemann, Nilsson, et al., 1998)**. A recent study of mealtime difficulty in a home for the aged found that 87% had some degree of difficulty with mealtime eating, including 68% with frank signs of dysphagia **(Robert F. Coleman, 2016)**. Exercise based dysphagia therapy can improve the functional and physiological changes in swallowing ability. Compensatory strategies such as postures, swallowing maneuvers, and with rehabilitative exercises like shaker exercise are designed to facilitate a physiologic change in the impaired laryngeal musculature.

Chin tuck against resistance (CTAR) exercise is claimed that strengthening the suprahyoid muscles is effective in restoring the oral feeding for patients with dysphagia. Yoon studied the activation of the suprahyoid muscles by administering the shaker exercise and CTAR exercise. In CTAR the patient is seated in an upright position and tucks the chin to compress an inflatable rubber ball**.** He found CTAR exercise is effective than shaker exercise **(Yoon, et al., 2013)**.

CTAR exercise would be more effective than shaker exercise - a rehabilitative regimen already which would demonstrate success in order to bring out a positive effect in hyolaryngeal musculature due to increased compliance and decreased strenuousness of the physical exercise. The results of Yoon's study indicated that CTAR yielded greater suprahyoid activation than shaker exercise. Thus Yoon claimed that CTAR would serve as an effective approach to exercising the suprahyoid muscles and adequate rest is provided in between the exercise schedule which prevents fatigue of muscles.

1.2 Need for the study:

Stroke is a life changing event. The prevalence rate of stroke is higher among the Asians. In India, it is about 250 - 300/ 10000 populations per year. The global burden of disease study estimated that the annual stroke incidence of India will increase from 91/100,000 in 2015 to 98/100,000 in 2030 **(Ezzati, et al., 2004).**

Dysphagia is resulted among stroke patients who had occlusion in the middle cerebral artery or internal carotid artery or vertebral or basilar artery. Dysphagia can be seen in 65% of the patients with stroke. Aspiration is the most common in the early period following acute stroke as a result of dysphagia **(Kidd et al., 1993).**

It is important to rehabilitate the swallowing mechanism as this helps to reduce distress, reduce the risk of aspiration, maintain fluid balance and promote motivation. The presence of dysphagia is associated with increased risk of mortality, malnutrition, dehydration, compromised pulmonary function disability. There are also emotional complications, from the stigma of being unable to eat, which is seen as a largely social activity, and the embarrassment, frustration or anger at needing assistance. **(Handy, 2004).** Due to limited length of stay in acute care and rehabilitation settings, more patients are being discharged and transitioning home with persisting dysphagia **(Johnson, et al., 2014**).

If dysphagia is effectively managed patients will be better nourished, which can improve rehabilitation rates and reduce the length of hospital stay. **(Layne, 1990).** It reduces the incidence of complications such as chest infections and pressure sores. Early detection and management of dysphagia in neurological patients is necessary to prevent complications and decrease number of deaths associated with dysphagia **(De Pauw et al., 2002).**

Various swallowing techniques have effect on the nutritional outcome of the stroke patients. The treatments such as oral motor exercise, difficult exercise, different swallowing techniques, positioning and diet modification helps to improve the nutritional pattern depending on the patient's condition **(Elmstahl, et al., 1999).**

Exercise based dysphagia therapy can improve the functional and physiological changes in swallowing performance of the adults with chronic dysphagia (Carnaby et al., 2012). In shaker exercise, the key component is exercising the suprahyoid muscles, and thereby strengthening it. But it may pose a physical challenge for elderly dysphagic with chronic disease **(Yoshida, et al, 2007)**.

Thus developing a less strenuous therapeutic exercise would potentially benefit the patients who find shaker exercise physically challenging. The Chin Tuck Against Resistance (CTAR) Exercise, performed in a seated position, is less strenuous as the patient is not required to lift the weight of her head. So performing CTAR in a seated position would make it convenient for dysphagic patients, thereby will improve the compliance. Thus finding a way to resolve dysphagia is the need of the hour. There is a present clinical need for effective efficient rehabilitative swallowing exercise. In order to improve the overall outcome following stroke it is essential that the swallowing and feeding performance are improved through Chin Tuck Against Resistance (CTAR) Exercise.

1.3 Statement of the problem:

Effectiveness of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among Cerebrovascular Accident patients with dysphagia at selected Hospital, Coimbatore.

1.4 Objectives:

- Assess the swallowing ability among CVA patients with dysphagia.
- Evaluate the effectiveness of Chin Tuck Against Resistance (CTAR) exercise in improvement of swallowing ability among CVA patients of intervention group.
- Compare the post test score of swallowing ability among CVA patients between intervention group and comparison group.
- To determine the correlation between the level of dysphagia and functional level of oral intake.
- To associate between grade of dysphagia among CVA patients with selected demographic variables.

1.5 Assumptions:

- Dysphagia can negatively impact the person's ability to maintain adequate hydration and nutrition**.**
- Chin Tuck Against Resistance (CTAR) exercise may improve swallowing ability among CVA patients with dysphagia.

1.6 Hypothesis:

- There will be a significant difference in the post test swallowing ability between comparison and intervention group after Chin Tuck Against Resistance (CTAR) exercise at 0.05 level of significance.
- There will be a significant association between level of dysphagia and selected demographic variables among CVA patients.

1.7 Delimitations:

In this study the delimitations are smaller sample size, study is delimited to only one setting; the patient group who suffer with dysphagia is limited to stroke population alone.

1.8 Operational definitions:

Effectiveness:

It refers to the reduction in the swallowing difficulty after administration of Chin Tuck Against Resistance (CTAR) exercise which is measured by using Gugging Swallowing Screening scale (GUSS), 3 times a day (morning, afternoon and night) during their feeding schedule.

Cerebrovascular accident patients:

In this study, it refers to stroke patients who had impaired swallowing ability which could be graded using GUSS and FOIS scale.

Dysphagia

Dysphagia, an impairment of the swallowing mechanism which can be assessed using Gugging Swallowing Screening scale in patients who have experienced stroke, the patients with the scores are graded as:

15-19 - Mild Dysphagia

10-14 - Moderate Dysphagia

0-9 - Severe Dysphagia

Chin Tuck Against Resistance (CTAR) exercise

CTAR exercise is an activity performed with a 12cm diameter inflatable rubber ball which is placed between chin and base of neck to provide resistance when the patient is seated in upright position. Chin tuck against the ball and sustained it for 10 sec (isometric) and for 10 repetitions (isokinetic), three times a day for 8 consecutive days.

Functional Oral Intake Scale (FOIS)

The FOIS is a seven point ordinal scale, described as follows: level 1 as nothing by mouth, level 2 as tube dependent with minimal attempts of food, level 3 as tube dependent with consistent oral intake, level 4 as oral diet of single consistency, level 5 as diet with multiple consistencies which requires special preparation, level 6 as diet with multiple consistencies with restrictions and level 7 as oral diet with no restrictions, so this reflects the functional oral intake of patients with dysphagia.

Optimal swallowing ability

If the patients are able to get the score of 20 in Gugging Swallowing Screening scale (GUSS). Then it is concluded that the patient attained optimal swallowing ability.

1.9 Projected outcome:

CTAR exercise would improve the swallowing ability to attain optimum swallow function among CVA patients with dysphagia.

1.10 Conceptual framework:

Modified Wiedenbach's helping art of clinical nursing theory is used as the conceptual framework to assess the Effectiveness of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among CVA patients with dysphagia at selected Hospital, Coimbatore.

The conceptual framework was developed by Ernestine Wiedenbach in 1964. The theory has two parts (a) helping art of clinical nursing theory and (b) nursing practice. Helping art of clinical nursing theory is a prescriptive theory for nursing which describes a desired action and the ways to attain it. It consists of three factors, central purpose, prescription, and realities.

Central purpose refers to what the researcher wants to accomplish. It is the overall goal. It is the task or the assignment directing towards the attainment of goal.

The central purpose of the study is the CTAR exercise would help the CVA patients with dysphagia to maintain optimal swallowing function.

Prescription is the plan of care for a patient. It includes the action and the rationale for that action which fulfils the central purpose.

In this study CTAR exercise was used for the intervention group as a therapy. The therapy was given for 10 repetitions/session/ 3 times a day for consecutive 8 days. The level of dysphagia is assessed using Gugging Swallowing Screening scale (GUSS) and Functional Oral Intake Scale (FOIS).

Realities refer to the physical, physiological, emotional and spiritual factors that involves in nursing actions. There are five realities they are as follows.

Agent: One who directs all actions towards the goal and has capacities, capabilities, commitment and competence to provide care. In this study the researcher is the agent who directs the action towards the goal.

Recipient: One who is vulnerable and dependent and receives all attention. In this study the CVA patients with dysphagia are recipient.

Goals: It refers to the desired outcome of the action. The CTAR exercise would help the CVA patients with dysphagia to achieve optimal swallowing function is the goal need to be attained.

Means: It refers to the activities used to achieve the goal. In this study CTAR exercise is given to the CVA patients with dysphagia to attain optimal swallowing function.

Environment: It refers to the facilities in which it is practiced. It refers to the neurology ward of PSG hospitals, Coimbatore. Wiedenbach's nursing practice consists of identification, ministration and validation.

Identification: It refers to the individual unique experiences and the perceptions. In this study it refers to the selection of the samples and the assessment of dysphagia.

Ministration: It refers to the provision of needed help. Here it refers to the administration of CTAR exercise to the intervention group and the routine care to the comparison group.

Validation: It refers to the restoration of physical ability after the implementation of action. In this study the assessment of dysphagia before and after administering the CTAR exercise and routine care helps to validate in intervention and comparison group respectively.

Chapter summary:

The consequent chapters are organised as follows:

Chapter I - describes statement of problem, need for the study, objectives, hypothesis, operational definition and conceptual framework.

Chapter II - describes about review of literature.

Chapter III - deals with materials and methods.

Chapter IV - explains about data analysis and interpretation.

Chapter V - deals with results and discussion

Chapter VI - deals with summary and conclusion.

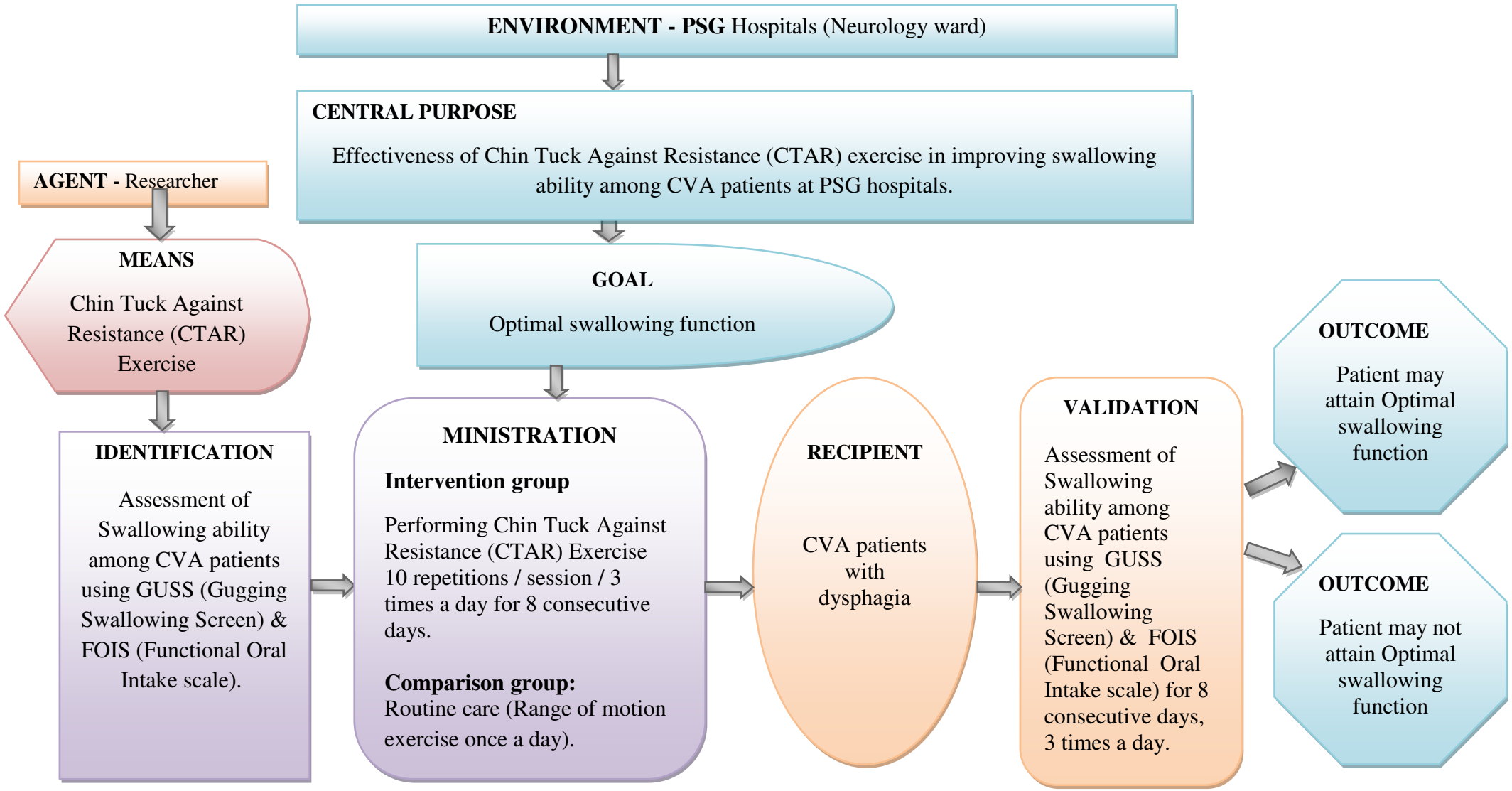

Figure 1.1: Modified Widenbach's Helping Art of Clinical Nursing Theory to assess the Effectiveness of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among CVA patients at PSG hospitals.

CHAPTER II

REVIEW OF LITERATURE

The literature review is designed to appraise a body of research. A literature review helps to lay the foundation and provide context for a new study. Reviewing the literature can help to identify the relevant conceptual frameworks or appropriate research methods. An entire chapter often is devoted to a literature **(Polit, 2009).**

Literatures relevant for this study were reviewed and have been organised as follows:

2.1 Literature related to incidence and cost burden of post stroke dysphagia.

2.2 Literature related to dysphagia and malnutrition.

2.3 Literature related to assessment of dysphagia.

2.4 Literature related to Chin Tuck Against Resistance (CTAR) Exercises for post stroke dysphagia.

2.1. Literature related to incidence and cost burden of post stroke dysphagia

A retrospective study was done in a teaching hospital in Bern with a purpose to evaluate dysphagia by using Gugging Swallowing Screen (GUSS). The sample size was 570 consecutive patients between the period of January 2012 to November 2013. The results showed that 118 of 570 (20.7%) patients were diagnosed with dysphagia. During hospitalisation, 36 of 118 (30.5%) patients with dysphagia needed a nasogastric tube and one patient required a percutaneous endoscopic gastrostomy. At the time of discharge, dysphagia persisted in 60 of 118 (50.9%) patients. Tube feeding was ongoing in 23(19.5%) patients at discharge. Among them 27 (22.9%) patients with dysphagia developed hospital acquired pneumonia ($p<0.001$). The use of antibiotics was markedly higher in patients with dysphagia (28%) than those without dysphagia (4.6%) at $p<0.001$. Thus the study concludes among dysphagic patients those who receive tube feeding had much higher risk for hospital acquired pneumonia, need of antibiotic treatment. **(Marcel Arnold, et al., 2016).**

A descriptive study was conducted in south carolina in order to address the cost of dysphagia management post stroke dysphagia patients. The sample included were 3200 patients who were hospitalized in south carolina Medicare in 2004 with a primary diagnosis of ischemic stroke, among them 317 patients were identified with dysphagia. The results showcased, in univariate analyses patients with post stroke dysphagia had $9297 higher one year crude charges and $3819 higher crude payments than those without post stroke dysphagia. In multivariable analyses, the African Americans had greater morbidity, independently had an effect on hospital cost and length of stay. Thus it is evident that the presence of dysphagia resulted to 23% increase in costs and a 30% longer length of stay. African Americans with post stroke dysphagia incurred 7% more costs and had a 16% longer length of stay. A higher Charlson co morbidity score resulted in 9% higher costs and a 4% longer length of stay. Finally, having a severe stroke was associated with a 31% longer length of stay. **(Heather Shaw Bonilha et al., 2014)**

A population-based long-term follow-up study was conducted to determine whether dysphagia present in the first week of acute stroke is associated with long-term outcome. Among 1188 patients and were grouped using Barthel scores. Dysphagia was assessed among these patients within 1 week of stroke, at 3 months and yearly for 5 years by using face-to-face interview method. Using Barthel Scores were divided into the two groups 15-20 and 0-14, and modelled using multiple logistic regression. There were 567 patients with dysphagia (mean age 74.3 years) and 621 with a safe swallow (mean age 69.6 years). The results are following multinomial logistic regression, residence in a nursing home was more likely to present with dysphagia during the first week of their stroke; however, this only reached statistical significance at 3 months (relative risk ratio (RRR) = 1.73; 95% confidence interval (CI) 1.02 to 2.95), and years 4 (RRR 3.35, 1.37–8.19) and 5 (RRR 3.06, 1.06-8.83). There was also a significant association with increased mortality only during the first three months. This study highlights that the presence of dysphagia during the acute phase of stroke is associated with poor outcome during the subsequent year, particularly at 3 months. **(Smithard D.G, et al., 2006).**

