THE BURDEN OF DYSPHAGIA AND CHEST INFECTION IN ACUTE ISCHEMIC STROKE IN A TERTIARY CARE HOSPITAL OF ISLAMABAD CAPITAL TERRITORY

Rao Suhail[1], Shahzad Ahmed[2], Sumaira Nabi[2], Mansoor Iqbal[1]
[1]Consultant neurologist, Department of neurology, Pakistan institute of medical sciences, Islamabad
[2]Post graduate resident, Department of neurology, Pakistan institute of medical sciences, Islamabad

Correspondence to: *Shahzad Ahmed Email: shehzadneuro@gmail.com*
Date of submission: *September 15, 2014,* ***Date of revision:*** *October 22, 2014,* ***Date of acceptance:*** *November 1, 2014*

ABSTRACT

Introduction: Stroke is the foremost cause of severe neurologic disability in adults and is associated with a variety of complications. Dysphagia complicates acute ischemic strokes (AIS) in 42% cases and is more evident during the first week after ischemic stroke. Chest infection complicates AIS in 32% of the cases and 89% of these cases are due to dysphagia. Videofluoroscopy is the gold standard for swallowing assessment but due to non availability, bedside swallowing assessment is a more handytool. **Methods:** From August 2013 to February 2014151 patients were enrolled according to the set criteria.Each patient was assessed for dysphagia according to the set protocol and monitored for the development of chest infection up to 1 week. Demographics and clinical features were recorded. **Results:** The mean age of patients was 59.09 ± 13.38 years with no sex predilection.Dysphagia was seen in 57 (37.7%) patients of AIS. Chest infection was seen in 38 (25.2%) of the patients. 32 (84.21%) patients with chest infection had dysphagia while 6 (15.78%) patients with chest infection did not have dysphagia. **Conclusion:** Chest infection is more common in patients of AIS with dysphagia.

INTRODUCTION

Stroke is defined as the sudden occurrence of a nonconvulsive, focal neurologic deficit[1]. It encompasses mainly 2 major disorders: Ischemic stroke and Hemorrhagic stroke. It is one of the leading causes of death in most parts of the world and the foremost cause of severe neurologic disability in adults. Ischemic stroke is characterized by the sudden loss of blood circulation to a part of the brain, which results in a corresponding loss of neurologic function. Acute ischemic stroke is attributed to thrombotic or embolic occlusion of a cerebral artery. Nearly 700,000 people suffer strokes each year in the United States; roughly 600,000 are ischemic lesions and 100,000 are hemorrhages. Stroke is the third leading cause of adult death and disability.[1] [There is no population based study on the incidence and prevalence of stroke in Pakistan] Dysphagia is defined as any impairment in swallowing efficiency and safety, including delays in timing of movements, reduced range of movements, or frank aspiration of food or liquids. Aspiration is defined as a more severe subset of dysphagia. Dysphagia complicates acute ischemic strokes in 42% cases[2]. Dysphagia is not only seen after brainstem strokes but it can result both with unilateral hemisphere involvement as well as with bi- cortical involvement due to slowed or discoordinated swallowing. There is also a decreased frequency of swallowing in stroke which causes saliva to pool in the mouth[2-4]. This problem is more evident during the first week after a hemispheric ischemic stroke and the effects can last up to weeks and months. This complicates the course of acute strokes through its potential of development of chest infection, nutritional problems and dehydration [2,3,5]. Chest infection complicates acute ischemic stroke in 32% of the cases.[2] Dysphagia leads to chest infections in 89% of the cases of acute stroke. Videofluoroscopy is the gold standard in determining the presence of aspiration during swallowing but is not widely available.[2,6] Bedside observation of the patient while swallowing water in an upright position is a simple and handy tool and the presence of cough, desaturation on pulse oximetry and the need to swallow small volumes slowly are indicative of a high risk of aspiration.[3,7] Infection in acute stroke has been, and remains, a significant problem. The most frequent infections complicating stroke are pneumonia and urinary tract infections.[10-12] Respiratory infection is significantly more likely to occur in patients with dysphagia.[10,11] The aim of this study is to determine the frequency of dysphagia in acute ischemic stroke by using bedside swallowing assessment and then monitoring patients of dysphagia for development of chest infection.

