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FREQUENCY OF DYSPHAGIA IN PATIENTS PRESENTING WITH ACUTE STROKE: A CROSS-SECTIONAL STUDY FROM A TERTIARY CARE HOSPITAL IN BANNU, KHYBER PAKHTUNKHWA, PAKISTAN

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Dysphagia, Stroke, Deglutition disorders, Cross-sectional studies, Risk factors, Pakistan.

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Abstract

Objective: *To determine the frequency of dysphagia among patients presenting with acute stroke, and to identify the demographic and clinical factors associated with it, at a tertiary care hospital in Bannu, Pakistan.*

Study Design: *Cross-sectional study.*

Place and Duration of Study: *Department of General Medicine, Khalifa Gul Nawaz Teaching Hospital, MTI, Bannu.*
Duration of study:2nd February 2025 to 2nd April 2025.

Methodology: *One hundred and forty-four patients aged 30–70 years with a first presentation of acute stroke, confirmed clinically and by computed tomography, were enrolled through consecutive non-probability sampling. Dysphagia was assessed at the bedside with a graded water-swallow test (3, 5, 10, 20, and 50 mL), adapted from the Gugging Swallowing Screen; a positive result was cough during swallowing or a fall in pulse-oximetry saturation of ≥2% from baseline. Demographic and clinical data were recorded on a structured proforma. Dysphagia was stratified against age, gender, body mass index, stroke duration, smoking, hypertension, diabetes, residence, profession, education, and socioeconomic background using the chi-square test, with Fisher's exact test applied where expected cell counts were below 5. A p-value ≤0.05 was taken as significant. Data were analyzed using IBM SPSS version 21.*

Results: *Dysphagia was present in 56 of 144 patients (38.9%). Patients with dysphagia were significantly older than those without (58.6±9.0 vs 51.8±10.0 years, p<0.001), and its frequency rose from 7.7% in patients aged 30–40 years to 60.4% in those aged 61–70 years (p=0.0003). Dysphagia was also more frequent among current smokers (57.1% vs 34.5%, p=0.046) and varied significantly by occupation, being highest among retired patients (60.7%, p=0.041). Gender, body mass index, stroke duration, hypertension, diabetes, residence, education, and socioeconomic background showed no statistically significant association with dysphagia.*

Conclusion: *Dysphagia affected almost two in five patients with acute stroke in this cohort, a figure consistent with regional and international literature, and was most strongly associated with advancing age. Routine, early bedside swallow screening is warranted in acute stroke patients,*

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particularly those over 60 years, to reduce the risk of aspiration and its complications.

INTRODUCTION

Stroke happens when blood stops reaching part of the brain. This happens two ways. A vessel can get blocked (ischaemic stroke), or a vessel can burst and bleed into the brain (haemorrhagic stroke).[1] Most strokes are ischaemic. Haemorrhagic strokes are fewer in number but far deadlier, and the two main types — bleeding inside the brain and bleeding around it — both carry a high early risk of death and lasting disability.[2] Worldwide, stroke is the second biggest killer and one of the leading causes of long-term disability.[3] The usual risk factors are well known by now: high blood pressure, smoking, diabetes, poor diet, and inactivity. Age and family history matter too, and cannot be changed.[4] Countries that have built organised stroke-care systems, such as China's CSPPC-Stroke programme, have managed to bring this burden down.[5] Much of Africa and South Asia have not reached that point yet. Care is often delayed, and resources are stretched thin.[6] Pakistan is no exception — one of the earliest community surveys done here, in a Karachi slum, found stroke and TIA rates high enough to call for urgent local data and local planning, not just borrowed figures from elsewhere.[7]

