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Research Article

The Frequency of Aspiration Pneumonia with Thick Liquid Diet among Stroke Patients having Dysphagia

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Abstract: Background: Oropharyngeal dysphagia is frequently encountered in clinical practice. When it is not recognized and managed properly, it can lead to serious consequences such as aspiration pneumonia.

Objective: To determine the frequency of aspiration pneumonia with thick liquid diet among stroke patients having dysphagia.

Materials and Methods: This prospective longitudinal study was conducted in Unit-4 of the Department of Medicine, Bahawal-Victoria Hospital, Bahawalpur, from 1st September 2025 to 27th February 2026. Patients aged 30–70 years with post-stroke dysphagia and receiving a thick liquid diet were enrolled through consecutive sampling. Baseline demographic and clinical variables were recorded. Patients were followed at two-week intervals for aspiration pneumonia, diagnosed based on clinical features and chest X-ray findings. Data were analyzed using SPSS 26.0, with appropriate statistical tests applied.

Result: Among 189 patients, the median age was 57.0 (IQR=48.0–64.0) years, with 112 (59.3%) males. Ischemic stroke was present in 134 (70.9%) patients. Diabetes mellitus was present in 82 (43.4%) patients, smoking in 64 (33.9%), and anemia in 91 (48.1%). Median duration of stroke, dysphagia, and hospitalization was 9.0 (5.0–16.0) days, 6.0 (IQR=3.0–10.0) days, and 8.0 (IQR=5.0–13.0) days, respectively. Aspiration pneumonia developed in 46 (24.3%) patients. On multivariable analysis, anemia (aOR 2.4, 95% CI: 1.3–5.2; p=0.032) and dysphagia duration >7 days (aOR 2.7, 95% CI: 1.5–4.9; p=0.014) remained independent predictors of aspiration pneumonia.

Conclusion: Aspiration pneumonia is a frequent complication among stroke patients with dysphagia. Anemia and prolonged dysphagia are key determinants of risk, underscoring the need for comprehensive clinical management beyond dietary modification.

Keywords: Anemia, Aspiration pneumonia, Dysphagia, Smoking, Stroke.

INTRODUCTION

Oropharyngeal dysphagia is frequently encountered in clinical practice, especially in older adults and in individuals with neurodegenerative as well as other non-neurological illnesses [1]. When it is not recognized and managed properly, it can lead to serious consequences such as aspiration pneumonia, poor nutritional status, repeated hospitalizations, and even death [1, 2]. Dysphagia after stroke is one of the common complications seen in the acute phase and adds substantially to patient burden and healthcare costs. It is linked with higher morbidity, mortality, and long-term dependence, largely because of its association with aspiration, chest infections, and malnutrition. Although swallowing function improves spontaneously in many patients over time, a considerable proportion continue to experience dysphagia even 6 months after stroke [3, 4].

Despite major progress in hyper acute stroke care and secondary prevention, post-stroke dysphagia has remained relatively under explored, and important aspects of its diagnosis, evaluation, and treatment still lack clear consensus [5, 6]. Managing dysphagia especially in older patients often require coordinated support from a multidisciplinary team. Nurses play an important role in ensuring safe feeding practices, guiding caregivers, and encouraging patients to take food in forms that are easier to swallow, such as soft or semi-solid diets. Thickened liquids are commonly used because they may help lower

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the chance of aspiration, support continued oral feeding, and improve quality of life [7, 8]. This approach is generally regarded as a practical and physiologically acceptable way to promote safer swallowing in patients with dysphagia. Even so, strong evidence showing that thickened fluids clearly prevent complications such as aspiration pneumonia remains limited. Existing literature suggests that dysphagia affects nearly 50% to 80% of patients after stroke [9, 10]. In a large case series of 483 patients with dysphagia, the incidence of aspiration was highest with thin liquids (32.9%), but decreased with mildly thickened (21.1%) and moderately thickened liquids (14.3%), demonstrating a significant protective effect of increased viscosity ($p<0.001$) [10]. In a prospective cohort of 143 acute stroke patients, the overall incidence was 24.5% [11]. Another study found that 25% of stroke patients developed aspiration pneumonia [12]. Predominant available literature addresses aspiration events or general pneumonia risk in dysphagia, rather than focusing on the clinical outcomes associated with the routine use of thick liquid diets in this population. Robbins *et al.*, found that aspiration pneumonia occurred in 8% and 15% cases with nectar-thick and honey-thick liquid diet respectively among patients having dysphagia [13]. Another study found that significantly more participants aspirated on thin liquids despite using chin-down posturing (68%) than when using nectar-thick (63%) or honey-thick liquids (53%) among patients having dysphagia [14].