MATERIALS AND METHODS:

It was a prospective study carried out at the PIMS hospi-

tal, Islamabad from August 2013 to February, 2014. A consecutive series of 151 patients diagnosed with acute ischemic stroke admitted to the neurology department were studied. Informed consent was obtained from all patients. All patients above the age of 13 years diagnosed as acute ischemic stroke presenting within 48 hours of the eventwere enrolled in the study. The diagnosis of ischemic stroke was made on the history of a sudden occurrence of a non-convulsive, focal neurologic deficit with infarct on CT scan brain (Plain).Bed side liquid swallowing assessment was done by resident neurologists within 24 hours of admission with cup and spoon using 3ml, 5ml, 10ml, 20 ml and finally 50 ml of water with the patient sitting in bed adapted from the Gugging Swallowing Screen (GUSS).[14] Patients with cough and desaturation ≥ 2% from baseline saturation on pulse oximetry were judged as having dysphagia.[3] The following parameters were checked to assess the development of chest infection daily up to 1 week of admission: tachypnoea(respiratory rate >22/min), tachycardia (heart rate> 100 beats/minute), fever (Temperature >37 F), inspiratory crackles/bronchial breathing on auscultation with stethoscope, radiographic evidence- consolidation on chest X-ray and hypoxia on arterial blood gases- PO2 < 60mmHg. The presence of three or more findings were taken as presence of chest infection.[3] Key exclusion criteria included patients having sensory aphasia- speech impairment characterized by fluent but meaningless speech and severe impairment of the ability to understand spoken or written words, Glasgow coma scale (GCS) < 10/15 and poor postural control (unable to sit up for swallowing assessment). All patients admitted to the Neurology ward with acute stroke on the basis of the clinical and radiologic evidence underwent detailed history and neurological examination. Demographic features recorded; included age and gender. Clinical features recorded included GCS at presentation and presence of motor dysphasia/aphasia.Each patient was then be subjected to swallowing assessment as per the set protocol within 24 hours of admission and monitored for the development of chest infection up to 1 week. The data was entered on a standardized proforma. Data was entered and analyzed using SPSS version 17. Mean and standard deviation were calculated for quantitative variables (age). Frequencies and percentages were calculated for qualitative variables (gender, GCS on admission, presence of dysphasia/aphasia, presence of facial palsy, dysphagia and chest infection). For the purpose of statistical tests, age was divided into three groups (i.e. 30-50, 51-70 and 71-90).and assessed as a categorical variable. Chi-square test was used to compare the frequencies of chest infection between the patients with and without dysphagia.P < 0.05 was taken as statistically significant.

RESULTS

In this151 patients were included. The mean age of patients was 59.09 years with standard deviation of 13.38 years (range 30- 90 years). Out of these 76 (50.3%) patients were male and 75(49.7%) patients were female. Most of the patients had presented within 24 hours of suffering from stroke (68.9%).

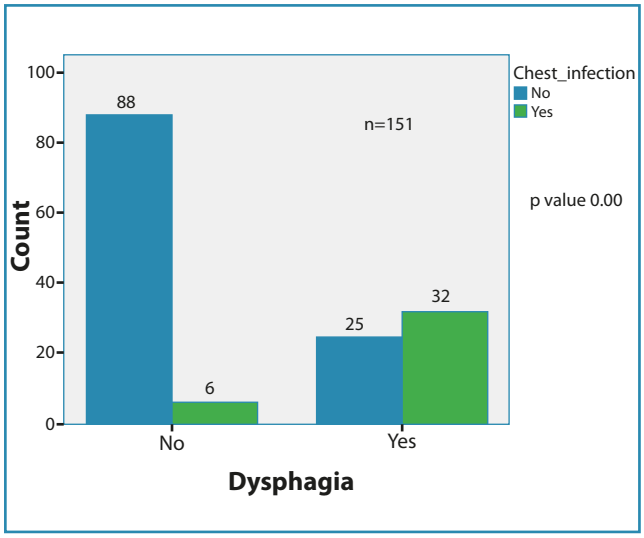
TABLE I: Demographic and clinical features

Age mean		59.09 ± 13.38 years (range 30-90years)
Gender	Male	50.3% (n=76)
	Female	49.7% (n=75)
Aphasia/dysphasia	Present	37.7% (n=57)
	Absent	62.3% (n=94)
Facial palsy	Present	51.6% (n=78)
	Absent	48.4% (n=73)
Dysphagia	Present	37.7% (n=57)
	Absent	62.3% (n=94)

Dysphagia was seen in 57 (37.7%) patients of AIS. No significant differences were noted between patients of AIS with and without dysphagiain terms of age (P=.665), gender (P=.817)and presence of facial palsy (P=.852) Dysphagia was associated withthe presence of aphasia/dysphasia (P=0.00).Chest infection was seen in 38 (25.2%) of the patients. 32 (84.21%) patients with chest infection had dysphagia with a highly significant P value (P= 0.00) as shown in figure no I. However, age (0.215) and gender (0.482) were not statistically significant.

