

Profile of dysphagia in acute stroke: a prospective observational study from a tertiary care centre in Mumbai, India.

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ABSTRACT

Background and Objectives: Acute stroke is a leading cause of morbidity and mortality all around the world. Post-stroke dysphagia is an important yet under-recognised complication occurring in the post-stroke period that may result in undernutrition, dehydration, aspiration pneumonitis, and retard the recovery of the patient. Despite the many path-breaking research in the management of stroke in the present era, post-stroke dysphagia remains a neglected area of research. **Materials and methods:** In the current study, consecutive patients of acute stroke who fulfilled inclusion criteria during hospitalization were evaluated for swallowing functions using a validated scale with varying consistencies of food at the time of admission and discharge. We analysed different parameters to evaluate swallowing functions following an acute stroke; incidence of post-stroke dysphagia, association between stroke severity and dysphagia and lastly impact of the dysphagia on duration of hospital stay and healthcare expenditure. **Results:** In our study, the incidence of dysphagia was 35% amongst all categories of acute stroke and stroke severity at admission was a strong predictor for risk of post-stroke dysphagia. Patients with dysphagia had higher average NIHSS scores as compared to patients without dysphagia. Despite the high incidence of dysphagia, most of the patients recovered significantly at the time of discharge. Post-stroke dysphagia was associated with extended duration of hospital stay and increased cost of healthcare as compared to patients without dysphagia. **Conclusion:** Dysphagia is a common complication occurring in patients with acute stroke and is seen in patients with increasing severity of stroke. Adequate screening of dysphagia and its management can help reduce complications, reduce hospital stay and the economic burden to the patient.

KEYWORDS- Stroke, Dysphagia, Swallowing, Bed-side swallowing assessment.

INTRODUCTION

Stroke is a major cause of morbidity and mortality all over the world. In the acute phase, it is associated with the occurrence of medical complications such as cardiac complications, aspiration pneumonia, urinary tract infection, deep vein thrombosis, pulmonary thromboembolism, incontinence, depression, anxiety, pressure ulcers, shoulder pain and dysphagia which further adds to the miseries of patients and their families and impairs clinical recovery(1-3). Dysphagia following acute stroke is a common but often under-diagnosed and under-recognized entity. The incidence of dysphagia ranges from 19-81%(4-6)

and this wide range is possibly attributed to the differences in the study design and the parameters used for evaluation of dysphagia (4). In acute stroke patients with dysphagia, there may be rapid recovery during the first few days or it may remain persistent at the time of discharge and up to 6

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months (7). If the normal swallowing does not return by day-10 then significant recovery in swallowing is unlikely to occur till 2-3 months (8). Dysphagia following stroke predisposes the patients to the risk of aspiration pneumonia, malnutrition and adds significantly to morbidity, mortality and increases the duration of hospital stay, hence increasing overall healthcare expenditure (9–11). While a significant proportion of patients typically have obvious features of aspiration such as coughing, choking while swallowing etc; many times, patients may not have any overt signs of aspiration – ‘silent aspiration’(12). Management of acute stroke has seen many advances and research in the last 2 decades including thrombolysis, mechanical thrombectomy etc, however management of dysphagia following stroke is a neglected area of research. Dysphagia following stroke is a major cause of pneumonia in this subgroup of patients and dysphagia is associated with a 3-fold increase and aspiration is associated with an 11-fold increase in the risk of pneumonia (4).

Normal swallowing, a very smooth and coordinated process, requires reflex and voluntary control that involves smooth orchestration between the nerves and muscles (13). Sound concept of the normal physiology of swallowing is a pre-requisite for understanding complex disorders related to dysfunctional swallowing ‘dysphagia’! Normal swallowing is divided into 3 phases: oral, pharyngeal and oesophageal phase. The oral phase is further subdivided into oral preparatory and propulsive phases. During the oral-preparatory phase, the bolus is processed into smaller pieces by the process of chewing till it is optimal for swallowing. During the next stage, processed food bolus is propelled by the tongue to the oro-pharynx, completing the first phase of swallowing. The pharyngeal phase comprises rapid sequential movement of food bolus from oro-pharynx to oesophagus. Smooth sequential contraction of pharyngeal muscles propels safe entry of bolus to the oesophagus. This phase is integral in airway protection by preventing entry of food bolus into larynx. Interplay of several airway protective mechanisms come into picture like closure of glottis, elevation of hyoid and larynx as well as

backward tilt of epiglottis to seal laryngeal vestibule. During the final phase of swallowing food bolus enters stomach via peristaltic wave of oesophageal muscles to complete the cycle of swallowing (13–15). Swallowing is also intricately linked to respiration such that breathing transiently ceases while swallowing by two-fold mechanisms of closure of airway by soft palate and neural suppression of respiration.