One stroke complication gets far less attention than it deserves: dysphagia, or trouble swallowing safely. It happens when a stroke damages the brain areas that coordinate swallowing. Depending on when and how it is checked, dysphagia shows up in anywhere from about 29% to 81% of acute stroke patients.[8,9] Left unrecognised, it is dangerous. Patients aspirate food or liquid into the lungs, and this raises the risk of pneumonia, dehydration, and malnutrition. Hospital stays get longer, and more patients die.[8] The financial side matters too — a dysphagic patient who develops pneumonia or malnutrition costs a health system considerably more to treat than one who does not.[10] A 2022 meta-analysis that pooled 42 studies and over 26,000 patients put the average dysphagia rate at 42%, and found dysphagic patients were roughly four times more likely to get pneumonia or die.[11] Simple bedside screening catches most of this early, which is exactly why European guidelines now say every stroke patient should be screened before they are given anything to eat or drink.[9]

Age makes this worse. Swallowing already slows down naturally as people get older — weaker throat muscles, slower reflexes — even without any illness.[12] A stroke on top of that has much less room to recover from, which is part of why older stroke patients are hit harder by dysphagia than younger ones.

Data from Pakistan on this specific problem are thin. One hospital study from Lahore, screening 150 stroke patients, found dysphagia in just over half, and linked it to stroke type and smoking history.[13] A more recent Pakistani study looking at swallowing and communication problems together found similar patterns.[14] Outside Pakistan, a hospital-based Egyptian study — the one we used to calculate our own sample size — reported dysphagia in 39.2% of first-time stroke patients, climbing to nearly 59% in haemorrhagic stroke.[15] We could not find any data at all from Bannu or the wider Khyber Pakhtunkhwa region, where stroke units run on tight resources and formal swallow screening is not yet routine.

So we set out to answer a simple question: how common is dysphagia in patients admitted with acute stroke at our hospital, and what patient factors go along with it? We hope the answer gives our team a reason to screen every stroke patient's swallowing at the bedside, and gives other centres in the region a number to compare against.

METHODOLOGY

This cross-sectional study was conducted in the Department of General Medicine, Khalifa Gul Nawaz Teaching Hospital (KGNTH), Medical Teaching Institution (MTI) Bannu, Khyber Pakhtunkhwa, Pakistan, from 2 February, 2025 to 2 April , 2025. following approval from the Institutional Ethical and Research Committee, Bannu Medical College (approval no. 36/AssoD(R)&MJ/REC/BMC/24, dated 18 September 2024), and registration of the synopsis with the Research and Training Monitoring Cell, College of Physicians and Surgeons Pakistan (RTMC registration no. MED-2023-343-21811).

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We used the WHO sample size calculator. Taking the previously reported dysphagia frequency of 39.2%[15], a 95% confidence level, and an 8% margin of error, the calculator gave a minimum sample size of 144. Patients were enrolled one after another as they presented — consecutive, non-probability sampling.

We included men and women aged 30–70 years who came in with acute stroke. Acute stroke meant sudden weakness or numbness, trouble speaking, or a severe headache, confirmed on CT scan by hypodense regions, loss of grey-white differentiation, and/or mass effect. We left out anyone with a disturbed conscious level, venous sinus thrombosis, a recent head injury, or advanced liver disease — these can confound or complicate a swallow assessment in ways our design could not account for.

Swallowing was checked at the bedside with a graded water-swallow test, adapted from the Gugging Swallowing Screen[16]. Patients sat upright and were given water by cup and spoon, in steps: 3 mL, 5 mL, 10 mL, 20 mL, and finally 50 mL. If the patient coughed during or right after swallowing, or their oxygen saturation dropped 2% or more from baseline, we called it a positive result — dysphagia present.

Before we touched anyone, we explained the study and took written consent — from the patient directly where possible, or from an attendant if the stroke had affected their speech but not their understanding. We then recorded age, gender, BMI, where they lived, what they did for work, education, income, and social class, plus how long it had been since the stroke started, and whether they smoked, had high blood pressure, or had diabetes. Everything went onto a structured proforma. A consultant with at least five years of post-fellowship experience carried out or directly supervised every swallow assessment.