A systemic review was done (1966 through May 2005) to determine the incidence of dysphagia and associated pulmonary compromise among stroke patients. Data sources included Medline, Embase, Pascal, relevant Internet addresses, and extensive hand searching of

bibliographies of identified articles and thus reviewed 277 sources. Among them selected articles were reviewed for quality, diagnostic methods, and patient characteristics. The relative risks (RRs) of developing pneumonia were calculated in patients with dysphagia and confirmed aspiration. In that out of the 277 sources identified, 104 were original, peer-reviewed articles that focused on adult stroke patients with dysphagia. The reported incidence of dysphagia was lowest using cursory screening techniques (37% to 45%), higher using clinical testing (51% to 55%), and highest using instrumental testing (64% to 78%). Dysphagia tends to be lower after hemispheric stroke and remains prominent in the brain stem stroke. There is increased risk for pneumonia in patients with dysphagia (RR, 3.17; 95% CI, 2.07, 4.87) and an even greater risk in patients with aspiration (RR, 11.56; 95% CI, 3.36, 39.77).Thus the study concludes dysphagia is more evident in case of patients with brain stem stroke. **(Rosemary Martino, et al., 2005).**

A multiethnic population based study was conducted to estimate the prevalence of acute impairments and disability among stroke patients from south London stroke register. Associations between impairments and death and disability at 3 months were identified. Impairments that occur at the time of maximum neurological deficit were recorded, and disability recorded according to the Barthel Index (BI) which was assessed at 1 week and 3 months after stroke. The results were, among 1259 registered patients, 6% had 1 or 2, 31.1% had 3 to 5, 50.6% had 6 to 10, and 10.6% had >10 impairments. The Common impairments noted were weakness (upper limb, 77.4%), urinary incontinence (48.2%), impaired consciousness (44.7%), dysphagia (44.7%), and impaired cognition (43.9%). Patients with total anterior circulation infarcts had the highest age-adjusted prevalence of weakness, dysphagia, urinary incontinence, cognitive impairment, and disability. Patients with subarachnoid hemorrhage had the highest rates of coma. Patients with lacunar stroke had the high prevalence of weakness but were least affected by disability, incontinence, and cognitive dysfunction. Blacks had higher age- and sex-adjusted rates of disability in ischemic stroke (BI <20, odds ratio 2.76, 95% CI 1.47 to 5.21, *P*=0.002; BI <15, odds ratio 1.8, 95% CI 1.45 to 2.81, *P*=0.01) but impairment rates similar to those of whites. The multivariable analysis showed that incontinence, coma, dysphagia, cognitive impairment, and gaze paresis were independently associated with severe disability (BI <10) and death at 3 months. Therefore the findings indicate that an acute assessment of

impairments and disability is necessary to determine the appropriate nursing and rehabilitation needs of patients with stroke. **(Enas .S Lawrence, et al., 2001)**

A prospective study was conducted to identify the prevalence of swallowing disorder and its diagnostic accuracy following acute stroke. The samples were 128 patients with acute first-ever stroke. They were assessed for the prevalence of swallowing disorders, the diagnostic accuracy of clinical assessment of swallowing function compared with videofluoroscopy, and interobserver agreement for the clinical and videofluoroscopic diagnosis of swallowing disorders and aspiration. The study results found that the clinical and videofluoroscopic evidence of a swallowing disorder in 51% [95% confidence interval (CI) 42–60%] and 64% (95% CI 55–72%) of patients, respectively, and aspiration in 49% (95% CI 40–58%) and 22% (95% CI 15–29%) of patients, respectively. Thus it mentions the clinical bedside examination underestimates the frequency of swallowing abnormalities and overestimates the frequency of aspiration compared with videofluoroscopy. **(Mann. G, et al., 2000).**

2.2 Literature related to dysphagia and malnutrition:

A descriptive study was conducted at university hospital of north Norway with a purpose to perform a formal screening for nutritional risk and dysphagia to ensure optimal nutritional management among stroke patients with the view to reduce the risk of aspiration in patients with dysphagia. They performed a chart review to assess performance of screening for nutritional risk and dysphagia in all patients with stroke hospitalized for ≥48 hours between June 1, 2012, and May 31, 2013. Then they applied a "clinical microsystems approach" with rapid improvement cycles and audits over a 6-month period to achieve full implementation. The results derived from chart review showed that nutritional risk screening was performed in 65% and swallow testing in 91% of eligible patients (n = 185). Proactive implementation resulted in >95% patients screened (n = 79). The overall prevalence of nutritional risk was 29%, and 23% of the patients failed the initial swallow test. Thus it concludes proactive implementation is required to obtain high screening rates for nutritional risk and swallowing difficulties using validated screening tools. **(Margitta. T, 2014).**

A randomised controlled trial study was conducted to evaluate looped NGT feeding among acute stroke patients with dysphagia. Among 104 patients with acute stroke fed by NGT in three UK stroke units. NGT was secured using either a nasal loop (n = 51) or a conventional adhesive dressing (n = 53). The main outcome measure was the proportion of prescribed feed and fluids delivered via NGT in 2 weeks post-randomisation. Secondary outcomes were frequency of NGT insertions, treatment failure, tolerability, adverse events and costs at 2 weeks; mortality; length of hospital stay; residential status; and Barthel Index at 3 months. Patients assigned to looped NGT feeding received a mean 17% (95% confidence interval 5-28%) thereby more volume of feed and fluids and had fewer electrolyte abnormalities than controls. There was more minor nasal trauma in the loop group. There were no differences in outcomes at 3 months. Looped NGT feeding cost 88 pounds sterling more per patient over 2 weeks than controls. Thus the study concludes the looped NGT feeding improves delivery of feed and fluids and reduces NGT reinsertion with little additional cost. **(Beavan J. et al., 2010).**

A randomised controlled study was conducted on food trials at three pragmatic multicentre with a view to establish whether the timing and route of enteral tube feeding had affected the stroke patients' outcomes at 6 months. The primary outcome was death or poor outcome at 6 months. Among 859 patients were enrolled between Nov 1, 1996, and July 31, 2003, by 83 hospitals in 15 countries. Two of three pragmatic multicentre included dysphagic stroke patients. In one trial, patients enrolled within 7 days of admission were randomly allocated to early enteral tube feeding or no tube feeding for more than 7 days (early versus avoid). In the other, patients were allocated percutaneous endoscopic gastrostomy (PEG) or nasogastric feeding. The results showed that early tube feeding was associated with an absolute reduction in risk of death of 5.8% (95% CI -0.8 to 12.5, p=0.09) and a reduction in death or poor outcome of 1.2% (-4.2 to 6.6, p=0.7). In the PEG versus nasogastric tube trial, 321 patients were enrolled by 47 hospitals in 11 countries. PEG feeding was associated with an absolute increase in risk of death of 1.0% (-10.0 to 11.9, p=0.9) and an increased risk of death or poor outcome of 7.8% (0.0 to 15.5, p=0.05).This study concludes that early tube feeding might reduce case fatality. **(Dennis MS, et al., 2005).**

A prospective study was conducted to estimate the prevalence and risk factors of malnutrition among stroke patients in a rehabilitation (Rehab) service centre. Among 49

consecutive patients who had enrolled in that rehab centre and follow-up was done at intervals of 2- to 4-months. Malnutrition was diagnosed using biochemical and anthropometric data. The results showed that at the time of admission to Rehab, the stroke patients have a very high prevalence of malnutrition which is of 49% and later declined to 34%, 22%, and 19% at 1 month, 2 months, and follow-up, respectively. Dysphagia, was present among 47% of patients at the admission time, which was associated with malnutrition (p = .032) and significantly declined over time. Using logistic regression, predictors of malnutrition on admission involved acute service tube feedings (p = .002) and histories of diabetes (p = .027) and prior stroke (p = .013). Tube feedings, associated with malnutrition on admission (p = .043), were more prevalent in brain stem lesion patients. Patients tube fed ≥ 1 month during rehabilitation or at home were not malnourished. Malnutrition was associated with advanced (>70 years) age at 1 month (p = .002) and weight loss (p = .011) and lack of community care (p = .006) at follow-up. Thus it concludes that early and ongoing detection and treatment of malnutrition are recommended during rehabilitation of stroke patients both on the service and at follow-up. **(MD Hillel, et al., 1995).**

A randomised study was conducted at three Glasgow teaching hospitals for a period of 28 days in order to compare percutaneous endoscopic gastrostomy and nasogastric tube feeding in patients with persisting neurological dysphagia. The study subjects were 40 patients with dysphagia for at least four weeks secondary to neurological disorders. In that 20 patients (10 women) were randomised to nasogastric feeding and 20 (eight women) to endoscopic gastrostomy.One patient in each group died before starting feeding. Treatment failure occurred in 18 of the 19 nasogastric patients and in none of the gastrostomy group. The results were mean (SE) duration of feeding for the nasogastric group was 5.2 (1.5) days. No complications occurred in the nasogastric group but three (16%) of the gastrostomy group developed minor problems (aspiration pneumonia (two patients) wound infection (one)). Gastrostomy patients received a significantly greater proportion of their prescribed feed (93% (2%)) compared with the nasogastric group, (55% (4%); p less than 0.001) and also gained significantly more weight after seven days of feeding (1.4 (0.5) kg v 0.6 (0.1) kg; p less than 0.05). Thus this study concludes percutaneous endoscopic gastrostomy tube feeding is a safe and effective method of providing long term enteral nutrition to patients with neurological dysphagia and offers important advantages over nasogastric tube feeding. **(Park RH, et al., 1992).**

2.3 Literature related to assessment of dysphagia:

A systematic review study was conducted on dysphagia screening measures for use in nursing homes with a purpose to evaluate the psychometric quality and feasibility of measurements for screening dysphagia in older adults to identify the 'right tool' for nurses to use in nursing homes. A checklist was used to evaluate the psychometric quality and applicability. Tools were evaluated for feasible incorporation into routine care by nurses. There were 29 tools from 31 studies were identified. Dysphagia screening tools with an acceptable validity and reliability had sensitivity between 68% and 100% and specificity between 52% and 100%. The Gugging Swallowing Screen (GUSS) and the Standardized Swallowing Assessment (SSA) were the tools with high psy- chometric quality, especially with high sensitivity, that nurses could perform feasibly to identify the risk and to grade the severity of dys- phagia and aspiration of nursing home residents. The results concluded that GUSS and SSA are reliable and sensitive tools for screening dysphagia which nurses can use in nursing homes. **(Park, Yeon-Hwan, et al, 2015).**

A validity and reliability study was conducted on initial psychometric assessment of a functional oral intake scale for dysphagia among stroke patients in a tertiary care metropolitan stroke unit with an objective to report on the development and psychometric evaluation of a clinical scale to document change in functional oral intake of food and liquid in stroke patients. The samples were 302 acute stroke patients. The results of the study revealed that the interrater reliability was high, with perfect agreement on 85% of ratings. Kappa statistics ranged from .86 to .91. Consensual validity was high (.90) and the criterian validity was high at onset and one month post stroke. There was a significant association identified between the FOIS and stroke handicap scales. Scores on the FOIS from the cohort of stroke patients showed a shift toward increased oral intake over a 6 month period. Thus the FOIS had adequate reliability, validity and sensitivity to change in functional oral intake. These findings concluded that the FOIS may be appropriate for estimating and documenting change in the functional eating abilities of stroke patients.(**Michael A. Crary, et al., 2005).**

2.4. Literature related Chin Tuck Against Resistance (CTAR) Exercises for post stroke dysphagia:

A within-subject repeated-measures design study was conducted at Texas Christian University among healthy individuals to compare the electrophysiological activity in submandibular hyolaryngeal muscles during performance of two exercises (Chin - to- Chest (CtC) exercise and Chin Tuck Against Resistance(CTAR) exercise) that incorporates resistance against muscular contraction and were measured using surface Electromyography during exercise performance. Among 20 healthy young adult women between 20-30 years of age and were selected by employing convenience sampling technique, Each participant completed both counterbalanced experimental exercise condition with 10 performing the CTAR and 10 performing the CtC as the first exercise. The results showed that the mean peak amplitude for CtC indicated as 136.64 and for CTAR 106.03. The mean average amplitude for CtC indicated as 75.54 and for CTAR 49.39. It is concluded that the CtC exercise resulted in both greater mean peak amplitude and greater mean average amplitude for the entire hyolaryngeal muscle contraction compared to CTAR (**Teresa Hughes, et al., 2015**).

A study was conducted using a swallowing exercise aid device in connection with three exercises namely the Chin Tuck Against Resistance (CTAR) exercise, Jaw opening Against Resistance (JOAR) and effortful swallow with resistance. The samples were 10 healthy senior volunteers who performed the exercises 3 times per day for 6 weeks. The outcomes were measured with the dynamometer, MRI and Vediofluoroscopy (VFSS) following 6 weeks of exercise, The results showed that the mean chin tuck strength, jaw opening strength, anterior tongue strength, suprahyoid muscle volume and maximum mouth opening significantly increased($p<0.05$). Feasibility and compliance (median 86%, range 48-100%) of the swallow exercise aid exercises were good**. (** **Kraaijenga, 2015**).

An experimental study was conducted to compare the maximum and mean surface electromyography (sEMG) activity of the suprahyoid muscles during the Chin Tuck Against Resistance(CTAR) exercise and the shaker exercise for both isokinetic and isometric tasks. The aim of the study is to find out whether CTAR is as effective as shaker exercise in exercising the Suprahyoid muscles. Among 40 healthy participants (20 males, 20 females) aged 21 - 39 years

were selected and completed tasks. During the CTAR exercises, the participant is seated while tucking the chin to compress an inflatable rubber ball, whereas during the shaker exercise, the participant is lay supine while lifting the head to look at the feet. The subjective feedback suggested that the sitting position for CTAR is less strenuous than the supine position for shaker, the results of separate analyses revealed significantly greater surface electromyography (sEMG) values during the CTAR exercise (mean peak sEMG:166.52; mean average sEMG:103.72) than during the equivalent shaker exercise($p<0.05$). Thus the study concludes that the CTAR exercise is effective and less strenuous than shaker exercise.**(Wai Lam Yoon, et al., 2014).**

An experimental study among 29 acute stroke patients was conducted at Chang Gung Memorial Hospital-Kaohsiung Medical Center in Taiwan to assess the functional outcome among them who are with Oropharyngeal Dysphagia after Swallowing Therapy was measured by clinical swallowing assessments and videofluoroscopy (VFS). They were randomly divided them into 3 therapy groups: traditional swallowing (TS)(11 patients), oropharyngeal neuromuscular electrical stimulation (NMES) (8 patients), and combined NMES/TS (10 patients). The results showed that (45%) with minimal to total oral intake (FOIS, 2-4). Three patients (38%) with FOIS 1 and 5 patients (62%) with FOIS 2-4 were in the NMES group. Five patients (50%) with FOIS 1 and 5 patients (50%) with FOIS 2-4 were in the combined NMES/TS group. The median FDS during VFS before therapy while on a soft diet, cookies, and thick and thin liquid were 21.1, 19.2, 26, and 18.9 in the TS group, 11.4, 17.8, 18.9, and 12.4 in the NMES group, and 25.4, 30, 32.6, and 22.3 in the combined NMES/TS group, respectively. The median FDS scales while on a soft diet, cookies, and thick and thin liquid were 21.1, 19.2, 26, and 18.9 before treatment and 15.7, 24.8, 23.4, and 16.2 after treatment in the TS group, respectively. There were significant differences in FOIS before and after therapy in all 3 groups ($P <.05$) **(Kun-Ling Huang, et al., 2014).**

Conclusion:

This chapter deals with the review of literature on various areas like incidence, cost burden, malnutrition of post stroke dysphagia and the effect of Chin Tuck Against Resistance (CTAR) Exercise for post stroke dysphagia. This literature review helped to gain knowledge

about dysphagia, retrieve various screening tools to assess dysphagia, to know about various exercises available to improve swallowing ability and mainly to identify the superiority of CTAR exercise among them, also guided in steps of CTAR exercise therapy. The literature review showed the evident of employing CTAR exercise to healthier individuals and one post test was done using eletromyography so the knowledge gap was identified in employing the CTAR exercise to CVA patients with dysphagia.

CHAPTER III

MATERIALS AND METHODS

Research design of a study spells out the basic strategies that researchers adopt to develop evidence that is accurate and interpretable **(Polit, 2009).** The present study is designed to find out the effectiveness of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among CVA patients with dysphagia at PSG hospital, Coimbatore. The study was conducted by adopting the steps of research process such as research design, setting, selection of population and sampling, criteria for selecting the samples, instruments and tool for data collection and method of data analysis. Pilot study was conducted and changes were incorporated.

3.1 Research approach:

This study adopted quantitative research approach. According to Cook and Campbell quasi experimental designs facilitates the search for knowledge and examination of causality in situations in which complete control is not possible **(Burns N., 2009).**

Research design:

Quasi - experimental design:

Time series design

Quasi experiments are like true experiments that involve an intervention. This design lack randomization, the signature of a true experiment. The signature of a quasi experimental design is an intervention in the absence of randomization. Time series with multiple institution of treatment is useful when the researcher wants to measure the effects of a treatment over a long period of time **(Polit, 2009).**

Intervention Group

$$O_1 \longrightarrow X_1 \longrightarrow O_2 \longrightarrow X_1 \longrightarrow O_3 \longrightarrow X_1 \longrightarrow O_4$$

Comparison Group

$$O_1 \longrightarrow X_2 \longrightarrow O_2 \longrightarrow X_2 \longrightarrow O_3 \longrightarrow X_2 \longrightarrow O_4$$

Where,

O_1	Pre test assessment of swallowing ability among CVA patients using GUSS (Gugging Swallowing Screen) & FOIS (Functional Oral Intake Scale) tool
O_2, O_3 and O_4	Observations of effect of CTAR exercise using GUSS (Gugging Swallowing Screen) & FOIS (Functional Oral Intake Scale) tool for 8 consecutive days, three times per day during their feeding time.
X_1	CTAR Exercise given for 8 consecutive days, three times per day until the patient gets discharge / gain optimal swallowing ability.
X_2	Routine care (Range of motion exercise once a day).