Both hemispheric and brainstem strokes can affect one or multiple aspects of normal physiology of swallowing. (16–18)

- 1) Cerebral lesions cause impairment of neural control of swallowing.
- 2) Lesion in primary motor cortex leads to paresis of contralateral facial, lingual and buccal musculature.
- 3) Lesions that affect and cause impairment of attention and consciousness.
- 4) Impaired sensations from oral cavity in case of brain-stem strokes, leading to disruption of normal smooth process of swallowing.
- 5) Lower cranial nerve nuclear or fascicular dysfunction
- 6) Oro-bucco-lingual apraxia.

Once the primary assessment and management of acute stroke are taken care of, evaluation for swallowing functions should be a priority and preferably be done within first 24 hours. Early detection of dysphagia and prompt intervention by speech language pathologists can reduce incidence of aspiration and pneumonia in patients with acute stroke(19). Evaluation of dysphagia following stroke can be done by either bedside swallowing assessment (BSA) method or with instrumentation supported procedures like videofluoroscopy (VFS) and function endoscopic evaluation of swallowing (FEES). In developing nations like India, where cost and availability of such procedures preclude its widespread utility, most centres rely on bedside assessment for swallowing evaluation for screening. Various studies have used different screening tools ranging from simple patient-oriented questionnaires to more refined scales like Gugging swallowing screen (GUSS)(20–22). In view of paucity of data from India, current study was undertaken to identify profile of dysphagia, its incidence, association between stroke severity,

vascular territory and presence of dysphagia, burden of dysphagia on healthcare expenses and long-term morbidity and mortality.

METHODOLOGY

Study design- Prospective observational study.

The current study was conducted from 1st January 2019 to 31st December 2020 at a tertiary care centre in Mumbai.

Inclusion criteria- We enrolled 100 consecutive patients with acute stroke admitted at our centre over a study period of 2 years. Those fulfilling exclusion criteria were excluded from the study.

Exclusion criteria included patients with mechanical dysphagia due to other causes. Patients with residual dysphagia from previous strokes. Patients with persistently obtunded state.

All the eligible patients were assessed for swallowing functions using Nair Hospital Bed-side Swallowing Assessment (NHBSA) and Nair Hospital Swallowing Ability Scale (NHSAS) within 24 hours of admission (23). Patients were re-assessed once they were shifted out of ICU and at the time of discharge. Those patients who continued to have dysphagia on day-7 of hospitalization were referred to the speech and swallow clinic and FEES was performed.

TECHNIQUE

All the patients were initially tested in sitting position with dry swallow testing, which once found safe, were evaluated using varying consistencies of food including thin liquids, thick liquids and soft-solids.(Table 1) Once patients were assessed with bedside evaluation, their dysphagia was graded as per Nair hospital swallowing assessment scale (NHSAS)(23) which is a 7-point ordinal scale ranging from no dysphagia to slight, mild, moderate, moderately severe, severe and complete dysphagia.(23) Informed consent was taken for everyone who participated in the study and institutional ethics committee approval was available.