Studies are available from other Asian regions including India and China [15, 16]. However, limited studies have been done before and no study has been conducted in South Punjab Pakistan and limited studies available from Pakistan to explore the incidence of aspiration pneumonia among stroke patients with dysphagia receiving thick liquid diet. The objective was to determine the frequency of aspiration pneumonia with thick liquid diet among stroke patients having dysphagia at a tertiary care hospital of South Punjab, Pakistan.

MATERIALS AND METHODS

This prospective longitudinal study was conducted in Unit IV of the in-patient Department of Medicine, Bahawal Victoria Hospital, Bahawalpur, from 1st September 2025 to 27th February 2026, after obtaining approval from the Institutional Ethical Committee (letter number: 2380/DME/QAMC Bahawalpur, dated: 17-04-2024).

Patients were enrolled through non-probability consecutive sampling. Patients aged 30–70 years of either gender with post-stroke dysphagia were included, provided they were conscious (GCS≥13) and planned to undergo thick liquid diet. Patients already enrolled in another trial, on mechanical ventilation, receiving treatment for chronic lung disease or pneumonia including chronic obstructive pulmonary disease, those with severe heart failure (ejection fraction <30%), altered level of consciousness (GCS <13), uremia, hepatic cirrhosis, or recurrent stroke were excluded. A sample size of 189 was calculated using the WHO sample size calculator, taking the expected proportion of aspiration pneumonia as 14.3% among patients receiving moderately thickened liquids,10 with a 95% confidence level and 5% margin of error.

Stroke was identified on the basis of clinical features including abnormal gait, blurred vision, or focal neurological deficits such as limb weakness or speech disturbance, assessed through a standardized neurological examination by a trained physician at admission, and confirmed by non-contrast computed tomography of the brain demonstrating a hypodense area consistent with ischemic stroke or a hyperdense area consistent with hemorrhagic stroke. Dysphagia was assessed using the 3-ounce water swallow test, in which patients were asked to drink 3 ounces of water without interruption in an upright position and were observed for one minute; the presence of cough or a wet or hoarse voice was taken as evidence of dysphagia [17]. Thick liquid diet was defined according to the International Dysphagia Diet Standardization Initiative (IDDSI) framework, with nectar thick and honey thick liquids corresponding to levels 2 and 3, respectively, verified using the IDDSI flow test based on the volume of liquid remaining in a 10 mL syringe after 10 seconds [18, 19].

After enrollment, informed written consent was obtained from legal guardians / attendants. Baseline demographic and clinical data were recorded including age, gender, duration of stroke, duration of dysphagia symptoms, hypertension (blood pressure ≥140/90 mmHg), smoking history of more than 5 pack years, diabetes (blood sugar random >200 mg/dL), anemia (hemoglobin <11 g/dL), type of stroke, and duration of hospital stay. Patients and their attendants were instructed regarding the preparation and administration of thickened liquids, including appropriate consistency selection and feeding technique. Feeding was performed with the patient in an upright position, initially under supervision of the researcher and subsequently by the attendants independently.

Patients were followed at two-week intervals for the development of aspiration pneumonia. Aspiration pneumonia was diagnosed when both clinical and radiological criteria were met, including the presence of low-grade fever, sudden onset of respiratory symptoms, difficulty in breathing, decreased oxygen saturation < 94% on room air and coarse crackles on auscultation along with chest X-ray evidence of new infiltrates in dependent lung regions. Patients diagnosed with aspiration pneumonia were managed according to standard institutional protocols. Patients were observed after beginning a thick liquid diet for 14 days. This length of time was chosen because studies have shown that most stroke patients develop aspiration pneumonia four days after having a stroke and experience majority of these events within one week after developing difficulty swallowing due to stroke [20].

STATISTICAL ANALYSIS

Data were entered and analyzed using SPSS version 26.0. Normality of quantitative variables was assessed using the Shapiro–Wilk test. Continuous variables such as age, duration of stroke, and duration of dysphagia symptoms were presented as mean and standard deviation or median and interquartile range as appropriate. Categorical variables including gender, hypertension, diabetes, smoking status, anemia, type of stroke, type of liquid, and aspiration pneumonia were expressed as frequencies and percentages. Stratification was performed for potential effect modifiers including age, gender, comorbidities, stroke characteristics, and duration of hospital stay. Post-stratification comparisons were carried out using chi-square test or Fisher's exact test where appropriate. Variables with $p<0.2$ in univariate analysis were entered in multivariate binary logistic regression model, and adjusted odds ratio (aOR) with 95% confidence interval (CI) were calculated, taking $p<0.05$ as significant.