Figure I:

Comparison of chest infection in patients with and without dysphagia



DISCUSSION

Dysphagia is a common and grave problem after acute stroke. Earlier it was believed that only brainstem and bicortical strokes only can lead to dysphagia, but it is being increasingly recognized now that unilateral hemispherical ischemic stroke can also cause dysphagia. It is postulated that swallowing is bilaterally, asymmetrically represented in the cerebral hemispheres which is not related to handedness. Dysphagia complicates acute ischemic strokes in 42% cases.[2] Dysphagia leads to malnutrition, dehydration, aspiration pneumonia and increased length of hospital stay.[15] Aspiration is definedas a more severe subset of dysphagia.There is a 3-fold increase in pneumonia risk among stroke patients with dysphagia which indicates that this is an important predictor for the development of pneumonia. Cerebral, cerebellar, or brain stem strokes can all affect the swallowing physiology. Cerebral lesions are proposed to interrupt the voluntary control of chewing and bolus motility during the oral phase of swallowing. Cortical lesions involving the precentralgyrus may produce impairment in facial, lip, and tongue motor control on the contralateral side along with compromised pharyngeal motility. Cerebral lesions can also lead to impaired cognitive function such as concentration which may also cause loss of control of swallowing.[16-18] Of all stroke patients, 32% develop chest infections with dysphagia and aspiration leading to infection in 89% of the cases.[19] 3.8% patients are said to die of pneumonia following stroke. [3]Dysphagia being an independent marker of post-stroke morbidity and mortality, it is important to promptly identify swallowing dysfunction in stroke. In this study of 151 patients, the mean age of patients was 59.09 years with standard deviation of 13.38 years. This is lower than the mean age seen in western studies. In American stroke association/ American heart association study on dysphagia the mean age of the patients was 74.6 years with a standard deviation of 2.4 years.[14] In this study of 151 patients the difference in the frequency of dysphagia was not statistically significant in different age groups. Although earlier studies have proposed that irrespective of lesion location normal age-related swallowing difficulty could further compound stroke-related dysphagia, as stroke is more prevalent in older age groups. The elderly poststroke patient might no longer be able to compensate for normal changes in skeletal muscle strength that diminish chewing or reduce lingual pressure.[20-22] In this study of 151 patients 76 (50.30%) patients were male and 75 (49.70%) patients were female. No sex predilection was seen. However, the American stroke association/ American heart association study on dysphagia shows a slight female preponderance, with 55% female and 45% male patients.[14] Conscious level has a major influence on the swallowing physiology. The initial stages of swallowing are under voluntary control determined by movements of facial, tongue and pharyngeal muscles. These are bound to be affected by altered mentation. The later stages are largely involuntary. They are controlled by subcortical centers which may be affected by basal ganglia, thalamic, large hemispherical or bihemispherical strokes.However, patients with altered sensorium were excluded from this study. A patient with ischemic stroke who has dysphagia may demonstrate some or all of the following; facial droop, difficulty controlling saliva/secretions, dysarthria, dysphasia/aphasia, weak or impaired cough, dysphonia and impaired conscious level. Any of these alone or in combination can adversely influence the various stages of swallowing. In our study aphasia/ dysphasia was significantly associated with dysphagia. However facial palsy was not found be a significant predictor. In this study of 151 patients, 57 (37.7%) patients of AIS had dysphagia. This is in accordance with previous studies of dysphagia in acute ischemic stroke. In literature it is mentioned that dysphagia is clinically present in 42% to 67% of patients in the first 3 days of stroke.[19,23] For many patients with unilateral ischemic strokes dysphagia is seen transiently, with a large proportion recovering quickly. This incidence tends to resolve by the end of the 5-7 days post stroke after resolution of acute edema.[24] Patients who have bilateral cortical strokes tend to have a more severe form of dysphagia which tends to persist for longer durations; possibly due to the impairment involving both hemispheres. In this study out of 151 patients, 38 (25.2%) patients of acute ischemic stroke had chest infection and 113 (74.8%) patients did not have chest infection. This again corresponds to results of previous studies. Studies have mentioned that the risk of chest infection within the first 5 days after stroke ranges from 19.5% to 42%. Pneumonia is one of the leading causes of mortality in patients with acute stroke. Respiratory infections contribute to length of hospital stay and are associated with significant increases in the patient care expenses, as well as leading to poorer outcomes for the patient.[19,23] In this study bedside liquid swallowing assessment was used to assess dysphagia in patients of acute ischemic stroke due to non-availability of video fluoroscopy. Patients were then clinically and radiologically monitored for development of chest infection. Out of the 151 patients, 32 patients who developed chest infection had dysphagia while 6 patients who developed chest infection had no dysphagia with a significant p value of 0.000. These results correspond with the results of previous studies in which dysphagia had been identified as a significant contributor towards aspiration and chest infection. Kidd et al. found that 25 (42%) out