RESULTS

Out of 100 patients in our study, 58 were males and 42 females. The average age of the patients during our study was 62.3 years with an age range from

18-94 years. Out of 100 stroke patients, 86 had ischemic stroke and 14 had haemorrhagic stroke. (Figure 1) In the category of ischemic stroke, 78 patients had hemispheric strokes and 8

Food trials for swallowing assessment	
Thin liquid	5 ml water via spoon
Thick liquid	5 ml milk-biscuit mixture via spoon
Soft solids	Small pieces of biscuits dipped in milk

Table 1- Food trials for swallowing assessment patients had brainstem strokes. Out of 78 patients with hemispheric ischemic strokes □ 29 had dysphagia during initial evaluation. (29/78 = 37.2%). (Figure 2) Out of 8 patients with brainstem ischemic strokes □ 5 had dysphagia during early evaluation. (5/8 = 62.5%). (Figure 3) During follow up at the time of discharge, 12/78 patients with acute ischemic hemispheric stroke had persistent dysphagia while, 3/8 patients with brainstem acute ischemic stroke had persistent dysphagia. To summarise, 41% (12/29) of hemispheric and 60% (3/5) of brainstem stroke patients with dysphagia at the onset of stroke had persistent dysphagia at the time of discharge. (Figure 4) Average duration of hospitalization for patients with dysphagia was 8.53 +/- 2.93 days as compared to 4.52 +/- 0.87 days for patients with no dysphagia. (p<0.0001). (Figure 5) Duration of hospital stay for patients who had persistent dysphagia at time of discharge was 11.25 +/- 2.17 days. (p < 0.002) Patients with dysphagia had average NIHSS score of 12 +/- 3.77 as compared to patients without dysphagia who had average NIHSS score of 4.75 +/- 1.81, p < 0.00001. (Figure 6) Presence of dysphagia was associated with average total healthcare cost of 96 thousand INR as compared to those without dysphagia, in whom average total healthcare expense was 67 thousand INR.

DISCUSSION

Dysphagia, 'difficulty with swallowing' is a commonly encountered condition in patients with acute stroke of various aetiologies and vascular territories. Although data about prevalence and

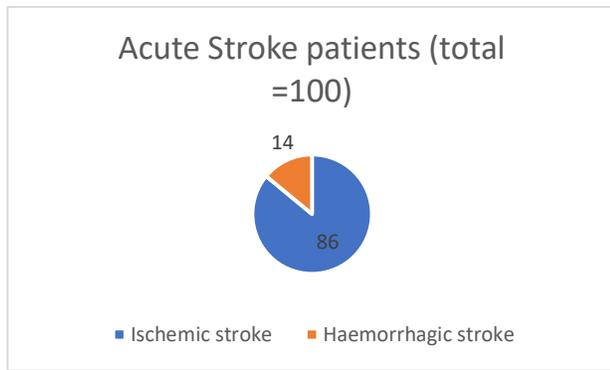


Figure 1- Prevalence of ischemic vs haemorrhagic stroke in study population.

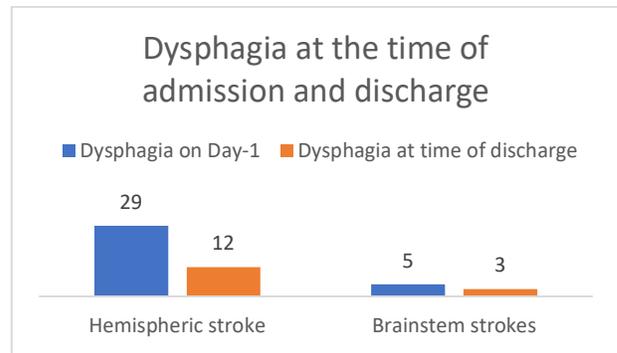


Figure 4- Patients of hemispheric and brainstem stroke with dysphagia on day-1 and at time of discharge.

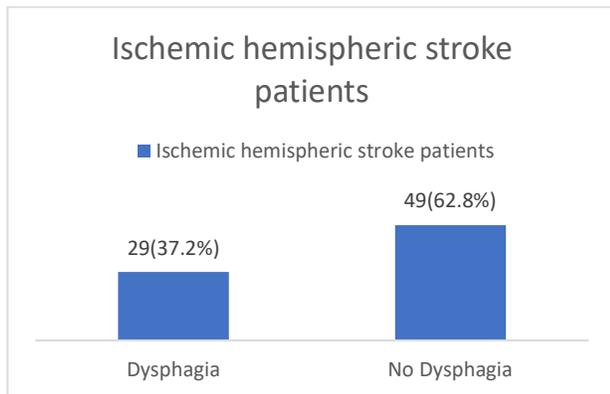


Figure 2- Prevalence of dysphagia amongst patients with ischemic hemispheric stroke.