3.2 Variables of the study:

Independent variable

The independent variable of this study is Chin Tuck Against Resistance (CTAR) exercise

Dependent variable

The dependent variable of this study is swallowing ability and feeding performance among CVA patients.

3.3 Setting of the study:

This study was conducted in Neurology ward at PSG Hospitals, Peelamedu, and Coimbatore. The hospital is a multi speciality hospital and research centre with bed strength of 1315 which caters multi lingual patients from various parts of the country. The PSG Hospitals has an outpatient facility whereby around 1000 patients take medical advice every day. This is the first teaching hospital in Tamilnadu and the third teaching hospital in India to get certified by National Accredited Board for Hospitals and Health Care Provider (NABH). The study was conducted at Neurology ward which comprises of all facilities to meet patients need.

The study was conducted in the Neurology ward. Bed strength of the Neurology ward is 20. Approximately 18 - 20 CVA patients with dysphagia was admitted in 1 month. Neurology ward is well equipped with all facilities for assessing the swallowing ability and feeding performance using GUSS (Gugging and Swallowing Screen) & FOIS (Functional Oral Intake

Scale) tool, it has got a very good dietary department which provides blended diet for feeding assessment at required times. It also has a well equipped physiotherapy department where they provide routine exercises to the CVA patients.

3.4 Population and Sampling:

The population composed of CVA patients who had dysphagia and admitted at PSG hospitals, Coimbatore. The total numbers of CVA patients admitted in last year were 224. The CVA patients with dysphagia who met the inclusion criteria were selected for this study. They were grouped into comparison group and intervention group using purposive sampling, each group consists of 16 patients respectively written consent for participation in the study was obtained from all patients.

3.4.1 Sampling technique and sample size: All patients who met the inclusion criteria were selected using the purposive sampling technique. First, the samples for comparison group were selected then, proceeded with the selection of samples for the intervention group in order to avoid sample contamination. Total samples were 32 patients. In each group 16 samples were assigned (intervention group= 16 and comparison group=16).

Sample Size:

The last year census of CVA patients to our hospital was 224. So the estimated sample size was 32. It includes both intervention and comparison group where each group consists of 16 patients respectively.

The formula for calculating sample size for finite population:

$$n = \frac{Z^2 \times N \times SD^2{}_P}{(N-1)e^2 + Z^2 \times SD^2{}_P}$$

N= size of population

n = size of sample

e = acceptable error

SDp = standard deviation of a population

Z = standard variation at a given confidence level

$$= \frac{(1.96)^2 \times 224 \times (3.94)^2}{(224-1) \times (1.25)^2 + (1.96)^2 \times (3.94)^2}$$

$$= \frac{13358.34}{408.07}$$

Estimated sample size is 32.

3.4.2 Sample selection criteria:

Inclusion Criteria:

- Patients admitted with right or left hemiplegia or hemiparesis.
- Patients who are alert, cooperative and obeys commands.
- Patients who are willing.
- Patients who are conscious.
- Patients who can assume sitting position.

Exclusion Criteria:

- Patients with ET intubation.
- Patients with tracheostomy.
- Patients with other neurological disorders.

3.5 Instruments and tool for data collection:

Section A: Demographic variables

It includes age, gender, education, income and occupation. (Annexure IV A)

Section B: Baseline clinical data

It includes diagnosis, associated illness, cause of stroke, duration of stroke and family history of stroke. (Annexure IV B)

Section C: Swallowing assessment

It includes drooling, coughing, choking, difficulty in swallowing, pain on swallowing, weight loss and history of aspiration. (Annexure IV C)

Section D: Nutritional assessment

It includes current diet as nil per oral state, liquid diet, semisolid diet and alternative nutrition method. The Dependency state of feeding includes partially or completely dependent for feeding. (Annexure IV D)

Section E: Gugging Swallowing Screen scale (GUSS)

The Gugging Swallowing Screen scale (GUSS) was developed by Trapl M and Michael Brainin in the year 2007 at centre of Clinical Neurosciences, Danube University, Krems, Austria. This could be applied to assess the swallowing ability of patients. It has 2 divisions: the preliminary assessment (Part 1 - indirect swallowing test) and the direct swallowing test (part 2) which consists of 3 subtests namely semisolid diet swallowing test, liquid diet swallowing test and solid diet swallowing test. Thus all these subsets must be performed sequentially from indirect swallowing test to solid diet swallowing test. (Annexure IV E)

Score and Interpretation of Gugging Swallowing Screen scale on level of dysphagia as follows:

15-19 - Mild Dysphagia
10-14 - Moderate Dysphagia
0-9 - Severe Dysphagia.

Section F: Functional Oral Intake Scale (FOIS)

The Functional Oral Intake Scale was developed by Michael A. Crary in 2005 at University of Florida Health science center, Gainesville. It is a seven point scale which describes the various states of NG feeding and feeding ability. This is mainly used to assess the feeding performance of dysphagia patients. (Annexure IV F)

Score and Interpretation of Functional Oral Intake Scale:

SCORE	INTERPRETATION
1	Patient on total NG feeding.
2	Patient on NG feed with minimal food trials of semisolid consistency and can move on to liquids if tolerated.
3	Patient on NG feed with consistent oral intake, can use water to wash the food through the throat . Meals take extra time (> 1 hour).
4	Patient on diet with single consistency (ground / pureed form otherwise called semisolid) but can drink water.
5	Patient on diet with multiple consistencies, Diet can be prepared using blender.
6	Patient on diet with multiple consistencies (pureed / grounded / chopped / regular). except salad, rice, meat, bread.
7	Patient on regular diet without any restrictions.

3.5.1 Validity and reliability of the study:

Validity of the tool:

Content validity of the tool Gugging Swallowing Screen scale (GUSS) and Functional Oral Intake Scale (FOIS) was obtained from expert's of different departments. The experts gave their opinions, clarity and appropriateness of the tool.

Reliability of tool:

Reliability of the Gugging Swallowing Screen scale (GUSS):

Reliability of the tool Gugging Swallowing Screen scale (GUSS) was determined using inter rater reliability method among two raters. The reliability of the GUSS tool was found to be 0.9. The tool was found to be highly reliable for the study.

Reliability of the Functional Oral Intake Scale (FOIS):

Functional Oral Intake Scale's (FOIS) interrater reliability was high, with perfect agreement on 85% of ratings. Kappa statistics ranged from 0.86 to 0.91 which was already established by Michael A. Crary. The reliability of the FOIS tool in this setting was determined

using inter rater reliability method among two raters. It was found to be 0.9. Thus the tool was found to be highly reliable for the study.

3.5.2 Ethical approval:

The Institutional Human Ethics Committee (IHEC), PSG Institute of Medical Science and Research reviewed the proposal on its full board meeting and approved the study to conduct. The Institutional Human Ethics Committee (IHEC) consists of fifteen members of different areas of expertise. After getting clearance from Institutional Human Ethics Committee (IHEC) data collection was done.

3.5.3 Techniques of data collection:

Demographic data and medical history collected through interview method and retrieved from medical records. Swallowing ability among CVA patients were assessed using Gugging Swallowing Screen and Functional Oral Intake Scale through observation method.

Intervention:

Chin Tuck Against Resistance Exercise:

A brief introduction on Chin Tuck Against Resistance Exercise was given to the participants and relatives with adequate positive reinforcement. Chin Tuck Against Resistance Exercise is the training helps to improve swallowing ability among CVA patients with dysphagia. Chin Tuck Against Resistance Exercise is repeated for 10 times per session for 3 sessions per day for consecutive 8 days.

Device needed:

- A rubber ball with 12 cm diameter.

Procedure:

I. Assess the swallowing ability among CVA patients with dysphagia using Gugging Swallowing Screen and Functional Oral Intake Scale.

II. Administer the Chin Tuck Against Resistance Exercise.
    - Seated upright in chair.

- A rubber ball with 12cm diameter is placed between chin and base of neck to provide resistance.
- Tuck the chin against the ball and sustaining it for 10 sec (isometric)
- Do it for 10 repetitions (isokinetic), three times a day for 8 consecutive days.

III. Ongoing assessment of the effectiveness of Chin Tuck Against Resistance Exercise done every day in the morning, afternoon and evening using GUSS and FOIS scales.

Note: CTAR Exercise can be continued until the patient gets discharged / gain optimal swallowing ability

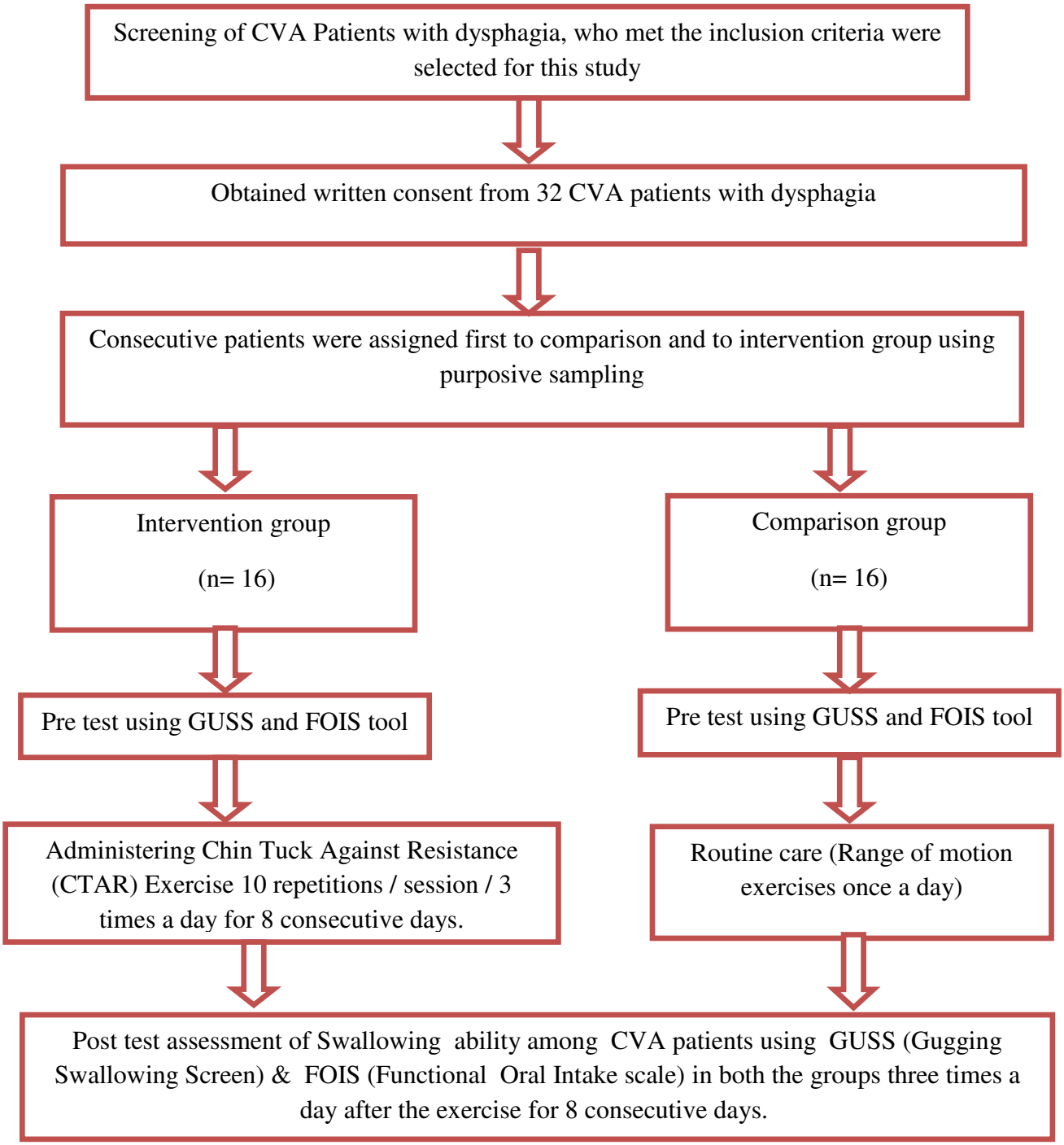

Figure 3.1: Schematic representation of data collection

3.5.4 Data collection procedure:

Permission was obtained from the Head of the Department, Neurology as well as from Institutional Human Ethics Committee (IHEC). PSG Institute of Medical Science and Research. After that the CVA patients who met the inclusion criteria were selected for this study. Informed consent was obtained from patients. Patients were assigned to intervention and comparison group by purposive sampling method. Demographic data and medical history collected through interview method and retrieved from medical records. Pre test data were collected regarding Swallowing ability among CVA patients using Gugging Swallowing Screen and Functional Oral Intake Scale through observation method. Chin Tuck Against Resistance (CTAR) exercise was administered 3 times a day for 8 consecutive days to CVA patients with dysphagia who belonged to intervention group and the comparison group received the routine care. Post test assessment of Swallowing ability among CVA patients was done using GUSS (Gugging Swallowing Screen) & FOIS (Functional Oral Intake scale) in both the groups three times a day after the exercise.

3.6 Report of the pilot study:

Pilot study was conducted for a period of 3 weeks to test the validity, practicability of the tool and feasibility of conducting the main study. Pilot study was conducted with 10 samples. The samples who met the inclusion criteria were selected for the study. After selection of patients, demographic data and medical history were collected through interview and retrieved from medical records. Patients were divided into intervention and comparison group using purposive sampling method. Pre test data were collected in both intervention and comparison groups. Chin Tuck Against Resistance Exercise was given to the patients who belonged intervention group 3 times a day for 8 consecutive days and the comparison group received the routine care. Post test assessment of Swallowing ability among CVA patients was done using GUSS (Gugging Swallowing Screen) & FOIS (Functional Oral Intake scale) in both the groups three times a day after the exercise for 8 consecutive days. Through the pilot study, the reliability and practicability of the tool and feasibility of the study has been found. There were no changes brought after pilot study.

3.7 Data analysis plan:

The data will be analysed using descriptive and inferential statistics.

Descriptive statistics:

Frequency and percentage distribution of samples will be done to assess the demographic variables. Frequency distribution, mean, standard deviation will be used to describe the swallowing ability before and after administration of Chin Tuck Against Resistance Exercise.

Inferential statistics:

Paired't' test will be used to find the significant differences between the pre-test and post-test level of dysphagia among CVA patients in both the groups. Independent't' test will be used to assess the significant difference in post-test level of dysphagia between the intervention and comparison group. Chi-square test will be used to find out the association between swallowing ability among CVA patients and their demographic variables.

CHAPTER-IV

DATA ANALYSIS AND INTERPRETATION

Analysis is a process of organizing the data in such a way that research question can be answered **(Polit and Hungler, 1999).** This chapter deals with the analysis of the data collected from the patient and the interpretation of the results helps in making sense of the results of a study. The data was collected to assess the Effectiveness of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among CVA patients with dysphagia at PSG hospital, Coimbatore. The data was collected, analyzed and tested for the significance.

The data analysis was organized and presented in table under the following sections:

Section I

- Frequency and percentage distribution of Demographic variables among CVA patients in intervention and comparison group
- Frequency and percentage distribution of Medical History among CVA patients in intervention and comparison group
- Frequency and percentage distribution of symptoms present among CVA patients in intervention and comparison group
- Frequency and percentage distribution of Diet History among CVA patients in intervention and comparison group

Section II

- Comparison of level of dysphagia among CVA patients in Intervention group and the Comparison group based on the GUSS score
- Comparison of level of functional oral intake between Intervention group and the Comparison group based on the FOIS score

Section III

- Comparison of pretest and post test mean and standard deviation scores of swallowing ability among CVA patients in intervention group using paired't' test at various time intervals.
- Comparison of pretest and post test mean and standard deviation scores of swallowing ability among CVA patients in comparison group using paired't' test at various time intervals.
- Comparison of pretest and post test mean and standard deviation scores of functional oral intake among CVA patients in intervention group using paired't' test at various time intervals.
- Comparison of pretest and post test mean and standard deviation scores of functional oral intake among CVA patients in Comparison group using paired't' test at various time intervals.
- Comparison of post test mean and standard deviation scores of swallowing ability among CVA patients in intervention group and comparison group using independent't' test at various time intervals.

Section IV

- The correlation between the post test mean and standard deviation scores of swallowing ability using GUSS and functional level of oral intake using FOIS
- Association between pre test level of dysphagia and selected demographic variables among CVA patients in comparison group.
- Association between pre test level of dysphagia and selected demographic variables among CVA patients in intervention group.

Table 4.1: Frequency and percentage distribution of Demographic variables among CVA patients in intervention and comparison group

n=32

Demographic variables	Intervention group n=16				Comparison group n=16			
Age and gender (Age in years)	**Male**	**%**	**Female**	**%**	**Male**	**%**	**Female**	**%**
35 -45 years	-	-	-	-	1	6.2	-	-
45 - 55 years	8	50	-	-	6	37.5	1	6.2
56 - 65 years	3	18.8	-	-	3	18.8	-	-
66 - 75 years	2	12.5	1	6.2	2	12.5	-	-
76 - 85 years	1	6.2	1	6.2	2	12.5	1	6.2
Education								
Illiterate	1		6.2		6		37.5	
Elementary	11		68.75		6		37.5	
SSLC	3		18.8		4		25	
Degree	1		6.2		-		-	
Income (per month)								
<5000	1		6.2		7		43.8	
5000 - 10000	10		62.5		7		43.8	
10000 - 15000	3		18.8		2		12.5	
>15000	2		12.5		-		-	
Occupation								
House wife	2		12.5		2		12.5	
Coolie	8		50		5		31.2	
Farmer	2		12.5		1		6.2	
Unemployed	-		-		3		18.8	
Business	3		18.8		5		31.2	
Professional	1		6.2		-		-	

The table 4.1 reveals that half of the patients in the intervention group, 6 (37.5%) in comparison group belongs to 45-55 years of age. Most of the patients 28 (87%) were males. Most of the patients 11 (68.75%) in intervention group and 6 (37.5%) from comparison group had completed their elementary school education. Majority of their family monthly income falls into the category of 5000 - 10000. Both in intervention 8 (50%) and comparison group 5 (31.2%) most of them were coolie.