60 stroke patients had dysphagia at 72 hours post stroke. In the first 14 days after their stroke, 19 patients developed lower respiratory tract infections. Of these 19 patients, 17 (89%) had dysphagia. A Scandanavian study of 1,156 patients reported 19.4% developed infections within 3 days of hospital admission. On an average 9.3 days were added to the patient's hospital admission by infection.[26] A study of 124 stroke patients who were admitted to Neurological Intensive Care Units in Cologne reported an incidence of pneumonia of 21%, occurring an average 1.8 days (±1.9 days), post stroke. [2] A study of 88 patients admitted to hospital with ischemic strokes found that infection occurred in 25 of 80 survivors during the first month post stroke. The incidence of respiratory infection was significantly higher in patients with dysphagia.[26] In a cohort of 330 acute ischemic stroke patients followed up for the first month after acute stroke, 51 had respiratory infections, with dysphagia again being a significant predictor. [27] Differences in dysphagia incidences reported in different studies are thought to be due to variations in the method of swallowing assessment, time after stroke and type of stroke. The reported incidence for dysphagia in studies of acute stroke patients irrespective of the variety of stroke (cortical or brainstem) was lowest with screening identification (37% -45%), higher with clinical testing (51%-55%), and highest with instrumental testing (64% -78%).[28] Instrumental testing is a better technique to visualize movement patterns. There is increasing evidence that early detection of dysphagia in patients with acute stroke not only reduces complications but also cuts short the duration of hospital stay and overall cost of healthcare facilities. Assessment of dysphagia and the consequent increased risk for chest infection in the stroke population will be critical to guide the design of future research targeting to assess benefits of dysphagia interventions. In our study, several limitations need to be recognized. The study was performed at a single tertiary care center, and the severity of illness and complication rates may be different than what would be expected in a population based cohort. However, this study had results similar to previous studies in establishing the association between dysphagia and chest infection.

CONCLUSION:

Dysphagia is a common and serious problem in stroke patients. It is encountered in about 37.7% of patients of acute ischemic stroke. Chest infection which is seen in 25.2% of the patients of acute ischemic stroke is more common in patients with dysphagia than the patients without dysphagia. Because pneumonia in stroke patients is often the result of aspiration, use of a dysphagia screen can result in a significantly decreased risk of pneumonia and an improved general outcome in patients of acute ischemic stroke.

REFERENCES

1. R Ropper AH, Samuels MA. Cerebrovascular Diseases. In: Davis JK, Sydor AM (editors) Adams and Victor's Principles of Neurology. 9thed. Boston, USA: McGraw-Hill; 2009:746-845.
2. Langdon C. Dypshagia and chest infections in acute ischemic stroke. In Acute ischemic stroke: Itechopen; 2012: 753-783.
3. Sundar U, Pahuja V, Dwivedi N, Yeolekar ME. Dysphagia in acute stroke: Correlation with stroke subtype, vascular territory and in-hospital respiratory morbidity and mortality. Neurol India 2008;56: 463-70.
4. SteinhagenV, GrossmannA, BeneckeR, WalterU. Swallowing disturbance pattern relates to brain lesion location in acute stroke patients. Stroke. 2009 May;40(5):1903-6.
5. Maeshima S, Osawa A, Miyazaki Y, Seki Y, Miura C, Tazawa Y, Tanahashi N. Influence of dysphagia on short-term outcome in patients with acute stroke. Am J Phys Med Rehabil. 2011 Apr;90(4): 316-20.
6. Schepp SK, Tirschwell DL, Miller RM, Longstreth WT Jr. Swallowing screens after acute stroke: a systematic review. Stroke. 2012 Mar;43(3):869-71.
7. Yeh SJ, Huang KY, Wang TG, Chen YC, Chen CH, Tang SC, Tsai LK, Yip PK, Jeng JS. Dysphagia screening decreases pneumonia in acute stroke patients admitted to the stroke intensive care unit. J Neurol Sci. 2011 Jul 15;306(1-2):38-41.
8. Tissue plasminogen activator for acute ischemic stroke. The National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group. N Engl J Med 1995; 333:1581.
9. Rha JH, Saver JL. The impact of recanalization on ischemic stroke outcome: a meta-analysis. Stroke 2007; 38:967.
10. Nakagawa T, Sekizawa K, Arai H, Kikuchi R, Manabe K, Sasaki H. High incidence of pneumonia in elderly patients with basal ganglia infarction. Arch Intern Med. 1997;157:321–324.
11. Hilker R, Poetter C, Findeisen N, Sobesky J, Jacobs A, Neveling M, Heiss WD. Nosocomial pneumonia after acute stroke: implications for neurological intensive care medicine. Stroke. 2003;34:975–981.
12. Roth EJ, Lovell L, Harvey RL, Heinemann AW, Semik P, Diaz S. Incidence of and risk factors for medical complications during stroke rehabilitation. Stroke. 2001;32:523–529.