We entered and analysed the data in IBM SPSS version 21. The Shapiro-Wilk test told us age, stroke duration, and income were not normally distributed, so we report those as median and interquartile range. BMI came close enough to a normal distribution ($p=0.058$) that we report it as mean ± SD. Categorical variables are given as counts and percentages. To see what went with dysphagia, we ran chi-square tests across age group, gender, BMI category, stroke duration, smoking, hypertension, diabetes, residence, occupation, education, and socioeconomic class — switching to Fisher's exact test wherever a cell's expected count fell below 5. We treated $p \leq 0.05$ as significant.

RESULTS

Of the 144 patients enrolled, 79 (54.9%) were male and 65 (45.1%) were female. The mean age was 54.4±10.2 years (range 31–70 years). Ninety-nine patients (68.8%) had hypertension, 47 (32.6%) had diabetes, and 28 (19.4%) were current smokers. Ninety-seven patients (67.4%) resided in rural areas, and 86 (59.7%) were literate. The median duration of stroke at the time of assessment was 11 hours (interquartile range 7–16.5 hours). Baseline characteristics are summarized in Table I.

Table I. Baseline Characteristics of Study Participants (N=144)

Characteristic	n	%
Total patients	144	100.0
Gender - Male	79	54.9
Gender - Female	65	45.1
Age, years - mean ± SD	54.4 ± 10.2	-
BMI, kg/m² - mean ± SD	25.4 ± 3.3	-
Duration of stroke, hours - median (IQR)	11 (7-16.5)	-
Hypertension	99	68.8
Diabetes mellitus	47	32.6

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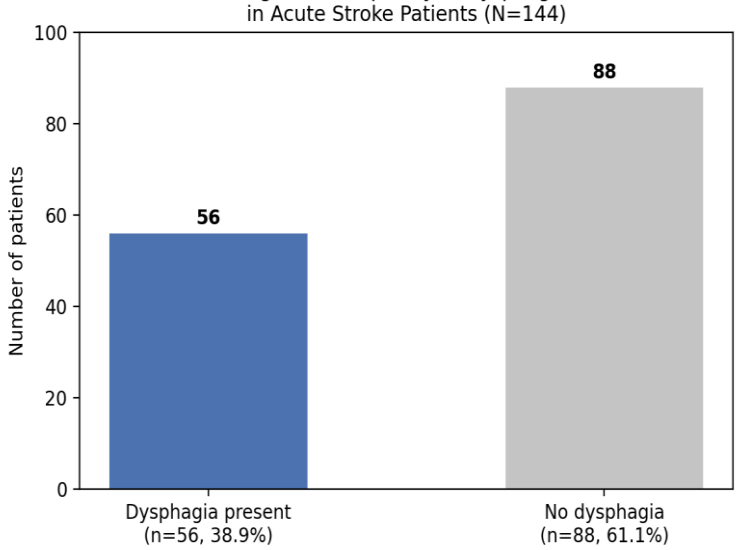
Current smoker	28	19.4
Residence - Rural	97	67.4
Residence - Urban	47	32.6
Literate	86	59.7
Dysphagia present	56	38.9

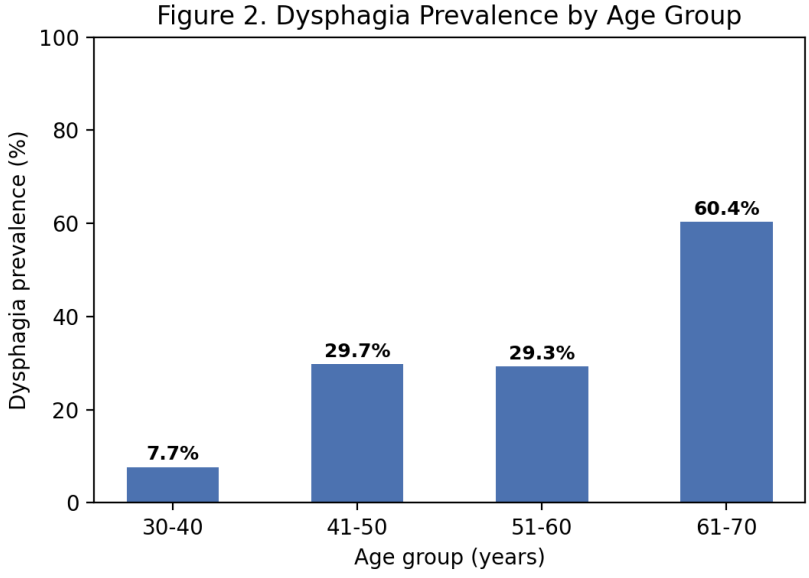
Dysphagia was present in 56 of the 144 patients, a frequency of 38.9% (Figure 1).