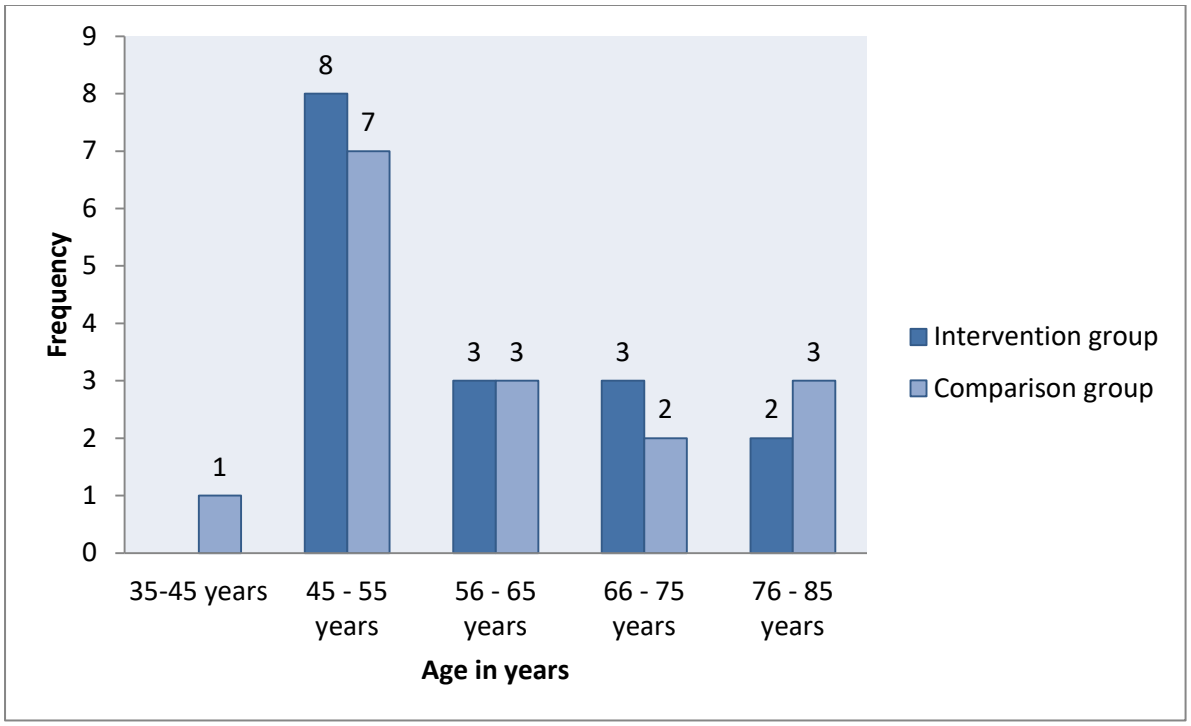

Figure 4.1: The bar diagram shows the frequency and percentage distribution of age among CVA patients in intervention and comparison group

This figure reveals that half of the patients 8 (50%) in the intervention group, 6 (37.5%) in comparison group belongs to 45-55 years of age as compared to the age group of 76 - 85 years, where 2 (12.5%) belongs to intervention group and 3 (18.8%) belongs to comparison group.

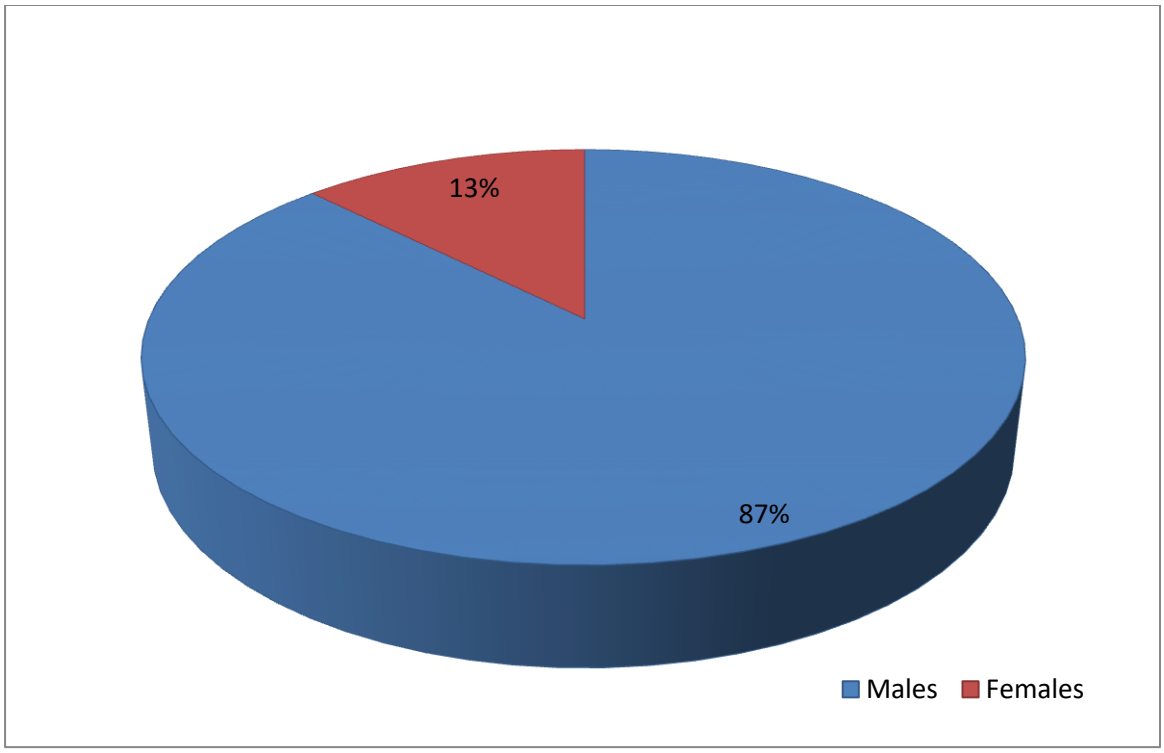

Figure 4.2: The pie diagram shows the frequency and percentage distribution of Demographic variable gender among CVA patients in intervention and comparison group

This figure depicts that in this study most of the CVA patients (87%) who suffer from dysphagia were males.

Table 4.2: Frequency and percentage distribution of Medical History among CVA patients in intervention and comparison group

n = 32

Medical History	Intervention group n=16		Comparison group n=16	
	f	%	f	%
Diagnosis				
Right hemiparesis	3	18.8	8	50
Right hemiplegia	7	43.75	4	25
Left hemiparesis	2	12.5	1	6.2
Left hemiplegia	4	25	3	18.8
Cause of stroke				
Ischemic	13	81.2	10	62.5
Hemorrhagic	3	18.8	6	37.5
Associated illness				
Diabetes mellitus	-	-	2	12.5
Hypertension	9	56.2	9	56.2
Both diabetes and hypertension	7	43.75	2	12.5
Both dibetes and hypertension with ischemic heart disease	-	-	3	18.8
Both diabetes and hypertension with chronic kidney disease	-	-	-	-
Duration of stroke				
<5 days	13	81.2	6	37.5
5 - 10 days	3	18.8	3	18.8
10 -15 days	-	-	1	6.2
15 - 20 days	-	-	3	18.8
>20 days	-	-	3	18.8
Family history of stroke				
Yes	-	-	-	-
No	16	100	16	100

The table 4.2 infers that most of them 7 (43.75%) in the intervention group were diagnosed as right hemiplegia and in the comparison group 8(50%) of them were with right hemiparesis. Among 16 (100%) patients in the intervention group 13 (81.2%) of them were found with ischemia as a cause of stroke and the duration of stroke is less than 5 days . In the comparison group as well as in the intervention group 9 (56.2%) of them in each group were with hypertension as associated illness. None of them have the family history of stroke.

Table 4.3: Frequency and percentage distribution of dysphagia symptoms present among CVA patients in intervention and comparison group

n = 32

Symptoms present among CVA patients		Intervention group n=16		Comparison group n=16	
		f	%	f	%
Drooling	Present	1	6.2	4	25
	Absent	15	93.8	12	75
Coughing	Present	16	100	15	93.8
	Absent	-	-	1	6.2
Choking	Present	-	-	-	-
	Absent	16	100	16	100
Difficulty in swallowing	Semisolid	16	100	12	75
	Liquid	-	-	3	18.8
	Solid	-	-	1	6.2
Pain on swallowing	Present	15	93.8	3	18.8
	Absent	1	6.2	13	81.2
Weight loss	Present	8	50	7	43.8
	Absent	8	50	9	56.2
History of aspiration	Present	-	-	1	6.2
	Absent	16	100	15	93.8

The table 4.3 describes the symptoms presented by CVA patients regarding their swallowing ability. In the intervention group among 16 patients, drooling was absent in 15 (93.8%) patients so chocking was also absent among all patients. All of them were having cough and mostly difficulty in swallowing semisolid diet 15 (93.8%). None of them had a history of aspiration. In comparison group 12(75%) of them were with difficulty in swallowing for semisolids and 7(43.8%) has weight loss.

Table 4.4: Frequency and percentage distribution of diet history among CVA patients in intervention and comparison group

n=32

Diet History		Intervention group n=16		Comparison group n=16	
		f	**%**	**F**	**%**
Current diet					
Nil per oral		16	100	12	75
Liquid diet		-	-	1	6.25
Semisolid diet		-	-	3	18.75
Alternative Nutrition Method	Nasogastric tube feed	16	100	12	75
	Percutaneous entero gastrostomy feed	-	-	-	-
Dependency state for feeding					
Partially dependent for feeding		-	-	4	25
Completely dependent for feeding		16	100	12	75

The table 4.4 reveals that in comparison group, 3 patients (18.75%) were on semisolid diet and partially dependent for feeding where as all 16 patients (100%) in the intervention group were on nil per oral and completely dependent for feeding.

Table 4.5: **Comparison of level of dysphagia among CVA patients in Intervention group and the Comparison group based on the GUSS score**

n=32

S.No	GUSS Score	Level of dysphagia	Intervention group n=16																		Comparison group n=16															
			Before		After																Before		After															
			Pre test		D1		D2		D3		D4		D5		D6		D7		D8		Pre test		D1		D2		D3		D4		D5		D6		D7		D8	
			f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	F	%	f	%	F	%	f	%	f	%	f	%	f	%	f	%	f	%
1	20	No dysphagia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	31.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	15 - 19	Mild dysphagia	-	-	-	-	-	-	-	-	-	-	3	18.8	7	43.75	8	50	9	56.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	12.5	2	12.5
3	10 - 14	Moderate dysphagia	-	-	-	-	-	-	5	31.2	6	37.5	8	50	7	43.75	7	43.75	2	12.5	3	18.8	3	18.8	3	18.8	3	18.8	3	18.8	3	18.8	4	25	2	12.5	2	12.5
4	0 - 9	Severe dysphagia	16	100	16	100	16	100	11	68.75	10	62.5	5	31.2	2	12.5	1	6.2	-	-	13	81.2	13	81.2	13	81.2	13	81.2	13	81.2	13	81.2	12	75	12	75	12	75

The table 4.5 describes the comparative view of level of dysphagia between intervention and comparison group. In the intervention group upto day 2 all patients fall into the category of severe dysphagia (GUSS score is 0-9), gradually at the end of day 8 none of them was having severe dysphagia, 2 (12.5%) of them were having moderate dysphagia (GUSS score is10-14), and mostly 9 (56.25%) patients were having mild dysphagia (GUSS score is 15-19) and even 5 (31.2%) of them had progressed to a state of no dysphagia with score 20 in GUSS at the end of 8 days of therapy. In the comparison group till day 8 most of them i.e 12 (75%) patients fall into the category of severe dysphagia.

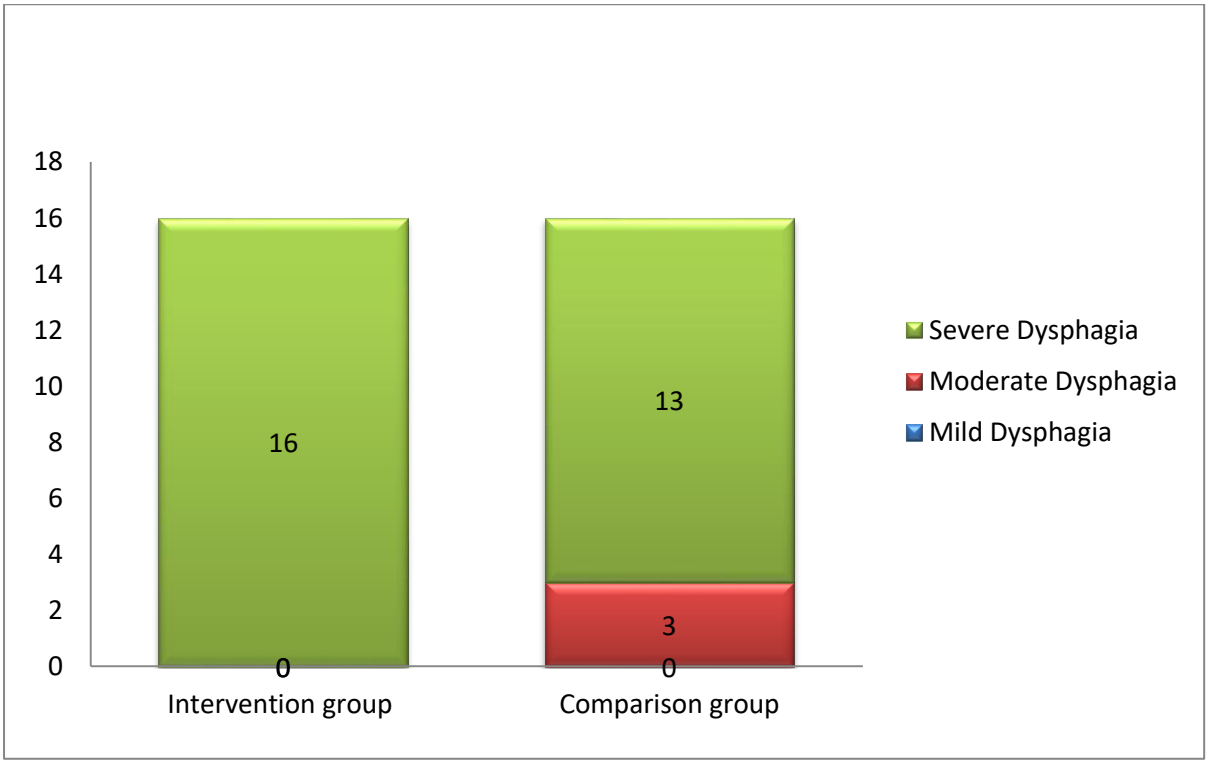

Figure 4.3 Bar diagram on comparison of pre test level of dysphagia among CVA patients in Intervention group and the comparison group based on the GUSS score

The figure 4.3 bar diagram depicts the pre test level of dysphagia among CVA patients, where all who belong to intervention group had severe dysphagia and only 3 (18.8%) out of 16 (100%) patients belong to moderate dysphagia in comparison group.

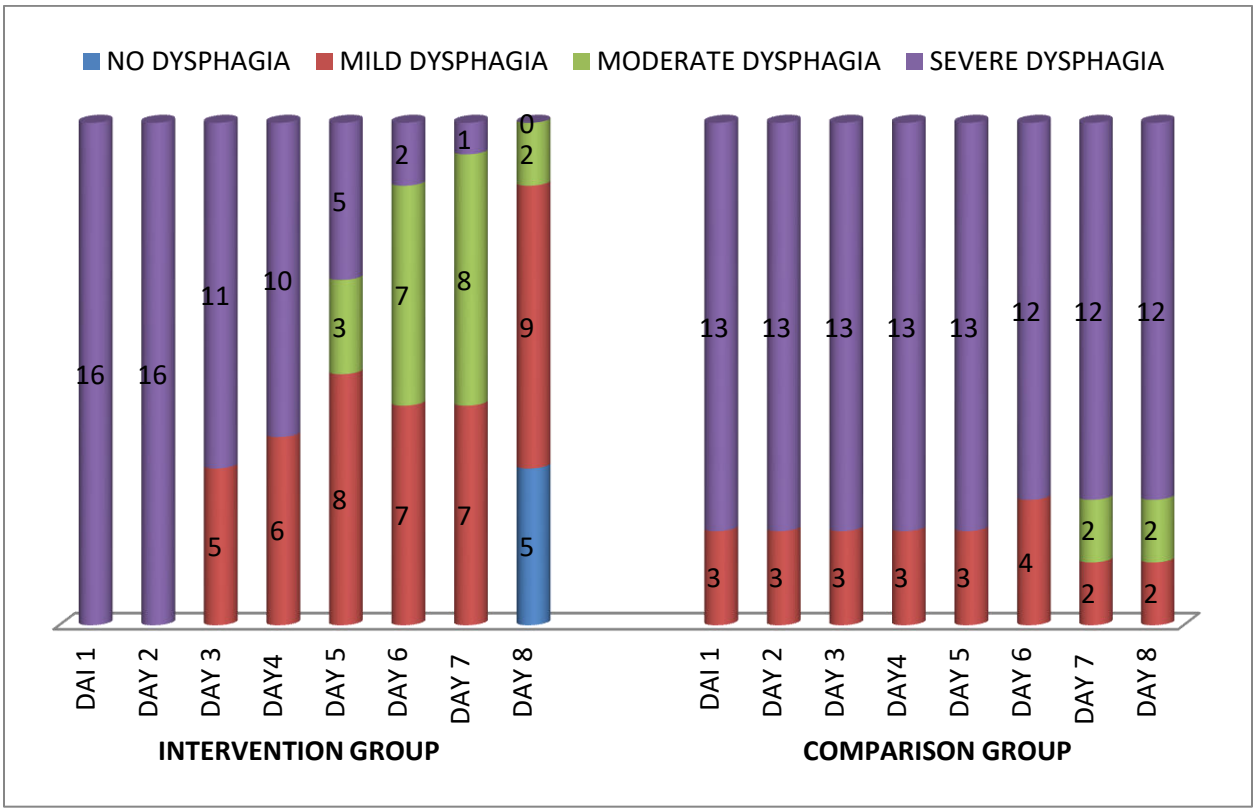

Figure 4.4: Multiple bar diagram comparison of post test level of dysphagia among CVA patients in Intervention group and the comparison group based on the GUSS score

The figure 4.4 multiple bar diagram highlights the changes in the level of dysphagia among CVA patients, in the intervention group all of them belonged to the category of severe dysphagia gradually at the end of eight days of observation mostly 9 (56.25%) of them progressed to mild dysphagia and 5 (31.2%) of them progressed to no dysphagia category. Thus it signifies 5 (31.2%) of them attained optimal swallowing state. In contrary, even at the end of eight days of observation 12 (75%) of them remained in severe dysphagia category.