RESULT

In a total of 189 patients, the median age was 57.0 (48.0–64.0) years, and 112 (59.3%) were males, and 77 (40.7%) females. Ischemic stroke was identified in 134 (70.9%) patients, and hemorrhagic stroke in 55 (29.1%). Diabetes mellitus was reported in 82 (43.4%) patients, smoking in 64 (33.9%), and anemia in 91 (48.1%). The median duration of stroke, and dysphagia were 9.0 (5.0-16.0) days, and 6.0 (3.0-10.0) days, respectively. The median duration of hospitalization was 8.0 (5.0-13.0) days. Table **1** is showing characteristics of patients.

Table 1. Characteristics of Patients (n=189).

Characteristics	Categories	Frequency (%)
Gender	Male	112 (59.3%)
	Female	77 (40.7%)
Age groups (years)	30-50	78 (41.3%)
	51-70	111 (58.7%)
Stroke type	Ischemic	134 (70.9%)
	Hemorrhagic	55 (29.1%)
Diabetes mellitus		82 (43.4%)
Smoking		64 (33.9%)
Anemia		91 (48.1%)
Duration of stroke (days)	≤7	78 (41.3%)
	>7	111 (58.7%)
Duration of dysphagia (days)	≤7	115 (60.8%)
	>7	74 (39.2%)

Aspiration pneumonia developed in 46 (24.3%) patients. Gender (p=0.344), age groups (p=0.091), stroke type (p=0.819), diabetes mellitus (p=0.485), smoking (p=0.385), and duration of stroke (p=0.086) were not found to have significant association with aspiration pneumonia in univariate analysis. Anemia was significantly more frequent in patients with aspiration pneumonia (OR:2.5, 95% CI:1.3–4.9; p=0.008). Duration of dysphagia showed a significant association with aspiration pneumonia (OR 2.6, 95% CI 1.3–5.0; p=0.006), as did duration of hospital stay >7 days (OR 2.3, 95% CI 1.2–4.4; p=0.020) (Table **2**).

Table 2. Association of Characteristics of Patients with Aspiration Pneumonia (N=189).

Characteristics		Aspiration pneumonia (n=46)	No aspiration pneumonia (n=143)	OR with 95% CI	P-value
Gender	Male	30 (65.2%)	82 (57.3%)	1.4 (0.7-2.8)	0.344
	Female	16 (34.8%)	61 (42.7%)	Reference	
Age groups (years)	30-50	12 (26.1%)	57 (39.9%)	Reference	0.091
	51-70	34 (73.9%)	86 (60.1%)	1.9 (1.02-3.5)	
Stroke type	Ischemic	32 (69.6%)	102 (71.3%)	0.9 (0.5-1.9)	0.819
	Hemorrhagic	14 (30.4%)	41 (28.7%)	Reference	

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Diabetes mellitus		22 (47.8%)	60 (42.0%)	1.3 (0.7-2.4)	0.485
Smoking		18 (39.1%)	46 (32.2%)	1.4 (0.7-2.7)	0.385
Anemia		30 (65.2%)	61 (42.7%)	2.5 (1.3-4.9)	*0.008
Duration of stroke (days)	≤7	14 (30.4%)	64 (44.8%)	Reference	0.086
	>7	32 (69.6%)	79 (55.2%)	1.9 (0.9-3.6)	
Duration of dysphagia (days)	≤7	20 (43.5%)	95 (66.4%)	Reference	*0.006
	>7	26 (56.5%)	48 (33.6%)	2.6 (1.3-5.0)	
Duration of hospital stay	≤7	16 (34.8%)	78 (54.5%)	Reference	*0.020
	>7	30 (65.2%)	65 (45.5%)	2.3 (1.2-4.4)	

CI: Confidence interval, *Significant at p<0.05.

On multivariable logistic regression analysis, anemia remained independently associated with aspiration pneumonia (adjusted OR 2.4, 95% CI: 1.3–5.2; p=0.032), as did duration of dysphagia >7 days (adjusted OR 2.7, 95% CI: 1.5–4.9; p=0.014). Age 51–70 years showed an adjusted OR of 1.4 (95% CI: 0.5–3.8; p=0.173), and duration of stroke >7 days an adjusted OR of 1.9 (95% CI 0.4–3.8; p=0.262) showing non-significant association after adjustment (Fig. **1**).

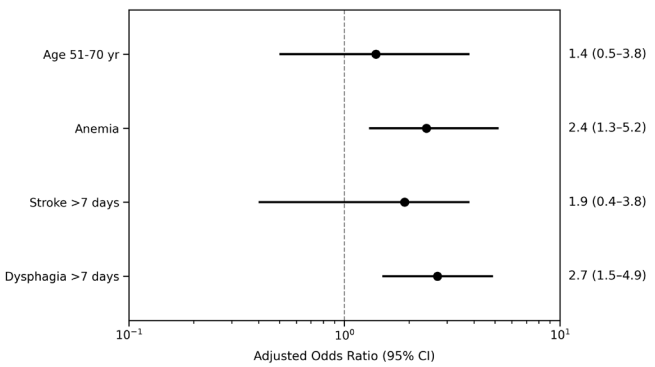

Fig. (1). Forest Plot of Adjusted Predictors of Aspiration Pneumonia among Stroke Patients with Dysphagia.