Figure 1. Frequency of Dysphagia in Acute Stroke Patients (N=144)



Age was the strongest correlate of dysphagia. Patients with dysphagia were significantly older than those without (58.6±9.0 vs 51.8±10.0 years, p<0.001, independent-samples t-test). When stratified by decade, dysphagia rose from 7.7% (1/13) among patients aged 30–40 years, to 29.7% (11/37) at 41–50 years, 29.3% (12/41) at 51–60 years, and 60.4% (32/53) at 61–70 years (p=0.0003) (Figure 2, Table II).

Figure 2. Dysphagia Prevalence by Age Group



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Dysphagia was significantly more frequent in current smokers than in non-smokers (57.1% vs 34.5%, p=0.046), and varied significantly across occupational groups, being highest among retired patients (60.7%) and lowest among those in the 'other' occupational category (28.0%, p=0.041). Hypertension showed a trend toward association with dysphagia (44.4% among hypertensive patients vs 26.7% among non-hypertensive patients) that did not reach statistical significance (p=0.065). Gender (40.5% in males vs 36.9% in females, p=0.789), body mass index category (p=0.361), stroke duration (p=0.616), diabetes (p=0.124), residence (p=0.777), education status (p=0.169), and socioeconomic background (p=0.935) were not significantly associated with dysphagia. Full stratified results are presented in Table II.

Table II. Association of Dysphagia with Demographic and Clinical Variables (N=144)

Variable	Dysphagia Yes n (%)	Dysphagia No n (%)	Total	p-value*
Gender - Male	32 (40.5)	47 (59.5)	79	0.789
Gender - Female	24 (36.9)	41 (63.1)	65	
Age 30-40 yrs	1 (7.7)	12 (92.3)	13	**0.0003†**
Age 41-50 yrs	11 (29.7)	26 (70.3)	37	
Age 51-60 yrs	12 (29.3)	29 (70.7)	41	
Age 61-70 yrs	32 (60.4)	21 (39.6)	53	
BMI - Underweight	1 (25.0)	3 (75.0)	4	0.361
BMI - Normal	31 (45.6)	37 (54.4)	68	
BMI - Overweight	18 (31.0)	40 (69.0)	58	
BMI - Obese	6 (42.9)	8 (57.1)	14	
Stroke duration ≤6 h	16 (45.7)	19 (54.3)	35	0.616
Stroke duration 7-24 h	31 (37.3)	52 (62.7)	83	
Stroke duration >24 h	9 (34.6)	17 (65.4)	26	
Smoking - Yes	16 (57.1)	12 (42.9)	28	**0.046†**
Smoking - No	40 (34.5)	76 (65.5)	116	
Hypertension - Yes	44 (44.4)	55 (55.6)	99	0.065
Hypertension - No	12 (26.7)	33 (73.3)	45	
Diabetes - Yes	23 (48.9)	24 (51.1)	47	0.124
Diabetes - No	33 (34.0)	64 (66.0)	97	
Residence - Rural	39 (40.2)	58 (59.8)	97	0.777
Residence - Urban	17 (36.2)	30 (63.8)	47	
Profession - Labour	16 (36.4)	28 (63.6)	44	**0.041†**
Profession - Office work	9 (40.9)	13 (59.1)	22	

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Profession - Retired	17 (60.7)	11 (39.3)	28	
Profession - Other	14 (28.0)	36 (72.0)	50	
Education - Illiterate	27 (46.6)	31 (53.4)	58	0.169
Education - Literate	29 (33.7)	57 (66.3)	86	
SES - Lower class	23 (39.0)	36 (61.0)	59	0.935
SES - Middle class	29 (38.2)	47 (61.8)	76	
SES - Upper class	4 (44.4)	5 (55.6)	9	