Table 4.6: Distribution of average daily dysphagia score using GUSS scale among CVA patients in the intervention group

n=16

Average daily dysphagia score using GUSS scale														
Day of dysphagia assessment / **Samples**	**Day 1**	**Day 2**	**Day 3**	**Day 4**	**Day 5**	**Day 6**	**Day 7**	**Day 8**	**Day 9**	**Day 10**	**Day 11**	**Day 12**	**Day 13**	**Day 14**
1	4	4	4	4	5	5	5	10	10	11	11	12	12	12
2	4	4	4	4	5	5	10	10	10	10	12	-	-	-
3	4	4	5	5	10	15	15	20	-	-	-	-	-	-
4	4	5	5	5	10	10	10	15	-	-	-	-	-	-
5	4	4	4	5	10	10	10	15	15	15	17	17	-	-
6	5	5	10	10	15	15	17	20	-	-	-	-	-	-
7	4	4	5	5	5	10	10	15	15	15	16	16	17	17
8	5	9	10	10	10	15	15	18	-	-	-	-	-	-
9	5	5	10	10	15	15	17	20	-	-	-	-	-	-
10	5	5	5	5	10	10	15	17	-	-	-	-	-	-
11	5	5	10	10	10	15	15	20	-	-	-	-	-	-
12	4	4	4	5	5	10	10	15	15	15	16	16	-	-
13	4	5	8	10	10	15	15	17	-	-	-	-	-	-
14	4	4	5	5	10	10	12	15	-	-	-	-	-	-
15	4	4	4	5	5	10	10	15	-	-	-	-	-	-
16	5	5	10	10	15	15	15	20	-	-	-	-	-	-

The table 4.6 describes the distribution of dysphagia score using GUSS scale among CVA patients. In the intervention group upto day 2 all patients fall into the category of severe dysphagia (GUSS score is 0-9) , gradually at the end of day 8 none of them was having severe dysphagia, 2 of them were having moderate dysphagia (GUSS score is10-14), and mostly 9 patients were having mild dysphagia (GUSS score is 15-19). Most of them (11) got discharged on day 8 and 5 patients with CVA attained optimal swallowing ability (GUSS score is 20) on day 8. Only 2 of them received CTAR exercises till 14 days and got discharged. The number of days the therapy given and assessment of swallowing ability using GUSS scale varies from 8 to 14 days.

Table 4.7: Distribution of dysphagia score using GUSS scale among CVA patients in the comparison group

n=16

Average daily dysphagia score using GUSS scale														
Day of dysphagia assessment / **Samples**	**Day 1**	**Day 2**	**Day 3**	**Day 4**	**Day 5**	**Day 6**	**Day 7**	**Day 8**	**Day 9**	**Day 10**	**Day 11**	**Day 12**	**Day 13**	**Day 14**
1	10	10	10	10	14	14	15	15	-	-	-	-	-	-
2	4	4	4	4	4	4	4	4	4	4	4	4	-	-
3	9	9	9	9	9	10	10	14	-	-	-	-	-	-
4	2	2	4	5	5	5	5	5	5	5	-	-	-	-
5	4	4	4	4	4	4	4	4	5	5	5	-	-	-
6	2	2	4	4	4	4	5	5	5	-	-	-	-	-
7	10	10	10	10	10	10	10	14	-	-	-	-	-	-
8	6	6	6	6	6	6	6	6	7	7	-	-	-	-
9	2	2	2	4	4	4	5	5	5	5	-	-	-	-
10	2	2	2	2	4	4	4	4	4	5	-	-	-	-
11	3	3	3	4	4	5	7	7	-	-	-	-	-	-
12	14	14	14	14	14	14	15	15	-	-	-	-	-	-
13	4	4	4	4	5	5	7	7	-	-	-	-	-	-
14	3	3	4	4	4	5	7	7	-	-	-	-	-	-
15	4	4	4	4	5	5	5	7	-	-	-	-	-	-
16	4	4	4	4	4	4	5	5	-	-	-	-	-	-

Table 4.7 describes the distribution of dysphagia score using GUSS scale among CVA patients. In the comparison group till day 8 most of them i.e 12 patients fall into the category of severe dysphagia. More than half of them (9) got discharged on day 8. Only one of them received routine care till 12 days and got discharged. The number of days the routine care given and assessment of swallowing ability using GUSS scale varies from 8 to 12 days.

Table 4.8: **Comparison of level of functional oral intake between Intervention group and the comparison group based on the FOIS score**

n=32

FOIS Score	Level of functional oral intake	Intervention group n=16																		Comparison group n=16															
		Before		After																Before		After															
		Pre test		D1		D2		D3		D4		D5		D6		D7		D8		Pre test		D1		D2		D3		D4		D5		D6		D7		D8	
		f	%	f	%	f	%	f	%	f	%	F	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	F	%	f	%	f	%	f	%
1	Total NG feed	12	75	12	75	9	56.25	5	31.25	2	12.5	-	-	-	-	-	-	-	-	11	68.75	11	68.75	11	68.75	11	68.75	11	68.75	11	68.75	11	68.75	11	68.75	7	43.75	5	31.25
2	NG feed with minimal semisolid trials	4	25	4	25	6	37.5	6	37.5	9	56.25	5	31.25	2	12.5	1	6.2	-	-	2	12.5	2	12.5	2	12.5	2	12.5	2	12.5	2	12.5	1	6.2	5	31.25	7	43.75
3	NG feed with consistent oral intake	-	-	-	-	1	6.2	4	25	3	18.8	7	43.75	7	43.75	6	37.5	2	12.5	3	18.8	3	18.8	3	18.8	3	18.8	2	12.5	2	12.5	3	18.8	1	6.2	1	6.2
4	Single consistency diet	-	-	-	-	-	-	1	6.2	2	12.5	4	25	5	31.25	4	25	4	25	-	-	-	-	-	-	-	-	1	6.2	1	6.2	1	6.2	2	12.5	2	12.5
5	Multiple consistency diet	-	-	-	-	-	-	-	-	-	-	-	-	2	12.5	5	31.25	4	25	-	-	-	-	-	-	-	-	-	-	-	-	1	6.2	1	6.2		
6	Multiple consistency diet with exceptions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	37.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

The table 4.8 illustrates the level of functional oral intake, where in the pre test most of the patients 12 (75%) belong to the intervention group were on total NG feed where as it was 11 (68.75%) patients in the comparison group. At the end of eight days of therapy in the intervention group 6 (37.5%) of the patients progressed to the state of multiple consistency diet with restrictions, 4 (25%) were progressed to multiple consistency diet and 4 (25%) were progressed to the state of single consistency diet. In the comparison group mostly 11 (68.75%) of the patients were remained in the state of total NG feed until six days of observation.

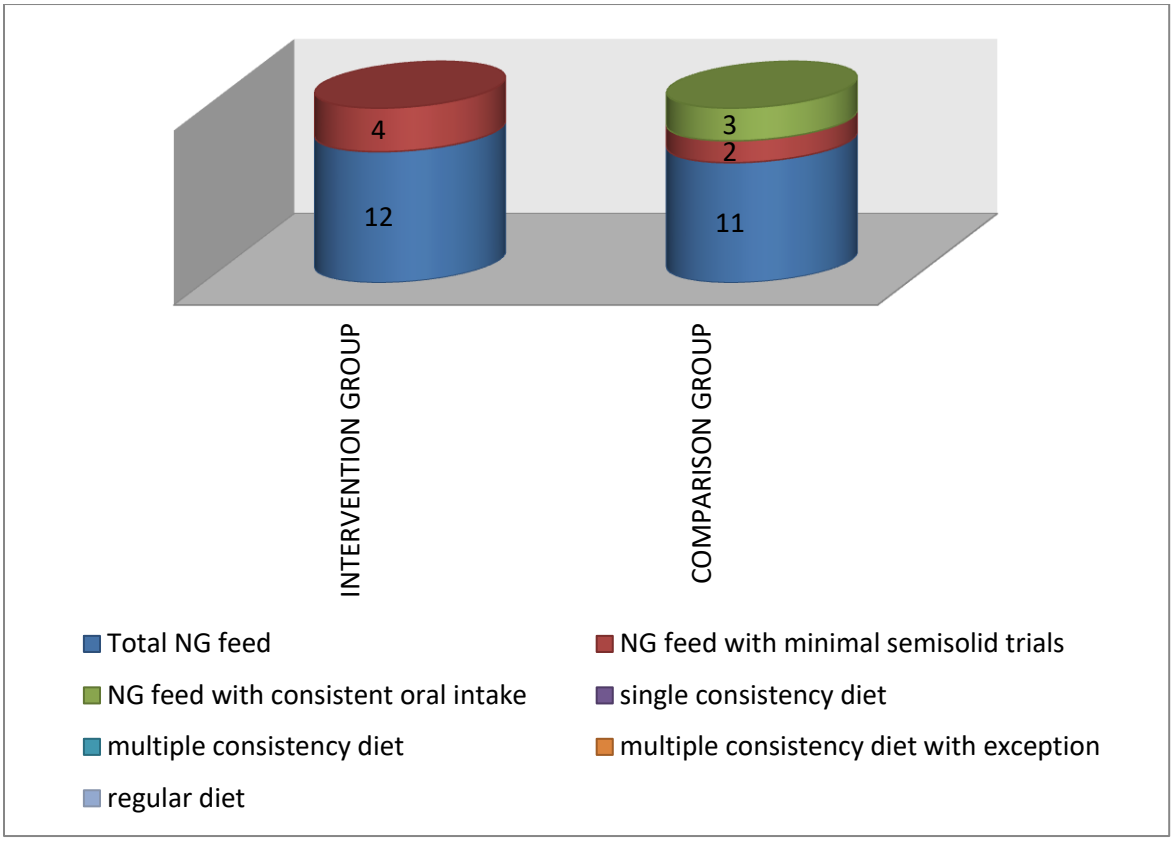

Figure 4.5: Multiple bar diagram on comparison of pre test level of functional oral intake among CVA patients in Intervention group and the comparison group based on the FOIS score

The figure 4.5 multiple bar diagram explains the pretest level of dysphagia among CVA patients in both the groups where 12 (75%) of them from intervention group and 11 (68.75%) of them from comparison group falls into the category of total NG feed.

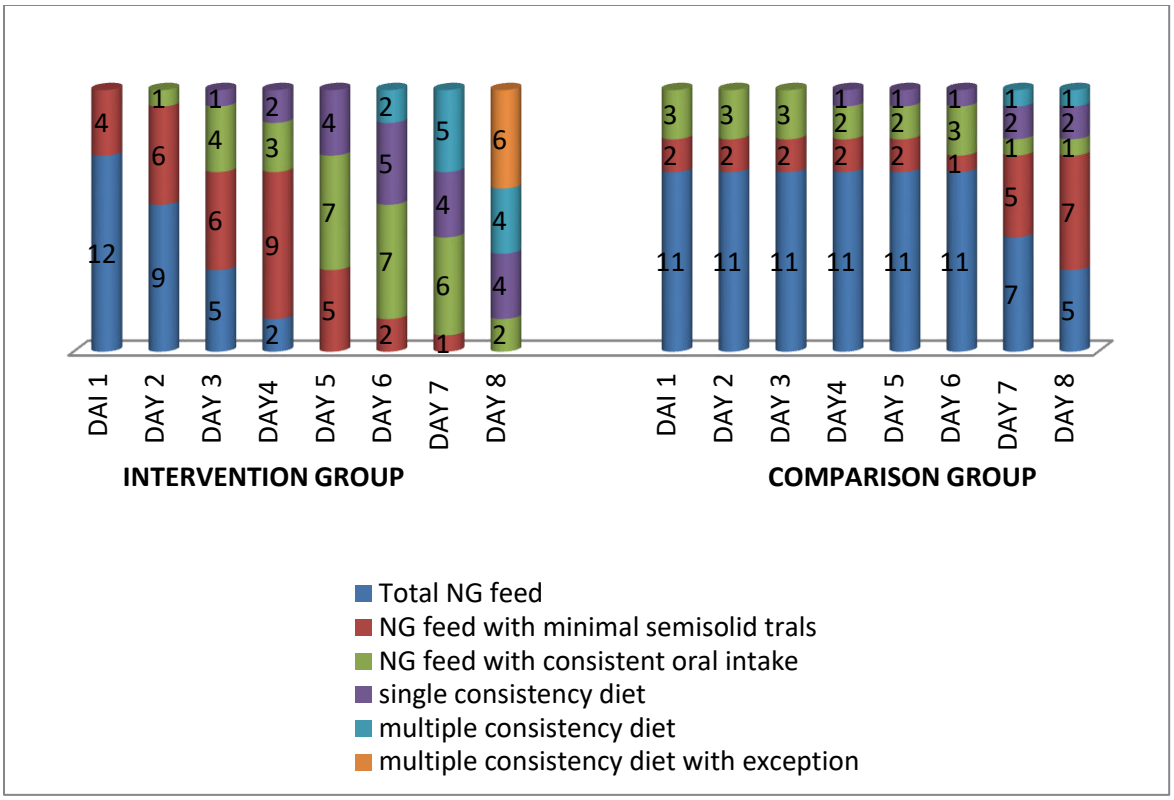

Figure 4.6: Multiple bar diagram on comparison of post test level of functional oral intake among CVA patients in Intervention group and the Comparison group based on the FOIS score

The figure 4.6 multiple bar diagram describes the effect of CTAR exercise among CVA patients in both intervention and comparison group using FOIS score. In the comparison group till day 6, most of them 11 (68.75%) out of 16 remained in the state of total NG feed. In contrary, on day 1 12 (75%) patients out of 16 were on total NG feed but this number gradually decreased to nil state on total NG feed and 6(37.5%) of them were progressed to a state of multiple consistency diet with exception at the end of day 8. This shows that CTAR exercise was effective among CVA patients with dysphagia.

Table 4.9: Comparison of pretest and post test mean and standard deviation scores of swallowing ability among CVA patients in intervention group using paired 't' test at various time intervals.

n=16

Days	Intervention group	Mean ± SD	Overall mean	't' value	Table value
Pretest		4.38 ± 0.48			
Posttest					
Day 1	M	4.38 ± 0.48	4.38 ± 0.48	0	2.131
	A	4.38 ± 0.48			
	N	4.38 ± 0.48			
Day 2	M	4.68 ± 1.23	4.73 ±1.19	1.45	
	A	4.75 ±1.19			
	N	4.75 ±1.19			
Day 3	M	6.25 ± 2.56	6.46 ± 2.58	3.91	
	A	6.56 ±2.71			
	N	6.62 ±2.66			
Day 4	M	6.75 ± 2.54	6.75 ± 2.54	4.82***	4.073
	A	6.94 ±2.51			
	N	6.94 ±2.51			
Day 5	M	9.38 ± 3.48	9.38 ± 3.48	6.46***	
	A	9.38 ± 3.48			
	N	9.38 ± 3.48			
Day 6	M	11.56 ± 3.40	11.56 ± 3.40	9.32***	
	A	11.56 ± 3.40			
	N	11.56 ± 3.40			
Day 7	M	12.48 ± 3.37	12.44 ± 3.37	11.33***	
	A	12.44 ± 3.37			
	N	12.75 ±3.34			
Day 8	M	16.25 ± 3.09	16.36 ± 3.16	17.347***	
	A	16.31 ± 3.16			
	N	16.31 ± 3.16			

Note: *** - significant at the level of $p<0.001$

Scoring:

15- 19 - Mild Dysphagia

10 - 14 - Moderate Dysphagia

0- 9 - Severe Dysphagia

In the intervention group, the pre test assessment shows that the patients were having severe dysphagia with the mean score of 4.38±0.48 before administering CTAR exercise. Then from day 6 onwards they are gradually progressed to moderate dysphagia with a mean post test score of 11.56 ± 3.40 and by day 8 they are progressed to mild dysphagia with a mean post test score of 16.31 ± 3.16. The calculated t value is 17.347 which is greater than the table value (4.073) at the level of $p<0.001$. This indicates that there is a significant difference between the pretest and the post test scores of swallowing ability among CVA patients who received CTAR exercise. There was a remarkable progress in the mean CTAR score from day 1(4.38 ± 0.48) to day 8 (16.31 ± 3.16).