DISCUSSION

Aspiration pneumonia was observed in almost one-fourth of stroke patients with dysphagia, while anemia, and prolonged duration of dysphagia greater than 7 days were independently associated with aspiration pneumonia. A recent study reported having dysphagia among stroke patients increased the adjusted odds of aspiration pneumonia by 3.0 times (1.1-8.2) [21]. A systematic review revealed that the incidence of pneumonia was significantly increased among acute stroke patients with dysphagia than without it (OR: 9.6; 95% CI: 5.6-16.0; p<0.001) [19]. Some other researchers have also reported that dysphagia and aspiration may also be the only manifestation of stroke [22]. All these evidences reinforce the consistency of the present findings within contemporary evidence that aspiration pneumonia is a frequent occurrence among stroke patients with dysphagia.

Anemia emerged as an independent associated factor of aspiration pneumonia. This finding supports the concept that reduced physiological reserve predisposes patients to infection following aspiration events [23]. Although limited literature exists that have evaluated anemia specifically, broader stroke literature indicates that compromised baseline health status, including nutritional and hematological deficits, contributes to increased susceptibility to post stroke infections [24].

Relatively increased duration of dysphagia was also independently associated with aspiration pneumonia highlighting the clinical importance of persistent swallowing dysfunction as a determinant of pulmonary complications. A systematic review and meta-analysis reported that stroke patients with dysphagia had 3-11 fold higher risk of developing pneumonia compared with those without dysphagia [25]. Contemporary reviews emphasize that persistent dysphagia increases cumulative exposure to aspiration events and delays recovery, thereby elevating infection risk [26]. These observations emphasize on the importance of early identification and active management of swallowing dysfunction.

This study observed that age did not sustain its position to be an independent factor in the adjusted analysis although higher crude odds were observed among relatively older cases. These findings are supported by the recent evidence and may suggest that age alone could not be a strong determinant once clinical factors like dysphagia severity, and functional status are adjusted [27]. Stroke related disability and neurological impairments could be playing more central roles in determining pneumonia odds than age [28].

Stroke type was not found to have significant association with aspiration pneumonia in this study and these observations may indicate that lesion characteristics and

functional impairments could be more relevant than the classification of stroke. A recently published cohort analysis documented that the clinical severity and swallowing dysfunction were found to be strong predictors of pneumonia than stroke subtypes [29].

The current study focuses on a significant gap in stroke care, specifically addressing an aspect of post-stroke dysphagia treatment; the safety and effectiveness of a thickened liquid diet as one of the most commonly prescribed non-invasive approaches to treating post-stroke dysphagia. An observational phase of this clinical trial has been created to capture 14 days of gave patients experiencing dysphagia after a stroke at clinically justified times with high potential for developing post-stroke pneumonia (most likely to develop during acute or immediate rehabilitation).

LIMITATIONS

Several limitations should be acknowledged. The study was conducted at a single center, which may limit generalizability to other settings. The cross-sectional design limits the ability to establish temporal relationships. The assessment of dysphagia was based on bedside testing rather than instrumental evaluation, which may underestimate subclinical aspiration.

CONCLUSION

Aspiration pneumonia is a frequent complication among stroke patients with dysphagia. Anemia and prolonged dysphagia are key determinants of risk, underscoring the need for comprehensive clinical management beyond dietary modification.

AUTHORS' CONTRIBUTION

Muhammad Mohsan Amin: Conceptualization, Study Design, Methodology, Data analysis and interpretation, Writing Draft and Final approval, final proof to be published.

Umair Arif, Javeria Afzal, Muhammad Ahsan Amin and **Ali Imran**: Study Design, Methodology, Data analysis and interpretation, Writing Draft, Critical review and revision the manuscript, Final approval, final proof to be published.

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Declared none.

ETHICAL DECLARATIONS

Data Availability Statement

Data will be available from the corresponding author upon a reasonable request.

Ethical Approval

This study was approved by the Ethical Review Committee of Bahawal Victoria Hospital, Bahawalpur, (letter number: 2380/DME/QAMC Bahawalpur, dated: 17-04-2024).

Consent to Participate

Written consent was sought from parents prior to study commencement.

Consent for Publication

All authors provide consent to publish the work.

Conflict of Interest

Declared none.

Competing Interest/Funding

Declared none.

Use of AI-Assisted Technologies

The authors used Claude to assist with language editing and improving readability. All intellectual contributions, including study design, data analysis, and conclusions, remain the sole responsibility of the authors.

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