**Chi-square test; Fisher's exact test applied where expected cell count <5. †p≤0.05, statistically significant.*

DISCUSSION

Just under two in five patients in our cohort — 38.9% — had dysphagia after an acute stroke. That number sits comfortably inside the range that international guidelines report (29–81%)[8,9], is close to the 42% pooled figure from a large 2022 meta-analysis[11], and is almost the same as the 39.2% we borrowed from an Egyptian hospital study to plan our sample size in the first place.[15] Three separate sources — a single-country study, a multinational pooled analysis, and now our own patients — land on roughly the same number. That kind of agreement makes us fairly confident that our result reflects something real, not a quirk of a small or unusual sample.

Age was, by far, the strongest signal in our data. Dysphagia went from 7.7% in patients in their thirties to 60.4% in patients in their sixties (p=0.0003). This fits what is already known about swallowing and ageing. Even a healthy older person swallows more slowly and less safely than a younger one — weaker throat muscles, slower protective reflexes.[12] A stroke on top of that has far less reserve to draw on. Age keeps turning up as one of the most reliable predictors of post-stroke dysphagia across the literature we read, and our own numbers reproduce that pattern almost exactly.

Two of our findings do not line up as neatly with the wider literature, and we think it is more honest to say so than to force them into a tidy story. First, we found no real difference in dysphagia between men and women (40.5% vs 36.9%, p=0.789). The 2022 meta-analysis, working from a much larger pool of patients, found women were at higher risk and men at lower risk.[11] We suspect this is simply a sample-size problem — 144 patients cannot reliably detect an effect that only shows up clearly across 26,000. Second, diabetes was not significantly linked to dysphagia here either (48.9% vs 34.0%, p=0.124), again against the same meta-analysis, which found diabetes to be a modest but real risk factor.[11] Both times, our numbers moved in the expected direction — just not far enough, with our sample, to cross the line into statistical significance.

The link we found between smoking and dysphagia (57.1% vs 34.5%, p=0.046) deserves a cautious read too. Smoking is a well-established risk factor for stroke itself[4], but it is not a factor that keeps showing up as an independent predictor of dysphagia once a stroke has already happened — the meta-analysis we relied on most does not list it among its significant predictors.[11] One earlier Pakistani study did find a link between smoking history and post-stroke dysphagia, similar to ours[13], so this may be a genuine pattern in South Asian populations rather than noise, though we cannot be certain. It is also possible smoking here is simply a marker of heavier underlying vascular disease rather than a direct cause of swallowing trouble. We did not score stroke severity or measure lesion size, so we cannot separate a direct effect from this kind of confounding. We would call this finding worth exploring further, not proven.

Occupation also came out significant, dysphagia was highest among retired patients (60.7%). We think this is really just age wearing a different hat: in our setting, retirement tracks closely with being older, and age was already the strongest factor in this dataset. We did not run a multivariable model to formally separate the two, so we are not presenting occupation as an

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independent risk factor — it is listed as a limitation below instead.

Stroke duration was not linked to dysphagia (p=0.616), which makes physiological sense — the swallowing problem comes from the stroke itself, not from how many hours have passed since it happened, at least within the roughly 24-hour window most of our patients were assessed in.[9] BMI (p=0.361) and socioeconomic background (p=0.935) were not linked either, which is not surprising, since neither has a clear biological reason to affect swallowing after an acute stroke.

Why does any of this matter practically? Dysphagia that goes unnoticed is what leads to aspiration pneumonia[17], and a formal bedside screen — even a simple one like ours — measurably cuts that risk by catching unsafe swallowing before a patient is fed.[17] A systematic review of stroke-associated pneumonia found dysphagia to be one of the most consistent and strongest risk factors identified across dozens of studies.[18] The damage is not only physical, either — dysphagia has been linked to greater overall disability even after minor strokes, not just severe ones.[19] Given how high our own frequency turned out to be, particularly in older patients, we think the case for making bedside screening routine here is a strong one.