Table 4.10: Comparison of pretest and post test mean and standard deviation scores of swallowing ability among CVA patients in comparison group using paired 't' test at various time intervals.

n=16

Days	Comparison group	Mean ± SD	Overall mean	't' value	Table value
Pretest		5.1875 ± 3.50			
Posttest					
Day 1	M	5.18 ± 3.50	5.18 ± 3.50	0	2.131
	A	5.18 ± 3.50			
	N	5.18 ± 3.50			
Day 2	M	5.18 ± 3.50	5.18 ± 3.50	0	
	A	5.18 ± 3.50			
	N	5.18 ± 3.50			
Day 3	M	5.5 ± 3.28	5.5 ± 3.28	1.775	
	A	5.5 ± 3.28			
	N	5.5 ± 3.28			
Day 4	M	5.75 ± 3.13	5.75 ± 3.13	2.769*	
	A	5.75 ± 3.13			
	N	5.75 ± 3.13			
Day 5	M	6 ± 2.96	6.23 ± 3.20	3.925*	
	A	6.31± 3.38			
	N	6.31 ± 3.38			
Day 6	M	6.44 ± 3.40	6.53 ± 3.41	4.355***	4.073
	A	6.44 ± 3.40			
	N	6.75 ± 3.45			
Day 7	M	7 ± 3.39	7.13 ± 3.42	4.748***	
	A	7.12 ± 3.48			
	N	7.25 ±3.44			
Day 8	M	7.75 ± 4.04	7.75± 4.04	5.988***	
	A	7.75 ± 4.04			
	N	7.75 ± 4.04			

Note: * - significant at the level of p<0.05; *** - significant at the level of p<0.001

Scoring:

15- 19 - Mild Dysphagia

10 - 14 - Moderate Dysphagia

0- 9 - Severe Dysphagia

In comparison group, the pre test assessment shows that the patients were having severe dysphagia with the mean score of 5.1875 ± 3.50 before administering routine care. Even at the end of 8 days of therapy they remained in severe dysphagia state with a mean post test score of 7.75 ± 4.04. The calculated t value is 5.988 which is greater than the table value (4.073) at the level of $p<0.001$. This showed that routine care also improves the swallowing ability among CVA patients the comparison group but the improvement is very slow because the mean value shows that they remain in severe dysphagia when compared to the intervention group who received CTAR exercise. Thus concludes CTAR exercise is more effective than routine care.

Table 4.11: Comparison of pretest and post test mean and standard deviation scores of functional oral intake among CVA patients in intervention group using paired 't' test at various time intervals.

n=16

Days	Intervention group	Mean ± SD	Overall mean	't' value	Table value
Pretest		1.25 ± 0.42			
Posttest					
Day 1	M	1.25 ± 0.42	1.25 ± 0.42	0	2.131
	A	1.25 ± 0.42			
	N	1.25 ± 0.42			
Day 2	M	1.37 ± 0.60	1.5 ± 0.74	2.27*	
	A	1.5 ± 0.74			
	N	1.5 ± 0.74			
Day 3	M	1.93 ± 0.82	2.06 ± 0.90	5.612***	
	A	2.06 ± 0.90			
	N	2.06 ± 0.90			
Day 4	M	2.25 ± 0.74	2.31 ± 0.84	8.188***	4.073
	A	2.31 ± 0.84			
	N	2.31 ± 0.84			
Day 5	M	2.81 ± 0.90	2.93 ± 0.74	13.418***	
	A	2.93 ± 0.74			
	N	2.93 ± 0.74			
Day 6	M	3.44 ± 0.86	3.44 ± 0.86	14.355***	
	A	3.44 ± 0.86			
	N	3.44 ± 0.86			
Day 7	M	3.68 ± 0.92	3.87 ± 0.93	15.339***	
	A	3.81 ± 0.94			
	N	3.88 ± 0.92			
Day 8	M	4.75 ± 0.96	4.87 ± 1.05	17.965***	
	A	4.88 ± 1.05			
	N	4.88 ± 1.05			

Note: * - significant at the level of $p<0.05$; *** - significant at the level of $p<0.001$

Scoring:

1 - Patient on total NG feeding.
2 - Patient on NG feed with minimal food trials of semisolid consistency and can move on to liquids if tolerated.
3 - Patient on NG feed with consistent oral intake can use water to wash the food through the throat. Meals take extra time (> 1 hour).
4 - Patient on diet with single consistency (ground / pureed form otherwise called semisolid) but can drink water.
5-Patient on diet with multiple consistencies, Diet can be prepared using blender.

The table 4.11 indicates that in the pre test functional oral intake assessment the CVA patients are in total NG feeding state with the mean score of 1.25 ± 0.42. Then after administration of CTAR exercise gradually they are progressed to total oral diet with single or multiple consistencies at the end of 8 days with the post test mean score of 4.88 ± 1.05. The calculated t value is 17.965 in day 8 which is greater than the table value (4.073) at the level of $p<0.001$. This indicates that there is a significant difference between the pretest and the post test scores of functional oral intake among CVA patients who received CTAR exercise. There was a remarkable progress in the post test mean score from day 1(1.25 ± 0.423) to day 8 (4.875 ± 1.053). It can be inferred that CTAR exercise is effective in improving the functional oral intake assessment among CVA patient

Table 4.12: Comparison of pretest and post test mean and standard deviation scores of functional oral intake among CVA patients in Comparison group using paired 't' test at various time intervals.

n=16

Days	Comparison group	Mean ± SD	Overall mean	't' value	Table value
Pretest		1.5 ± 0.79			
Posttest					
Day 1	M	1.5 ± 0.79	1.5 ± 0.79	0	2.131
	A	1.5 ± 0.79			
	N	1.5 ± 0.79			
Day 2	M	1.5 ± 0.79	1.5 ± 0.79	0	
	A	1.5 ± 0.79			
	N	1.5 ± 0.79			
Day 3	M	1.56 ± 0.78	1.53 ± 0.79	1	
	A	1.5 ± 0.79			
	N	1.5 ± 0.79			
Day 4	M	1.56 ± 0.93	1.56 ± 0.93	1	
	A	1.56 ± 0.93			
	N	1.56 ± 0.93			
Day 5	M	1.56 ± 0.93	1.56 ± 0.93	1	
	A	1.56 ± 0.93			
	N	1.56 ± 0.93			
Day 6	M	1.62 ± 0.99	1.71 ± 0.99	2.126	
	A	1.62 ± 0.99			
	N	1.81 ± 0.18			
Day 7	M	2 ± 1.12	2.06 ± 1.24	3.9296*	
	A	2.06 ± 1.24			
	N	2.12 ± 1.22			
Day 8	M	2.12 ± 1.22	2.16 ± 1.18	4.4856*	
	A	2.18 ± 1.18			
	N	2.18 ± 1.18			

Note: * - significant at the level of $p<0.05$.

Scoring:

1 - Patient on total NG feeding.
2 - Patient on NG feed with minimal food trials of semisolid consistency and can move on to liquids if tolerated.
3 - Patient on NG feed with consistent oral intake, can use water to wash the food through the throat. Meals take extra time (> 1 hour).

In comparison group, the pre test assessment shows that the patients were on total NG feeding state with the mean score of 1.5 ± 0.79 before administering routine care. At the end of 8 days of therapy they progressed to a state of total NG feed with minimal food trials of semisolid consistency with a mean post test score of 2.16 ± 1.18 The calculated t value is 3.929 in day 7 and 4.486 in day 8 which is greater than the table value (2.131) at the level of $p<0.05$. This showed that routine care also improves the swallowing ability of CVA patients with dysphagia in the comparison group, here the patients swallowing ability improved from nothing by mouth to tube dependent with minimal attempts of food. The mean score is comparatively low with the intervention group who received CTAR exercise. Thus concludes CTAR exercise is more effective than routine care.

Table 4.13: Comparison of post test mean and standard deviation scores of swallowing ability among CVA patients in intervention group and comparison group using independent 't' test at various time intervals.

H_1: There will be a significant difference in the post test swallowing ability between intervention group and comparison group after CTAR exercise at 0.05 level of significance.

n = 32

Post test	Intervention group	Comparison group	Calculated	Table
	Mean ± SD	Mean ± SD	't' value	value
Day 1	4.375 ± 0.4841	5.1875 ± 3.5039	0.4575	
Day 2	4.7313 ± 1.1972	5.1875 ± 3.5039	0.4837	
Day 3	6.4563 ± 2.5855	5.5 ± 3.2977	0.9033	
Day 4	6.75 ± 2.5372	5.7688 ± 3.1228	1.0167	
Day 5	9.375 ± 3.4799	6.2313 ± 3.2075	2.5572*	1.75
Day 6	11.5625 ± 3.402	6.5375 ± 3.4108	4.0134***	3.646
Day 7	12.4375 ± 3.3348	7.1313 ± 3.4278	4.4109***	
Day 8	16.3688 ± 3.1658	7.75 ± 4.0389	6.5009***	

Note: * - significant at the level of p<0.05; ** * - significant at the level of p<0.001

The table 4.13 describes that the mean value of intervention group gradually increased till day 6, and then it resulted in faster improvement in swallowing ability at the end of day 8, with the mean score of 16.3688. So this concludes that minimum 8 days of CTAR exercise is necessary to show good improvement in swallowing ability among CVA patients with dysphagia. In comparison group, even at the end of 8 days of therapy they remained in severe dysphagia state with a mean post test score of 7.75 ± 4.0389. The calculated t value is 6.5009 which is greater than the table value (3.646) at the level of p<0.001. Thus research hypothesis was accepted. This showed that CTAR exercise significantly improves the swallowing ability of CVA patients with dysphagia in the intervention group than who received the routine care in the comparison group. Hence it can be concluded that CTAR is effective in improving the swallowing ability as compared to routine care among CVA patients.

Table 4.14: The correlation between the post test mean and standard deviation scores of swallowing ability using GUSS and functional level of oral intake using FOIS

n=32

Post test	Intervention group (GUSS)	Intervention group (FOIS)	Calculated 'r' value	'p' value
	Mean ± SD	Mean ± SD		
Day 1	4.38 ± 0.48	1.25 ± 0.42	0.6261*	0.000127
Day 2	4.73 ± 1.19	1.5 ± 0.74	0.0868NS	0.63666
Day 3	6.46 ± 2.58	2.06 ± 0.90	0.9231*	<0.00001
Day 4	6.7 ± 2.53	2.31 ± 0.84	0.8254*	<0.00001
Day 5	9.3 ± 3.48	2.93 ± 0.74	0.9325*	<0.00001
Day 6	11.56 ± 3.40	3.43 ± 0.86	0.9353*	<0.00001
Day 7	12.44 ± 3.33	3.87 ± 0.93	0.9364*	<0.00001
Day 8	16.36 ± 3.16	4.87 ± 1.05	0.9358*	<0.00001

Note* - significant at the level of $p<0.05$

It is observed from the table 4.14 that there is a strong positive correlation between the post test scores of swallowing ability using GUSS and functional oral intake using FOIS scale scores. The above table signifies that according to GUSS score from day 6 onwards CVA patients with severe dysphagia were progressed to moderate dysphagia and at the end of 8 days they were progressed to mild dysphagia. Similarly their functional level of oral intake also improved from nothing by mouth to total oral diet of single consistency at the end of 8 days. Thus among CVA patients with dysphagia as their swallowing ability improves invariably their functional level of oral intake also improved with "r" value 0.93 at the end of 8 days.

Table 4.15: Association between pre test level of dysphagia and selected demographic variables among CVA patients in comparison group.

H_2: There will be significant association between level of dysphagia and selected demographic variables among CVA patients in comparison group.

n = 16

Demographic variables	Level of Dysphagia		Chi square value		
Age	**Severe dysphagia f (%)**	**Moderate dysphagia f (%)**	**$\chi 2$**	Df	**Table value**
35 -45 years	1 (6.25%)	-	3.341^{NS}	4	9.49
45 - 55 years	5 (31.25%)	2 (12.50%)			
56 - 65 years	3 (18.75%)	-			
66 - 75 years	1 (6.25%)	1 (6.25%)			
76 - 85 years	3 (18.75%)	-			
Gender					
Male	11 (68.75%)	3 (18.75%)	0.527^{NS}	1	3.84
Female	2 (12.50%)	-			
Education					
Illiterate	5 (31.25%)	1 (6.25%)	0.137^{NS}	2	5.99
Elementary	5 (31.25%)	1 (6.25%)			
SSLC	3 (18.75%)	1 (6.25%)			
Income(per month)					
<5000	6(37.50%)	1 (6.25%)	0.996^{NS}	2	5.99
5000 - 10000	5 (31.25%)	2 (12.50%)			
10000 - 15000	2 (12.50%)	-			
Occupation					
House wife	2 (12.50%)	-	2.872^{NS}	4	9.49
Coolie	3 (18.75%)	2 (12.50%)			
Farmer	1 (6.25%)	-			
Unemployed	3 (18.75%)	-			
Business	4(25%)	1 (6.25%)			

Note: NS - denotes non significant

It is observed from the table 4.15 that the chi square value was lower than table value for demographic variables age, gender, education, income and occupation with pre test level of dysphagia among CVA patients at the level of $p<0.05$. Thus null hypothesis was accepted. There was no significant association between pre test level of dysphagia and demographic variables such as age , gender , education , income, occupation among CVA patients of comparison group at the level of $p<0.05$. Hence the research hypothesis was rejected.

Table 4.16: Association between pre test level of dysphagia and selected demographic variables among CVA patients in intervention group.

H_3: There will be significant association between level of dysphagia and selected demographic variables among CVA patients in intervention group.

n = 16

Demographic variables	**Level of Dysphagia**		**Chi square value**		
Age	**Severe dysphagia f (%)**	**Moderate dysphagia f (%)**	**χ2**	**Df**	**Table value**
45 - 55 years	8 (50%)	-	0^{NS}	3	7.81
56 - 65 years	3 (18.75%)	-			
66 - 75 years	3 (18.75%)	-			
76 - 85 years	2 (12.50%)	-			
Gender					
Male	14 (87.50%)	-	0^{NS}	1	3.84
Female	2 (12.50%)	-			
Education					
Illiterate	1 (6.25%)	-	0^{NS}	3	7.81
Elementary	11 (68.75%)	-			
SSLC	3 (18.75%)	-			
Degree	1 (6.25%)				
Income(per month)					
<5000	2 (12.50%)	-	0^{NS}	2	5.99
5000 - 10000	11 (68.75%)	-			
10000 - 15000	1 (6.25%)	-			
>15000	2 (12.50%)				
Occupation					
House wife	2 (12.50%)	-	0^{NS}	4	9.49
Coolie	8 (50%)	-			
Farmer	4 (25%)	-			
Professional	1 (6.25%)	-			
Business	3 (18.75%)	-			

Note : NS - denotes non significant

It is observed from the table 4.16 that the chi square value was lower than table value for demographic variables age, gender, education, income and occupation with pre test level of dysphagia among CVA patients at the level of $p<0.05$. Thus null hypothesis was accepted. There was no significant association between pre test level of dysphagia and demographic variables such as age, gender, education, income, occupation among CVA patients of intervention group at the level of $p<0.05$. Hence the research hypothesis was rejected.

CHAPTER V

RESULTS AND DISCUSSION

This chapter deals with the discussion of the study findings and the results. The discussion brings the right report to closure. This is the most important section of any research report. Stroke is a leading cause of acquired disability in adults. It is estimated that there will be 23 million new incidence of stroke in 2030.

Chin Tuck Against Resistance **(**CTAR) exercise helps to improve the swallowing ability among CVA patients with dysphagia. The main objective is to evaluate the effect of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among CVA patients with dysphagia.

5.1 Frequency and percentage distribution of patients according to demographic profile and clinical condition.

Age of the stroke patients ranged from a minimum of 35 years to a maximum of 85 years. The present study shows that most of the patients in the intervention group 8(50%) patients and comparison group 6(37.5%) patients belonged to the age group of 45 - 55 years. This finding was supported by another study which showed that half of the subjects (50%) were in the age group of 50 - 70 years **(Sujisusan James, et al., 2015).**

Regarding the sex of the patients, most of the CVA patients (87%) who suffer from dysphagia were males and only 13% of patients were females. The results are consistent with the result of another study showed that male to female ratio of stroke was 2:1 **(Nagaraja, et al., 2008).** Another study found similar findings that among 25patients with CVA, 14 were males and 11 females **(Yang, et al., 2007).**

Regarding educational qualification of the patients, most of the patients in the intervention group 11 (68.75%) patients and in the comparison group 6(37.5%) had completed elementary level of education. This finding was contradictory with a study stated that half of the CVA patients were illiterates (46%) **(Nagaraja, et al., 2008).**

In this study majority of the patients 7(43.75%) in the intervention group were diagnosed as CVA with right hemiplegia and only 4(25%) were diagnosed as CVA with left hemiplegia. The present study results are in consistent with the findings of another study showed that among 25 patients, 16 were right sided stroke and 9 were diagnosed as left sided stroke **(Yang, et al., 2007).** In a similar study found that among 1174 patients, 513 were affected with right sided stroke and 499 patients were affected with left sided stroke **(Nagaraja, et al., 2008).**

There were more than half of the CVA patients 9(56.2%) both in the intervention as well as in the comparison group had history of hypertension. Nearly half of the CVA patients 7(43.75%) in the intervention group had history of both diabetes and hypertension. The results result was supported by a study showed that hypertension and diabetes mellitus are the important risk factors for stroke **(Chin -Yi Wu, 2014).** Another study revealed that out of 91 patients with stroke, 51 was suffering from hypertension **(Jehangirchan, et al., 2006).** Another study revealed that according to co - morbid illness, majority of subjects with hypertension (40%) developed stroke. **(Sujisusan Jasmes, et al., 2015).**

5.2 Comparison of level of dysphagia among CVA patients in Intervention group and the Comparison group based on the GUSS score

The study findings describe the distribution of dysphagia score using GUSS scale among CVA patients. In the intervention group upto day 2 all patients fall into the category of severe dysphagia (GUSS score is 0-9) , gradually at the end of day 8 none of them was having severe dysphagia, 2 of them were having moderate dysphagia (GUSS score is10-14), and mostly 9 patients were having mild dysphagia (GUSS score is 15-19). Most of them (11) got discharged on day 8 and 5 patients with CVA attained optimal swallowing ability (GUSS score is 20) on day 8. Only 2 of them received CTAR exercises till 14 days and got discharged. The number of days the therapy given and assessment of swallowing ability using GUSS scale varies from 8 to 14 days.