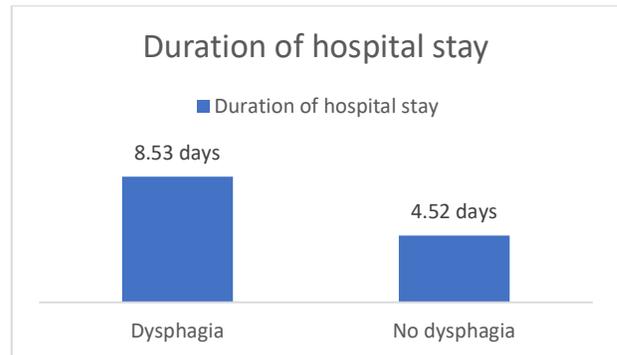


Figure 5- Average duration of hospital stay for patients with and without dysphagia.

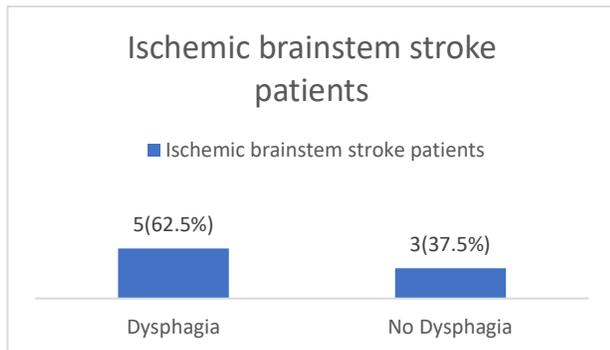


Figure 3- Prevalence of dysphagia amongst patients with ischemic brainstem stroke.

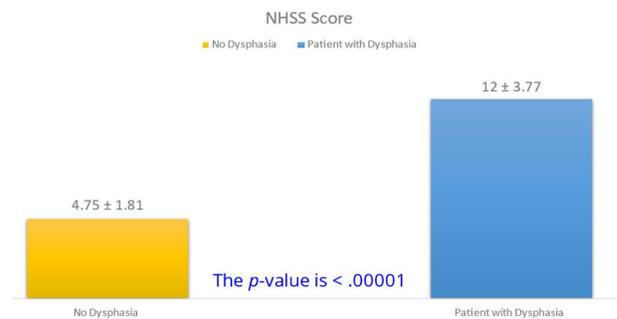


Figure 6- Patients with and without dysphasia and their average NIHSS scores.

profile of dysphagia is abundant from western world, similar large-scale studies from India are rather sparse. In current study, we try to find answers to many of such unresolved questions about dysphagia in patients with acute stroke in the Indian context.

In our study, in which we enrolled consecutive 100 patients of acute stroke from a tertiary care centre in Mumbai, males and females were respectively 58 and 42 in numbers. Average age of patients with acute stroke in current study was 62.3 years with age range of 18 to 94 years.

Ischemic strokes were more common than haemorrhagic strokes in our study. Out of 100 patients with acute stroke, 86 had ischemic stroke, while 14 had haemorrhagic stroke. In our study hemispheric strokes were more prevalent as compared to brainstem strokes in patients with acute ischemic strokes. Among 86 patients with ischemic stroke, 78 had hemispheric stroke and 8 had brainstem stroke. Swallowing function was assessed using validated NHBSA and NHSAS questionnaire, and the overall incidence of dysphagia in patients of acute stroke was 35% including both ischemic and haemorrhagic strokes. Prevalence of dysphagia has had wide range from 19-81 % (4-6) across various studies given the myriad bedside swallowing screening tools, different definitions of dysphagia used and differences in the timing of screening for dysphagia.

During current study, we found that 29 out of 78 patients (37.17%) with hemispheric ischemic stroke had dysphagia during first evaluation performed within first 24 hours, while 5 out of 8 patients (62.5%) with brainstem ischemic stroke had dysphagia on first evaluation.