A few limitations are worth being upfront about. This was a single-hospital, cross-sectional study using convenience-style consecutive sampling, so we cannot claim our numbers apply everywhere, and we cannot claim cause and effect — only association. We excluded patients with a disturbed conscious level, and this group is usually at the highest risk of dysphagia, so our 38.9% is probably an underestimate of the true burden across all stroke severities. We used a bedside water-swallow test, not an instrumental test like videofluoroscopy or fibreoptic endoscopy; bedside testing is standard for first-line screening and is what most stroke units can realistically do, but it can miss silent aspiration that only shows up on imaging.[9] We also did not record stroke subtype (ischaemic vs haemorrhagic) or a formal severity score such as the NIHSS, both of which are known to affect dysphagia risk and would have let us explain our findings more completely. Cardiovascular risk factors of the kind we recorded — hypertension, diabetes, smoking — are already common across Pakistani stroke cohorts more broadly[20], which makes untangling their individual contribution to dysphagia even harder without a larger sample and formal adjustment. Lastly, every association here is a simple two-way comparison. We did not adjust for overlap between variables — age, retirement, and hypertension almost certainly move together in our data — so a proper multivariable analysis would sharpen these findings considerably.

CONCLUSION

Almost two in five patients with acute stroke in our cohort had dysphagia — a number that matches what other regional and international studies have found. Age mattered more than anything else: dysphagia was seven times more common in our oldest patients than in our youngest. Smoking and occupation also stood out as significant, though we would treat both with some caution given our design and the likely overlap with age. What this tells us, practically, is that every acute stroke patient walking into our ward — especially anyone over 60 — should have their swallowing checked at the bedside before they are given anything by mouth. Larger, multi-centre studies that record stroke severity and subtype, and that can properly adjust for overlapping risk factors, would take this further and help shape screening policy across the region.

PATIENT'S CONSENT

Written informed consent was obtained from all patients, or from an attendant where the patient's communication was impaired by stroke but consciousness was preserved, prior to enrolment.

ETHICAL APPROVAL

The study was approved by the Institutional Ethical and Research Committee, Bannu Medical College, Bannu (Approval No. 36/AssoD(R)&MJ/REC/BMC/24, dated 18 September 2024), and the synopsis was reviewed and registered by the Research and Training Monitoring Cell, College of Physicians and Surgeons Pakistan (RTMC No. MED-2023-343-21811).

COMPETING INTEREST

The authors declared no conflict of interest.

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AUTHORS' CONTRIBUTION

MHK: Conception, data collection, data analysis, manuscript drafting, and final approval. AR: Study supervision, critical revision of the manuscript for important intellectual content, and final approval. Both authors approved the final version of the manuscript and take responsibility for the integrity of the work.

REFERENCES

Murphy SJX, Werring DJ. Stroke: causes and clinical features. Medicine (Abingdon). 2020;48(9):561–566. doi:10.1016/j.mpmed.2020.06.002

Montaño A, Hanley DF, Hemphill JC 3rd. Hemorrhagic stroke. Handb Clin Neurol. 2021;176:229–248. doi:10.1016/B978-0-444-64034-5.00019-5

Katan M, Luft A. Global burden of stroke. Semin Neurol. 2018;38(2):208–211. doi:10.1055/s-0038-1649503

Boehme AK, Esenwa C, Elkind MSV. Stroke risk factors, genetics, and prevention. Circ Res. 2017;120(3):472–495. doi:10.1161/CIRCRESAHA.116.308398

Chao BH, Yan F, Hua Y, Liu JM, Yang Y, Ji XM, et al. Stroke prevention and control system in China: CSPPC-Stroke Program. Int J Stroke. 2021;16(3):265–272. doi:10.1177/1747493020913557

Akinyemi RO, Ovbiagele B, Adeniji OA, Sarfo FS, Abd-Allah F, Adoukonou T, et al. Stroke in Africa: profile, progress, prospects and priorities. Nat Rev Neurol. 2021;17(10):634–656. doi:10.1038/s41582-021-00542-4