The present study revealed the changes in the level of dysphagia among CVA patients. In the intervention group initially all 16 (100%) patients were having severe dysphagia, gradually at the end of eight days of therapy mostly 9 (56.25%) of them progressed to mild dysphagia and 5 (31.2%) of them progressed to no dysphagia. Thus it signifies 5 (31.2%) of them attained optimal

swallowing state in the intervention group. In contrary, in the comparison group even at the end of eight days of observation 12 (75%) of them were having severe dysphagia. The results of another study where they had employed shaker exercise and hyoid lift maneuver for 6 weeks for stroke patients with dyysphagia, the results showed that on the basis of Gugging Swallowing Screening scale (GUSS), about 16.67% of the subjects had no dysphagia, 26.67% had mild dysphagia, 23.33% had moderate dysphagia and 33.33% had severe dysphagia after the intervention(shaker exercise and hyoid lift maneuver). **(Sujisusan Jasmes, et al., 2015)**.Thus it shows Chin Tuck Against Resistance (CTAR) Exercise is effective than shaker exercise. The results revealed that Chin Tuck Against Resistance (CTAR) Exercise had improved the swallowing ability among CVA patients within short duration (8 days) than shaker exercise.

5.3 Comparison of level of dysphagia between Intervention group and the Comparison group based on the FOIS score

The present study results describes the effect of CTAR exercise among CVA patients in both intervention and comparison group using FOIS score. In the comparison group till day 6 most of them (68.75%) 11 out of 16 remained in the state of total NG feed. In contrary, on day 1, 12(75%) patients out of 16 were on total NG feed but this number gradually decreased to nil state on total NG feed and 6 (37.5%)of them were progressed to a state of multiple consistency diet with exception at the end of day 8. The results of another study where they had employed shaker exercise and hyoid lift maneuver for 6 weeks, the results showed that in accordance with the Functional Oral Intake Scale (FOIS), 36.67% of the subjects were in the state of total NG feed and 63.33% were in the state of NG feed with consistent oral intake **(Sujisusan Jasmes et al., 2015).** This shows that CTAR exercise was effective among CVA patients with dysphagia.

5.4 Effectiveness of CTAR Exercise in improving the swallowing ability among CVA patients in Intervention group using paired 't' test

In the intervention group, the pre test assessment shows that the patients were having severe dysphagia with the mean score of 4.38±0.48 before administering CTAR exercise. Then from day 6 onwards they are gradually progressed to moderate dysphagia with a mean post test score of 11.56 ± 3.40 and by day 8 they are progressed to mild dysphagia with a mean post test score of 16.31 ± 3.16. The calculated t value is 17.347 which is greater than the table value

(4.073) at the level of $p<0.001$. This indicates that there is a significant difference between the pre test and the post test scores of swallowing ability among CVA patients who received CTAR exercise. There was a remarkable progress in the mean CTAR score from day 1(4.38 ± 0.48) to day 8 (16.31 ± 3.16).

According to FOIS score the CVA patients with dysphagia are progressed from nothing by mouth state to total oral diet with single or multiple consistency with the mean and standard deviation from 1.25 ± 0.42 to 4.88 ± 1.05 at the end of 8 days of CTAR exercise. The calculated t value is 17.965 in day 8 which is greater than the table value (4.073) at the level of $p<0.001$. This indicates that there is a significant difference between the pre test and the post test of swallowing difficulty score among CVA patients who received CTAR exercise. There was a remarkable progress in the mean CTAR score from day 1(1.25 ± 0.42) to day 8 (4.88 ± 1.05). It can be inferred that CTAR exercise is effective in improving the swallowing ability among CVA patients.

The CTAR exercise significantly improves the swallowing ability of CVA patients with dysphagia in the intervention group than who received the routine care in the comparison group. In the intervention group, at the end of 8 days of CTAR exercise most of the progressed to mild dysphagia with a mean post test score of 16.3688 where as in comparison group, even at the end of 8 days of routine care they remained in severe dysphagia state with a mean post test score of 7.75 ± 4.0389. Thus it is statistically significant with 't' value 6.5009 at the level of $p<0.001$. Hence it can be concluded that CTAR is effective in improving the swallowing ability as compared to routine care among CVA patients.

These findings are supported by a study where separate analyses revealed significantly greater surface electromyography (sEMG) values during the CTAR exercise (mean peak sEMG: 166.52; mean average sEMG: 103.72) than during the equivalent shaker exercise ($p<0.05$). Thus the study concludes that the Chin Tuck Against Resistance (CTAR) exercise is effective and less strenuous than shaker exercise**. (Wai Lam Yoon et al, 2014).** Another study which contradictorily shows that the mean peak amplitude for CtC (Chin - to- Chest) exercise indicated as 136.64 and for Chin Tuck Against Resistance (CTAR) exercise 106.03. The mean average amplitude for CtC (Chin - to- Chest) exercise indicated as 75.54 and for Chin Tuck Against Resistance (CTAR) exercise 49.39. It is concluded that the CtC (Chin - to- Chest) exercise

resulted in both greater mean peak amplitude and greater mean average amplitude for the entire hyolaryngeal muscle contraction compared to CTAR **(Teresa Hughes et al, 2015).**

5.5 Association between pre test level of dysphagia and selected demographic variables among intervention and comparison group of CVA patients.

The results revealed that CVA patients between 45 - 55 years of age were having dysphagia as a result of co-morbidity like hypertension and diabetes mellitus. Most of them 78.13% (25 patients) were males who had severe dysphagia. So males were more affected than females due to their habits, stress, accidents etc. Nearly half of the CVA patients (17) had completed elementary education which reveals that poor awareness about CVA also could be a contributing factor. Among 32 CVA patients 12 were coolie so their monthly income fell into the category of 5000 - 10,000 invariably this resulted into economic burden to the family. There was no significant association between pre test level of dysphagia and demographic variables such as age, gender, education, income, occupation among CVA patients of intervention group at the level of $p<0.05$.

Another study supports the results that there is no significant association exist between the swallowing and feeding performance of the post stroke dysphagic patients with selected demographic variables like age, gender and education at the level of $p<0.05$. **(Sujisusan Jasmes, et al., 2015).**

CHAPTER - VI

SUMMARY AND CONCLUSION

Maintaining nutrition through normal oral intake gives a sense of wellbeing to the people and which is also essential to maintain good health. The present study is a study to assess the effectiveness of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among CVA patients with dysphagia at PSG hospital, Coimbatore. The main objective is to evaluate the effect of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among CVA patients with dysphagia. The reviews evaluated the effects Chin Tuck Against Resistance (CTAR) exercise for CVA patients with dyspagia. The wide literature search also helped in selection of appropriate conceptual planning, developing framework and research plan.

The research design used in this study was quasi experimental research approach, time series design. The study was conducted in neurology ward of PSG Hospitals, Peelamedu, Coimbatore. The sampling technique used in this study was purposive sampling technique. As per the inclusion criteria, 32 samples were selected by purposive sampling and were divided into intervention and comparison group where each group consists of 16 patients. Standardized tool Gugging Swallowing Screen scale (GUSS) and Functional Oral Intake Scale (FOIS) was used to assess the swallowing ability among CVA patients with dysphagia.The data were collected after ethical approval. Pre test level of dysphagia was assessed using Gugging Swallowing Screen scale (GUSS) and Functional Oral Intake Scale (FOIS) and the intervention was provided. Chin Tuck Against Resistance (CTAR) exercise was given to patients who belong to intervention group. They were asked to tuck the chin against the ball (12cm diameter) and sustained it for 10 sec (isometric), did it for 10 repetitions (isokinetic), three times a day for 8 consecutive days. Post test was done three times a day after intervention for eight days.

The patients willingly and interestingly performed Chin Tuck Against Resistance (CTAR) exercise. The data was collected through interview and observation for all patients of both intervention and comparison group. Both descriptive and inferential statistics were used for analyses of the data. Student and independent "t" test was used to evaluate the effectiveness of

Chin Tuck Against Resistance (CTAR) exercise and routine care. Chi square test was used to find out the association between dysphagia in CVA patients and their demographic variables.

6.1 Major findings of the study:

- Among 32 patients, most of them 15 (47%) were in the age group of 45-55 years.
- Most of the CVA patients with dysphagia 28(87%) were males. The remaining 4 (13%) were female patients.
- Among 32 patients, 17 patients (53.13%) had elementary education and only 1 patient (6.2%) was a degree holder.
- Majority of the patients 17 (53.13%) family monthly income fell into the category of 5000 - 10,000.
- Most of the CVA patients 13(40.63%) were coolie.
- Among 16 patients in the intervention group 7 patients (43.75%) were diagnosed as CVA with right side hemiplegia and out of 16 patients in the comparison group 8 patients (50%) were diagnosed as CVA with right hemiparesis.
- Mostly the cause of stroke was ischemia and haemorrhage. More than half of the patients (13) 81.2% in the intervention group and (10) 62.5% in the comparison group were identified with ischemia as the cause of stroke.
- Most of the patients had associated illness. Nearly half of the patients 56.2% both in the intervention group as well as in the comparison group had history of hypertension. There were 7 patients (43.75%) in the intervention group had history of both diabetes and hypertension.
- Among 32 patients in the intervention group 13 patients (81.2%) and in the comparison group 6 patients (37.5%) had the duration of stroke as less than 5days.
- None of the patients had family history of stroke in both intervention and comparison group.
- Among 32 CVA patients, in the intervention group all 16 (100%) patients and in the comparison group 12(75%) patients had difficulty in swallowing semisolid. Thus they were all on nasogastric tube feeding.

- Gugging Swallowing Screen scale (GUSS) was intended to assess the level of dysphagia among CVA patients where at the end of 8 days of Chin Tuck Against Resistance (CTAR) exercise therapy in the intervention group 5 patients (31.2%) progressed to no dysphagia and 9 patients (56.25%) progressed to mild dysphagia from severe dysphagia. Thus it concludes Chin Tuck Against Resistance (CTAR) exercise significantly improved the swallowing ability within 8 days among CVA patients.

- Functional Oral Intake Scale (FOIS) was intended to assess the feeding performance of CVA patients with dysphagia who received Chin Tuck Against Resistance (CTAR) exercise. At the end of eight days of therapy in the intervention group 6 (37.5%) patients progressed to the state of multiple consistency diet with restrictions, 4 (25%) patients were progressed to multiple consistency diet and 4 (25%) patients were progressed to the state of single consistency diet.

- There is a significant difference between the pre test and the post test scores of swallowing ability among CVA patients who received CTAR exercise. There was a remarkable progress in the mean CTAR score from day 1(4.38 ± 0.48) to day 8 (16.36 ± 3.16). It can be inferred that CTAR exercise is effective in improving the swallowing ability among CVA patients because by day 6 the patients were progressed to moderate dysphagia and by day 8 the patients were progressed to mild dysphagia.

- The CTAR exercise significantly improves the swallowing ability of CVA patients with dysphagia in the intervention group than who received the routine care in the comparison group. In the intervention group, at the end of 8 days of CTAR exercise most of the progressed to mild dysphagia with a mean post test score of 16.3688 where as in comparison group, even at the end of 8 days of routine care they remained in severe dysphagia state with a mean post test score of 7.75 ± 4.0389. Thus it is statistically significant with 't' value 6.5009 at the level of $p<0.001$. Hence it can be concluded that CTAR is effective in improving the swallowing ability as compared to routine care among CVA patients.

- There was no significant association between pre test level of dysphagia and demographic variables such as age, gender, education, income, occupation among CVA patients of intervention group at the level of $p<0.05$.

6.2 Conclusion:

Chin Tuck Against Resistance (CTAR) exercise was an effective, inexpensive measure for improving swallowing ability among CVA patients with dysphagia. The present study was intended to assess the effectiveness of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among CVA patients with dysphagia at PSG hospital, Coimbatore. The report of this study was found that there was faster improvement within 8 days in the swallowing ability among CVA patients with dysphagia in the intervention group than comparison group.

6.3 Nursing implications:

The present study has implications for nursing practice, nursing education, nursing administration and nursing research.

6.3.1 Nursing practice:

- Nurses can implement the practice of Chin Tuck against Resistance (CTAR) exercise to improve the swallowing ability among CVA patients with dysphagia in clinical and community settings.
- Nurses should assess the swallowing ability of CVA patients with dysphagia by using Gugging Swallowing Screen scale (GUSS) and Functional Oral Intake Scale (FOIS) on daily basis.
- Nurses should involve in educating CVA patients with dysphagia and their families on the importance of Chin Tuck Against Resistance (CTAR) exercise in the improvement of the swallowing ability.
- Nurses should provide support and motivation for CVA patients with dysphagia to continue Chin Tuck Against Resistance (CTAR) exercise regimens for permanent incorporation into a daily routine.

6.3.2 Nursing education:

- Chin Tuck Against Resistance (CTAR) exercise can be included in the literature on improving the swallowing ability among CVA patients with dysphagia.
- Chin Tuck Against Resistance (CTAR) exercise training program can be included into the nursing curriculum to improve the swallowing ability among CVA patients with dysphagia.

6.3.3 Nursing administration:

- Provision should be made for staff working in Neurology ward to get training in Chin Tuck Against Resistance (CTAR) exercise.
- Protocol for the procedure of Chin Tuck Against Resistance (CTAR) exercise can be developed based on the study findings.
- Nursing administrators can motivate nurses to use Chin Tuck Against Resistance (CTAR) exercise in their clinical practice for CVA patients with dysphagia.

6.3.4 Nursing research:

- Nurse researchers can conduct studies to verify the scientific rationale or physiology behind the effect of Chin Tuck Against Resistance (CTAR) exercise to improve the swallowing ability among CVA patients with dysphagia.
- Randomized clinical trials could be under taken so that the validity of the results can be increased and it can be incorporated into the evidence based nursing practice.

6.4 Limitations:

- The number of days the CTAR exercise given to patients vary from 8 days to 14 days.

6.5 Recommendations for future study:

- A similar study could be conducted in rehabilitation centers and community setting.
- A comparative study can be conducted on Chin Tuck Against Resistance (CTAR) exercise with shaeker exercise
- The similar study can be conducted in larger group of population.

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UNPUBLISHED THESIS:

1. Kondal Devi., (2006). Promotion of swallowing therapy among patients with dysphagia related to Neuromuscular weakness at PSG Hospitals, Coimbatore, M.Sc Nursing Thesis, PSG College of Nursing, Coimbatore, submitted to the Tamil Nadu Dr. M.G.R Medical University, Chennai.

2. Rathi.R (2012). Effectiveness of communication board on the level of satisfaction in communication among the clients on mechanical ventilator in PSG Hospitals, Coimbatore, M.Sc Nursing Thesis, PSG College of Nursing, Coimbatore, submitted to the Tamil Nadu Dr. M.G.R Medical University, Chennai.

3. Sandy.M.Varughese (2011). Effectiveness of mirror box therapy in amputees experiencing phantom limb pain. M.Sc Nursing Thesis, PSG College of Nursing, Coimbatore, submitted to the Tamil Nadu Dr. M.G.R Medical University, Chennai.

ANNEXURE I

From

Ms. N. Santhosh Priya
M.Sc Nursing I Year
PSG College of Nursing
Peelamedu, Coimbatore - 04

To

Medical Director,
PSG Hospitals
Coimbatore – 4

Through: The Principal, PSG College of Nursing

Respected Sir,

Sub: Seeking permission to carry out the study in

Neurology Ward at PSG Hospitals, Coimbatore.

I Ms. N. Santhosh Priya , I year M.Sc Nursing student is interested in doing this study. **"Effectiveness of Chin Tuck Against Resistance(CTAR) exercise in improving swallowing ability among CVA patients with Dysphagia at PSG hospital, Coimbatore".** Kindly grant me permission to carry out the study.

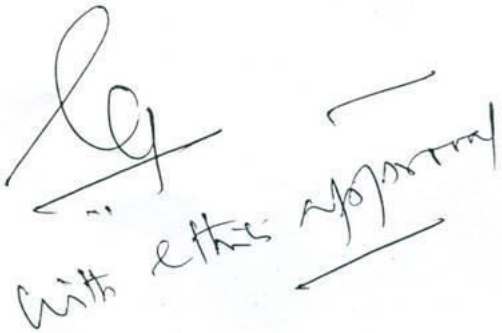
Thank you,

Date: 5.7.16
Place: COIMBATORE

Yours sincerely

Ms. N. Santhosh Priya
I year M.Sc Nursing

Signature of the Medical Director:



From

Ms. N. Santhosh Priya
M.Sc Nursing I Year
PSG College of Nursing
Peelamedu, Coimbatore - 04

To

Dr. Ramadoss
HOD Neurology Department,
PSG Hospitals
Coimbatore – 4

Through: The Principal, PSG College of Nursing

Respected Sir,

Sub: Seeking permission to carry out the study in

Neurology Ward at PSG Hospitals, Coimbatore.

I Ms. N. Santhosh Priya , I year M.Sc Nursing student is interested in doing this study. **"Effectiveness of Chin Tuck Against Resistance(CTAR) exercise in improving swallowing ability among CVA patients with Dysphagia at PSG hospital, Coimbatore".** Kindly grant me permission to carry out the study.

Thank you,

Date: 5.7.16
Place: COIMBATORE

Yours sincerely

Ms. N. Santhosh Priya
I year M.Sc Nursing

Signature of the HOD of Neurology Department.

ANNEXURE II

PSG Institute of Medical Sciences & Research
Institutional Human Ethics Committee
Recognized by The Strategic Initiative for Developing Capacity in Ethical Review (SIDCER)
POST BOX NO. 1674, PEELAMEDU, COIMBATORE 641 004, TAMIL NADU, INDIA
Phone : 91 422 - 2598822, 2570170, Fax : 91 422 - 2594400, Email : ihec@psgimsr.ac.in

To
Ms N Santhosh Priya
I M Sc Nursing
Guide/s: Dr A Tamil Selvi / Dr G Malarvizhi
PSG College of Nursing
Coimbatore

Ref: Project No.16/237

Date: August 18, 2016

Dear Ms Santhosh Priya,

Institutional Human Ethics Committee, PSG IMS&R reviewed and discussed your application dated 07.07.2016 to conduct the research study entitled "*Effectiveness of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among CVA patients with dysphagia at PSG Hospital, Coimbatore*" during the IHEC meeting held on 22.07.2016.