We re-evaluated all the patients at the time of discharge to identify those who continued to have dysphagia even at the time of discharge. 12 of 29 patients with ischemic hemispheric stroke had persistent dysphagia at the time of discharge, while 3 of 5 patients with brainstem ischemic stroke had persistent dysphagia. Overall prevalence of dysphagia at the time of admission and discharge was higher in patients with brainstem strokes, however due to a smaller number of patients with

brainstem strokes, statistical significance of this finding could not be established. Various studies have shown contradictory results regarding whether brainstem strokes are associated with dysphagia more frequently at the time of admission and discharge. Brainstem lesions are known to impair oro-pharyngeal sensations, interfere with elevation of larynx and cause lower cranial nuclear / fascicular palsies which significantly predispose the patient to impaired swallowing mechanisms and result in dysphagia. On the contrary hemispheric lesions impairs normal swallowing by interfering with process of motor planning and execution of swallowing, impaired cognition, neglect, and apraxia (16-18).

One of the strong determinants of dysphagia risk was stroke severity at the time of admission. One study showed that NIHSS, Glasgow coma scale and speech/language changes were positively associated with dysphagia risk during the immediate post-stroke period. In our study severity of stroke as determined by NIHSS was a strong risk factor for dysphagia which is consistent with results from previous studies (24,25). Patients with dysphagia had an average NIHSS scores of 12 +/- 3.87 as compared to patients without dysphagia who had average NIHSS scores of 4.75 +/- 1.171, $p < 0.0001$. Our study substantiated the findings of earlier studies with regards to severity of stroke at admission being one of the chief predictors of dysphagia risk.

Former studies have highlighted the impact of dysphagia on overall duration of hospital stay, increasing morbidity, mortality and healthcare expenditure to the patients with acute stroke (9,10). Our study corroborated these findings and provide invaluable insight into the excessive burden that dysphagia can put on patients and their families in a resource-limited settings like India. Average duration of hospitalization for patients with acute stroke without dysphagia was 4.52 +/- 0.87 days, while for patients with dysphagia it was 8.53 +/- 2.93 days. To add on to this, patients who had persistent dysphagia at the time of discharge had overall longer duration of hospital stay (11.25 +/- 2.17 days) as compared to those who had no dysphagia at the time of discharge (8.53 +/- 2.93 days). Similarly, patients with dysphagia, because

of their extended hospital stay and risks of other medical complications during prolonged hospital stay have higher hospital expenses as compared to acute stroke patients without dysphagia. In our study, patients with dysphagia had an overall average hospital expense of 96 thousand INR as compared to average expense of 67 thousand INR for patients without dysphagia. A study from a tertiary care centre of India reported similar findings with average care of acute stroke patients costing 89 thousand INR per patient (26). In a country like India where awareness about stroke and its complications remains low, majority of population still belongs to lower socio-economic strata with no facility of health-care insurance, dysphagia can put patients and their families under excess financial burden, only to add to their agonies of dealing with disability inflicted by acute stroke and its complications. Early detection of dysphagia by comprehensive cost-effective bedside screening tools can help us identify at-risk patients of dysphagia during immediate post-stroke period in very early stages. Early and effective interventions with the help of speech language pathologists can help us prevent many of the medical complications secondary to dysphagia and reduce overall morbidity and mortality of patients with acute stroke.

LIMITATIONS OF THE STUDY

Although our study provides many captivating aspects related to the profile of dysphagia from a developing nation like India in patients with acute stroke, which can provide us with early opportunities to intervene and reduce rates of many medical complications, we observed that one major limitation of our study was our inability to assess patients with severe stroke who were in the obtunded state at the time of first assessment. Such patients are likely to have high NIHSS scores and increased rates of complications, morbidity and mortality during follow up. We wanted to follow up patients for up to 6 months but due to sudden emergence of Covid pandemic, many patients were lost to follow-up, which we feel is another major limitation of our study(27). We would like to design future studies to follow up such patients for minimum up-to 6 months to give us a more complete picture.

CONCLUSION

Acute stroke represents one of the major causes of morbidity and mortality. Post-stroke dysphagia although a common but under-diagnosed entity, can affect many dimensions of acute stroke-care. Stroke severity measured by NIHSS remains one of the chief predictors of post-stroke dysphagia risk and post-stroke dysphagia is associated with increased duration of hospital stay and health care expenses. Early detection of dysphagia and timely intervention can likely result in rapid recovery of swallowing functions, early discharge from hospital and reduced rate of secondary complications due to prolonged hospital stay; however larger case studies will be required.

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