Kamal AK, Itrat A, Murtaza M, Khan MU, Rasheed A, Ahmed B, et al. The burden of stroke and transient ischemic attack in Pakistan: a community-based prevalence study. BMC Neurol. 2009;9:58. doi:10.1186/1471-2377-9-58

Jones CA, Colletti CM, Ding MC. Post-stroke dysphagia: recent insights and unanswered questions. Curr Neurol Neurosci Rep. 2020;20(12):61. doi:10.1007/s11910-020-01081-z

Dziewas R, Michou E, Trapl-Grundschober M, Lal A, Arsava EM, Bath PM, et al. European Stroke Organisation and European Society for Swallowing Disorders guideline for the diagnosis and treatment of post-stroke dysphagia. Eur Stroke J. 2021;6(3):LXXXIX–CXV. doi:10.1177/23969873211039721

Marin S, Serra-Prat M, Ortega O, Audouard Fericgla M, Valls J, Palomera E, et al. Healthcare costs of post-stroke oropharyngeal dysphagia and its complications: malnutrition and respiratory infections. Eur J Neurol. 2021;28(11):3670–3681. doi:10.1111/ene.14998

Banda KJ, Chu H, Kang XL, Liu D, Pien LC, Jen HJ, et al. Prevalence of dysphagia and risk of pneumonia and mortality in acute stroke patients: a meta-analysis. BMC Geriatr. 2022;22(1):420. doi:10.1186/s12877-022-02960-5

Feng HY, Zhang PP, Wang XW. Presbyphagia: dysphagia in the elderly. World J Clin Cases. 2023;11(11):2363–2373. doi:10.12998/wjcc.v11.i11.2363

Ehsaan F, Khan MSG, Malik SN, Kanwal S. Frequency of post-stroke dysphagia in Pakistan: a hospital based study. J Pak Med Assoc. 2016;66(10):1281–1285. PMID:27686304

Ehsaan F, Mumtaz N, Saqulain G. Post-stroke swallowing and communication complications: prevalence and association with comorbid conditions and risk factors. J Pak Med Assoc. 2023;73(8):1700–1702. doi:10.47391/JPMA.7596

Khedr EM, Abbass MA, Soliman RK, Zaki AF, Gamea A. Post-stroke dysphagia: frequency, risk factors, and topographic representation: hospital-based study. Egypt J Neurol Psychiatr Neurosurg. 2021;57:23. doi:10.1186/s41983-021-00281-9

Frontier in Medical & Health Research

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Trapl M, Enderle P, Nowotny M, Teuschl Y, Matz K, Dachenhausen A, et al. Dysphagia bedside screening for acute-stroke patients: the Gugging Swallowing Screen. Stroke. 2007;38(11):2948–2952. doi:10.1161/STROKEAHA.107.483933

Lakshminarayan K, Tsai AW, Tong X, Vazquez G, Peacock JM, George MG, et al. Utility of dysphagia screening results in predicting poststroke pneumonia. Stroke. 2010;41(12):2849–2854. doi:10.1161/STROKEAHA.110.597039

Eltringham SA, Kilner K, Gee M, Sage K, Bray BD, Smith CJ, et al. Factors associated with risk of stroke-associated pneumonia in patients with dysphagia: a systematic review. Dysphagia. 2020;35(5):735–744. doi:10.1007/s00455-019-10061-6

Sreedharan SE, Sayed JV, Vipina VP, Mohan MP, Paul R, Sylaja PN. Dysphagia and disability in minor strokes — an institutional study. J Stroke Cerebrovasc Dis. 2020;29(9):105070. doi:10.1016/j.jstrokecerebrovasdis.2020.105070

Khan RSU, Nawaz M, Khan S, Raza HA, Nazir T, Anwar MS, et al. Prevalence of dyslipidemia in ischemic stroke patients: a single-center prospective study from Pakistan. Cureus. 2022;14(6):e25880. doi:10.7759/cureus.25880