The following documents were reviewed and approved:

1. Project Submission form
2. Study protocol (Version 1.1 dated 10.08.2016)
3. Informed consent form - English (Version 1.1 dated 10.08.2016)
4. Informed consent form - Tamil (Version 1.2 dated 17.08.2016)
5. Data collection tool (Version 1.1 dated 10.08.2016)
6. Permission letter from the Dean and concerned Head of Department
7. Current CVs of Principal investigator, Co-investigators
8. Budget

The following members of the Institutional Human Ethics Committee (IHEC) were present at the meeting held on 22.07.2016 at IHEC Secretariat, PSG IMS & R between 10.00 am and 11.00 am:

Sl. No.	Name of the Member of IHEC	Qualification	Area of Expertise	Gender	Affiliation to the Institution Yes/No	Present at the meeting Yes/No
1	Mr R Nandakumar (Chairperson, IHEC)	BA., BL	Legal Expert	Male	No	Yes
2	Dr. S. Bhuvaneshwari (Member-Secretary, IHEC)	MD	Clinical Pharmacology	Female	Yes	Yes
3	Dr S Shanthakumari	MD	Pathology, Ethicist	Female	Yes	Yes
4	Dr Sudha Ramalingam	MD	Epidemiologist, Ethicist Alt. member-Secretary	Female	Yes	Yes
5	Dr D Vijaya	M Sc., Ph D	Basic Medical Sciences (Biochemistry)	Female	Yes	Yes

The study is approved in its presented form. The decision was arrived at through consensus. Neither PI nor any of proposed study team members were present during the decision making of the IHEC. The IHEC functions in accordance with the ICH-GCP/ICMR/Schedule Y guidelines. The approval is valid until one year from the date of sanction. You may make a written request for renewal / extension of the validity, along with the submission of status report as decided by the IHEC.

PSG Institute of Medical Sciences & Research
Institutional Human Ethics Committee

Recognized by The Strategic Initiative for Developing Capacity in Ethical Review (SIDCER)
POST BOX NO. 1674, PEELAMEDU, COIMBATORE 641 004, TAMIL NADU, INDIA
Phone : 91 422 - 2598822, 2570170, Fax : 91 422 - 2594400, Email : ihec@psgimsr.ac.in

Following points must be noted:

1. IHEC should be informed of the date of initiation of the study
2. Status report of the study should be submitted to the IHEC every 12 months
3. PI and other investigators should co-operate fully with IHEC, who will monitor the trial from time to time
4. At the time of PI's retirement/intention to leave the institute, study responsibility should be transferred to a colleague after obtaining clearance from HOD, Status report, including accounts details should be submitted to IHEC and extramural sponsors
5. In case of any new information or any SAE, which could affect any study, must be informed to IHEC and sponsors. The PI should report SAEs occurred for IHEC approved studies within 7 days of the occurrence of the SAE. If the SAE is 'Death', the IHEC Secretariat will receive the SAE reporting form within 24 hours of the occurrence
6. In the event of any protocol amendments, IHEC must be informed and the amendments should be highlighted in clear terms as follows:
   a. The exact alteration/amendment should be specified and indicated where the amendment occurred in the original project. (Page no. Clause no. etc.)
   b. Alteration in the budgetary status should be clearly indicated and the revised budget form should be submitted
   c. If the amendments require a change in the consent form, the copy of revised Consent Form should be submitted to Ethics Committee for approval
   d. If the amendment demands a re-look at the toxicity or side effects to patients, the same should be documented
   e. If there are any amendments in the trial design, these must be incorporated in the protocol, and other study documents. These revised documents should be submitted for approval of the IHEC and only then can they be implemented
   f. Any deviation-Violation/waiver in the protocol must be informed to the IHEC within the stipulated period for review
7. Final report along with summary of findings and presentations/publications if any on closure of the study should be submitted to IHEC

Kindly note this approval is subject to ratification in the forthcoming full board review meeting of the IHEC.

Thanking You,

Yours Sincerely,

SECRETARY
PSG IMS&R
COIMBATORE-641004.
INSTITUTIONAL HUMAN ETHICS COMMITTEE

Dr S Bhuvaneshwari
Member - Secretary
Institutional Human Ethics Committee

ANNEXURE III

PSG Institute of Medical Science and Research, Coimbatore
Institutional Human Ethics Committee
INFORMED CONSENT FORMAT FOR RESEARCH PROJECTS

(strike off items that are not applicable)

I Ms. N. Santhosh priya carrying out a study on the topic: **Effectiveness of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among CVA patients with dysphagia at selected Hospital, Coimbatore.**

As part of my research project being carried out under the aegis of the Department of: Medical surgical Nursing.

(*Applicable to students only*): My research guide is: Dr.A.Tamilselvi

The justification for this study is: Exercise based dysphagia therapy can improve the functional and physiological changes in swallowing performance of the adults with chronic dysphagia. The Chin Tuck Against Resistance (CTAR) Exercise, performed in a seated position, is less strenuous as the patient is not required to lift the weight of her head. So performing CTAR in a seated position would make it convenient for dysphagic patients, thereby will improve the compliance.

The objectives of this study are:

- Assess the swallowing ability among CVA patients with dysphagia.
- Evaluate the effectiveness of Chin Tuck Against Resistance(CTAR) exercise in improvement of swallowing ability among CVA patients of intervention group.
- Compare the post test score of swallowing ability among CVA patients between intervention group and comparison group.
- To determine the correlation between the level of dysphagia and functional level of oral intake.
- To associate between grade of dysphagia among CVA patients with selected demographic variables.

Sample size: 32

Study volunteers / participants are: CVA patients with dysphagia.

Location: PSG Hospitals , Neurology ward.

I request you to kindly cooperate with me in this study. I propose collect background information and other relevant details related to this study. I will be carrying out:

Initial interview (specify approximate duration): 30 minutes.

Data collected will be stored for a period of 2 years. I will not use the data as part of another study.

Clinical examination (Specify details and purpose): Gugging Swallowing Screening scale (GUSS) is used to find out level of dysphagia and Functional Oral Intake Scale (FOIS) is used to assess the feeding performance.

Benefits from this study: CTAR exercise will improve the swallowing ability to attain optimum swallow function among CVA patients with dysphagia.

Risks involved by participating in this study: Nil

How the **results** will be used: 1. To perform evidence based practice. 2. Submission in the thesis. 3. To publish in the journals and conference presentation.

If you are uncomfortable in answering any of our questions during the course of the interview / biological sample collection, **you have the right to withdraw from the interview / study at anytime.** You have the freedom to withdraw from the study at any point of time. Kindly be assured that your refusal to participate or withdrawal at any stage, if you so decide, will not result in any form of compromise or discrimination in the services offered nor would it attract any penalty. You will continue to have access to the regular services offered to a patient. You will **NOT** be paid any remuneration for the time you spend with us for this interview / study. The information provided by you will be kept in strict confidence. Under no circumstances shall we reveal the identity of the respondent or their families to anyone. The information that we collect shall be used for approved research purposes only. You will be informed about any significant new findings - including adverse events, if any, – whether directly related to you or to other participants of this study, developed during the course of this research which may relate to your willingness to continue participation.

Consent: The above information regarding the study, has been read by me/ read to me, and has been explained to me by the investigator/s. Having understood the same, I hereby give my consent to them to interview me. I am affixing my signature / left thumb impression to indicate my consent and willingness to participate in this study (i.e., willingly abide by the project requirements).

Signature / Left thumb impression of the Study Volunteer / Legal Representative:

Signature of the Interviewer with date: Witness:

Contact number of PI:8903416205

Contact number of Ethics Committee Office: 0422 2570170 Extn.: 5818

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§¾¾¢ : 5.7.16

¿¡. °ó§¾¡‰ À¢Ã¢Â¡ ¬¸¢Â ¿¡ý, À¢. ±Š. ƒ¢. ÁÕòÐÅì Á¨ÉÂ¢ý, ¿ÃõÒÁñ¼Ä Ð¨ÈÂ¢ý ¸£ú, **Àì¸Å¡¾ §¿¡Â¡Ç¢¸Ç¢ø ¯½× Å¢ØíÌÅ¾¢ø °¢ÃÁõ ¯ûÇÅ÷ìÌ °¢ .Ê. ². ¬÷ ÀÂ¢ü°¢ ãÄõ Å¢ØíÌõ ¾¢È¨É §ÁõÀÎò¾ þÂÖõ "** ±ýÈ ¾¨ÄôÀ¢ø ¬ö× §Áü¦¸¡ûÇ ¯û§Çý.

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§ÁÖõ, Þó¾ ¬öÅ¢ø ÀíÌ ¦¸¡ûÅÐ ¯í¸û ¦°¡ó¾ Å¢ÕôÀõ. Þ¾¢ø ±ó¾ Å¢¾ì ¸ð¼¡ÂÓõ Þø¨Ä. ¿£í¸û Å¢ÕôÀô Àð¼¡ø, Þó¾ ¬öÅ¢ý ÓÊ×¸û ¯í¸Ùì Ì ¦¾Ã¢Âô ÀÎò¾ôÀÎõ.

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ANNEXURE IV

TOOL

SECTION - A

DEMOGRAPHIC DATA

1. Sample number:

2. Age:

3. Sex:

4. Education

5. Income:

6. Occupation:

SECTION - B

BASELINE DATA

1. Date of admission:

2. Diagnosis:

3. Associated illness:

4. Cause of the stroke:

5. Duration of stroke:

6. Family history of stroke:

SECTION - C

SYMPTOMS REPORTED BY PATIENT

1. Drooling

2. Coughing

3. Choking

4. Difficulty Swallowing : solids, liquids, Semisloids

5. Pain on swallowing

6. Weight loss

7. History of aspiration / pneumonia

SECTION - D

CURRENT DIET

1. Nil Per Oral(NPO)
2. Liquid diet
3. Semisolid diet
3. Alternative nutrition method - Nasogastric tube, Percutaneous Entero Gastrostomy tube feed.

DEPENDENCY STATE FOR FEEDING:

1.Partially dependent for feeding

2. Completely dependent for feeding

SECTION - E

GUGGING SWALLOWING SCREEN (GUSS)

1. Preliminary Investigation / Indirect Swallowing Test

	YES	NO
Vigilance (Patient must be alert for at least 15 min)	1	0
Cough / Throat clearing (Patient should cough / clear throat twice)	1	0
SALIVA SWALLOW		
• Swallowing Successful	1	0
• Drooling	0	1
• Voice Change	0	1
SUM 5		
1 -4 = Investigate further 5 = Continue with direct swallowing test		

2. Direct Swallowing Test:

	SEMISOLID	**LIQUID**	**SOLID**
DEGLUTITION:			
Swallowing not possible	0	0	0
Swallowing Delayed (> 2 sec; solid textures > 10 sec)	1	1	1
Swallowing Successful	2	2	2
COUGH (Involuntary): (Before, during or after swallowing - until 3 min later)			
Yes	0	0	0
No	1	1	1
DROOLING:			
Yes	0	0	0
No	1	1	1
VOICE CHANGE: (Listen to voice before and after swallowing)			
Yes	0	0	0
No	1	1	1
SUM	5	5	5
	1 -4 = Investigate further 5 = Continue Liquid	1 -4 = Investigate further 5 = Continue Solid	1 -4 = Investigate further 5 = Normal

SCORING AND INTERPRETATION

SCORE	RESULTS	SEVERITY CODE	RECOMMENDATIONS
20	Semisolid / liquid and solid texture successful	Slight / No dysphagia, minimal risk of aspiration	Normal diet. Reegular liquids (first time under supervision of the speech language therapist or a trained stroke nurse)
15 - 19	Semisolid and liquid texture successful and solid unsuccessful.	Slight dysphagia with a low risk of aspiration	Dysphagia diet (pureed and soft food). Liquids very slowly - one sip at a time. Functional swallowing assessments such as Fiberoptic Endoscopic Evaluation of Swallowing (FEES) or Videofluoroscopic Evaluation of Swallowing (VFES). Refer to speech language therapist. (SLT).
10 - 14	Semisolid swallow successful and liquids unsuccessful.	Moderate dysphagia with a risk of aspiration	Semisolid textures such as baby food and additional parenteral feeding. All liquids must be thickened. Pills must be crushed and mixed with thick liquid. No liquid medication. Functional swallowing assessments such as Fiberoptic Endoscopic Evaluation of Swallowing (FEES) or Videofluoroscopic Evaluation of Swallowing (VFES). Refer to speech language therapist.(SLT).
0 - 9	Preliminary investigation unsuccessful or semisolid swallow unsuccessful	Severe dysphagia with a high risk of aspiration	NPO Functional swallowing assessments such as Fiberoptic Endoscopic Evaluation of Swallowing (FEES) or Videofluoroscopic Evaluation of Swallowing (VFES). Refer to speech language therapist.(SLT).

Trapl M et al.,2007, Journal of the American Heart Association

FUNCTIONAL ORAL INTAKE SCALE

LEVEL	TYPE OF INTAKE
1	Nothing by mouth
2	Tube dependent with minimal attempts of food or liquid.
3	Tube dependent with consistent oral intake of food or liquid
4	Total oral diet of a single consistency
5	Total oral diet with multiple consistencies but requiring special preparation or compensations
6	Total oral diet with multiple consistencies without special preparation, but with specific food limitations.
7	Total oral diet with no restrictions

SCORING AND INTERPRETATION

SCORE	INTERPRETATION
1	Patient on total NG feeding.
2	Patient on NG feed with minimal food trials of semisolid consistency and can move on to liquids if tolerated.
3	Patient on NG feed with consistent oral intake, can use water to wash the food through the throat . Meals take extra time (> 1 hour)..
4	Patient on diet with single consistency (ground / pureed form otherwise called semisolid) but can drink water.
5	Patient on diet with multiple consistencies, Diet can be prepared using blender.
6	Patient on diet with multiple consistencies (pureed / grounded / chopped / regular). except salad, rice, meat, bread.
7	Patient on regular diet without any restrictions.

Michael A. Crary et al.,2005,Archives of Physical Medicine and Rehabilitation

ANNEXURE V

INTERVENTION

Effectiveness of Chin Tuck Against Resistance (CTAR) exercise in improving swallowing ability among CVA patients with dysphagia at selected Hospital, Coimbatore.

Chin Tuck Against Resistance Exercise:

A brief introduction on Chin Tuck Against Resistance Exercise was given to the participants and relatives with adequate positive reinforcement. Chin Tuck Against Resistance Exercise is the training helps to improve swallowing ability among CVA patients with dysphagia. Chin Tuck Against Resistance Exercise is repeated for 10 times per session for 3 sessions per day for consecutive 8 days.

Device needed:

- A rubber ball with 12 cm diameter.

Steps:

I. Assess the swallowing ability among CVA patients with dysphagia using Gugging Swallowing Screen and Functional Oral Intake Scale.

II. Administer the Chin Tuck Against Resistance Exercise.

- Seated upright in chair.
- A rubber ball with 12cm diameter is placed between chin and base of neck to provide resistance.
- Tuck the chin against the ball and sustaining it for 10 sec (isometric)
- Do it for 10 repetitions (isokinetic), three times a day for 8 consecutive days.

III. Ongoing assessment of the effectiveness of Chin Tuck Against Resistance Exercise done every day in the morning, afternoon and evening using GUSS and FOIS scales.

Note: CTAR Exercise can be continued until the patient gets discharged / gain optimal swallowing ability

ANNEXURE-VI

MASTER CODING SHEET

Comparison Group

1	1	3	2	1	1	6	2	2	2	2	1	2	2	2	1	2	3	1	2	3
5	1	3	2	5	2	2	1	2	2	2	1	2	1	1	1	2	1	2	3	1
2	1	1	1	1	1	2	1	2	2	2	1	2	2	2	2	2	3	1	3	2
1	2	2	1	4	2	1	1	1	2	1	1	2	1	2	1	2	1	2	3	1
4	1	2	2	2	1	6	2	2	2	2	1	2	1	2	1	2	1	2	3	1
1	1	2	2	1	3	2	2	1	2	1	2	2	1	2	2	2	1	2	3	1
3	1	1	1	5	4	2	1	2	2	2	1	2	2	2	2	2	3	1	2	3
4	2	2	1	4	1	2	2	2	2	2	1	2	1	2	1	2	1	2	3	2
1	1	3	2	5	2	1	2	2	2	2	1	2	1	2	2	2	1	2	3	1
1	1	2	2	1	1	2	2	2	2	1	1	2	1	2	2	1	1	2	3	1
3	1	1	1	6	2	2	1	1	2	2	1	2	1	2	2	2	1	2	3	1
1	1	2	2	1	4	2	1	2	2	2	1	2	3	1	2	2	3	1	2	3
2	1	1	1	6	1	2	1	2	2	2	1	2	1	2	1	2	1	2	3	1
2	1	1	1	6	1	5	1	1	2	2	1	2	1	1	2	2	1	2	3	1
1	1	3	3	5	4	5	1	1	2	2	1	2	1	2	1	2	1	2	3	1
4	1	1	3	5	1	6	1	1	2	1	1	2	1	2	2	2	1	2	3	1

Intervention Group

4	1	2	3	5	2	2	1	1	2	2	1	2	1	1	1	2	1	2	3	1
3	1	3	2	5	3	2	1	1	2	2	1	2	1	1	2	2	1	2	3	2
1	1	4	4	7	3	5	1	1	2	2	1	2	1	1	2	2	1	2	3	2
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1	1	2	2	1	2	5	1	2	2	2	1	2	1	1	2	2	1	2	3	1
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3	2	2	1	4	2	5	1	1	2	2	1	2	1	1	1	2	1	2	3	1