13. Upadya A, Thorevska N, Sena KN, Manthous C, Amoateng-Adjepong Y. Predictors and consequences of pneumonia in critically ill patients with stroke. J Crit Care. 2004;19:16–22.
14. Trapl M, Enderle P, Nowotny M, Teuschl Y, Matz K, Dachenhausen A, Brainin M. Dysphagia Bedside Screening for Acute-Stroke Patients. Stroke. 2007; 38: 2948-2952.
15. Marik, P.E. Aspiration pneumonitis and aspiration pneumonia. N Engl J Med. 2001; 344:665-671.
16. Zald DH, Pardo JV. The functional neuroanatomy of voluntary swallowing. Ann Neurol. 1999; 46:281–286.
17. Daniels SK, Brailey K, Foundas AL. Lingual discoordination and dysphagia following acute stroke: analyses of lesion localization. Dysphagia. 1999;14:85–92.
18. Veis SL, Logemann JA. Swallowing disorders in persons with cerebrovascular accident. Arch Phys Med Rehabil. 1985;66:372–375.
19. Kidd, D., Lawson, J., Nesbitt, R., McMahon, J. The natural history and clinical consequences of aspiration in acute stroke. QJM. 1995; 88(6): 409-413.
20. Devroey D, Van Casteren V, Buntinx F. Registration of stroke through the Belgian sentinel network and factors influencing stroke mortality. Cerebrovasc Dis. 2003;16:272–279.
21. Jaradeh S. Neurophysiology of swallowing in the aged. Dysphagia. 1994; 9:218 –220.
22. Nicosia MA, Hind JA, Roecker EB, Carnes M, Doyle J, Dengel GA, Robbins J. Age effects on the temporal evolution of isometric and swallowing pressure. J GerontolABiolSci Med Sci. 2000;55: 634–640.
23. Perry L, Love CP. Screening for dysphagia and aspiration in acute stroke: a system review. Dysphagia. 2001;16:7–18.
24. Broadley, S., Croser, D., Cottrell, J. et al. Predictors of prolonged dysphagia following acute stroke. Journal of Clinical Neuroscience. 2003; 10(3): 300-305.
25. Kammersgaard, L.P., Jorgensen, H.S., Reith, J. et al. Early infection and prognosis after acute stroke: The Copenhagen Stroke Study. Journal of Stroke and Cerebrovascular Diseases. 2001; 10: 217-221.
26. Langdon, P.C., Lee, A.H., Binns, C.W. Dysphagia in acute ischaemic stroke: Severity, recovery and relationship to stroke type. J Clin Neuroscience. 2007; 14(7):630-634.
27. Langdon, P.C., Lee, A.H., Binns, C.W.High incidence of respiratory infections in 'Nil by Mouth' acute stroke patients. Neuroepidemiology. 2009; 32(2):107-13.
28. Martino R, Foley N, Bhogal S, Nicholas Diamant N, Speechley M, Teasell R. Dysphagia After Stroke-Incidence, Diagnosis, and Pulmonary Complications. Stroke. 2005;36:2756-63.

Conflict of interest: Author declares no conflict of interest.

Funding disclosure: Nil

Author's contribution:
Dr. Rao Suhail: Study concept and design, protocol writing, data collection, data analysis, manuscript writing, manuscript review
Dr. Shahzad Ahmed: Data collection, data analysis, manuscript writing, manuscript review
Dr. Sumaira Nabi: Data collection, data analysis, manuscript writing, manuscript review
Dr. Mansoor Iqbal: Manuscript writing, manuscript review