Original Article

Access this article online

Quick Response Code:

Website: www.jehp.net

DOI: 10.4103/jehp.jehp_1704_23

Prevalence, severity, and predictors of dysphagia among patients with acute stroke in Oman

Raya Said Al-Mamari, Eilean Rathinasamy Lazarus[1], Maryam Al-Harrasi[1], Huda Al-Noumani[1], Omar Al Zaabi[1]

Abstract:

BACKGROUND: Up to 80% of stroke patients suffer from dysphagia. It is associated with increased morbidity, mortality, and healthcare costs due to aspiration, pneumonia, and malnutrition, which represent a significant burden to stroke survivors, their relatives, and the healthcare system. Early recognition and management of post-stroke dysphagia is key to reducing its complications and enhancing patients' quality of life. Despite the importance of dysphagia following a stroke and its adverse consequences, no study has investigated dysphagia after stroke in Oman. This study was conducted to estimate the prevalence of post-stroke dysphagia and its severity among acute stroke patients, assess the association between the selected factors and dysphagia, and identify dysphagia predictors.

MATERIALS AND METHOD: A cross-sectional descriptive study design was utilized to identify the prevalence and risk factors for post-stroke dysphagia among acute stroke patients (n = 274) admitted to two Omani tertiary hospitals over 6 months. Dysphagia was assessed using the Gugging swallowing screen. Descriptive analysis, correlations, and regression analysis were computed.

RESULTS: The prevalence of dysphagia following stroke was 70.1%. Among those who had dysphagia, 37.5% had severe, 31.25% moderate, and 31.25% mild dysphagia. Aging, obesity, having a medical co-morbidity, hypertension, stroke location, low Glasgow Coma Scale (GCS) score, and the use of thrombectomy or thrombolysis therapy were contributing factors and were found to be correlated with post-stroke dysphagia. This study revealed that old age [odds ratio (OR) = 0.961, 95% confidence interval (CI): 0.933–0.989, *P* = 0.007)], obesity (OR = 0.387, 95% CI: 0.157–0.952, *P* = 0.039), and low GCS score (OR = 0.027, 95% CI: 0.009–0.077, p=<0.001) were predictors of dysphagia after stroke.

CONCLUSION: Post-stroke dysphagia is more common among acute stroke patients. There are various risk factors correlated with dysphagia following a stroke. Therefore, dysphagia predictors should be considered when designing dysphagia prevention strategies to reduce its adverse consequences. Recognition of such predictors may help with the early detection and treatment of dysphagic patients and the implementation of preventive approaches.

Keywords:

Dysphagia, Oman, predictors, prevalence, severity, stroke

Stroke Unit, Khoula Hospital, Muscat, Oman, [1]Adult Health and Critical Care Department, Sultan Qaboos University, College of Nursing, Muscat, Oman

Address for correspondence:
Dr. Eilean Rathinasamy Lazarus, Adult Health and Critical Care Department, Sultan Qaboos University, College of Nursing, Muscat, Oman.
E-mail: eileansrmc@gmail.com

Received: 23-10-2023
Accepted: 22-01-2024
Published: 28-09-2024

Introduction

Dysphagia post-stroke is the most common and significant neuromuscular disorder, especially with massive stroke.[1-3] It can be defined as difficulty in swallowing food or liquids transiting from the oral cavity to the pharynx onward to the esophagus.[4] Losurdo *et al*.[5] (2018 identified that dysphagia develops in 38.5% of the stroke population. Although the prevalence of dysphagia following stroke varies from 19% to 81%, it depends on the study population, methodology,

How to cite this article: Al-Mamari RS, Lazarus ER, Al-Harrasi M, Al-Noumani H, Al Zaabi O. Prevalence, severity, and predictors of dysphagia among patients with acute stroke in Oman. J Edu Health Promot 2024;13:351.

and inclusion criteria. It has been shown that stroke patients with dysphagia are up to 11 times more likely to develop aspiration and/or aspiration pneumonia than non-dysphagic patients.[6,7] Post-stroke dysphagia, therefore, is an independent prognosticator of a prolonged recovery period, poor quality of life, and negative clinical outcome.[3,8-10] Hence, early assessment and recognition of dysphagia is recommended.

Many recent studies revealed that formal dysphagia screening reduces the incidence of stroke-related pneumonia, which may ultimately improve quality of life and cost savings and lower mortality rates.[3,9,11,12] This might be ensured by using numerous screening tools to detect dysphagia, for example, the Gugging swallowing screen (GUSS) as a simple bedside swallowing assessment.[10] Furthermore, there are many factors associated with dysphagia in stroke. According to Benfield and Michou (2016),[13] a range of factors may be related to dysphagia, such as the patient's physical characteristics (e.g. age, severity of stroke, and location of stroke). In addition, there are accompanying medical co-morbidities associated with dysphagia, such as diabetes mellitus (DM) and hypertension (HTN).[2]

According to the Ministry of Health (2021), the Omani health research priority report, stroke has been the eighth priority for research in Oman. An approximate estimation of dysphagia prevalence post-stroke and its contributing factors will critically evaluate the benefits of dysphagia screening and interventions to prevent further life-threatening consequences.[2,14] Although it is an important topic to study, to the best of our knowledge, there is no distinct study about dysphagia prevalence, its associated factors, and clinical outcome performed in Oman. For that reason, this research in Oman can be used in the future as evidence to carry out effective measures and/or modify some protocols to reduce the burden of dysphagia in stroke. It will best prepare the healthcare team and caregivers to plan essential clinical facilities and develop a government-based rehab center reinforced with efficient rehabilitation interventions. This would positively result in enhanced stroke patients' clinical outcomes and quality of life, which will eventually improve the productivity and cost-effectiveness of the local healthcare institutions. In addition, this will re-assure all healthcare workers of the required bedside swallowing assessment training. Certainly, this research will meet the Oman Ministry of Health goals and provide a baseline for future studies.

Many aspects of this research are groundbreaking. As the first comprehensive study on dysphagia prevalence, related variables, and clinical outcomes in stroke patients in Oman, it is unique. It addresses the Ministry of Health's 2021 healthcare priorities, demonstrating its relevance to Omani healthcare needs and ambitions. This study might also influence Oman's healthcare policy and practice by providing evidence-based dysphagia screening and therapeutic guidelines. The lack of dysphagia data in Oman highlights the need for this research to bridge a knowledge gap and better understand stroke patients' issues. As a fundamental resource, this research allows for additional research, longitudinal studies, and treatments, expanding knowledge and improving Omani stroke patient outcomes.

Materials and Methods

Study design and setting

A cross-sectional descriptive study design was used to (1) estimate the prevalence of post-stroke dysphagia and its severity in selected hospitals in Oman, (2) assess the association between the selected variables and dysphagia following a stroke, and (3) examine the extent of the selected factors predicting dysphagia among acute stroke patients in Oman. The research was conducted in the stroke unit of two tertiary hospitals.

Study participants and instrument

Study participants were acute stroke patients (either ischemic or hemorrhagic) who were admitted from June 2, 2021 until November 21, 2021. The data collection procedure in this study involved the use of four valid tools, including the clinical data, which were extracted from the hospital information system. The Glasgow Coma Scale (GCS), Gugging Swallowing Screen (GUSS) dysphagia screening tool, and Charlson Comorbidity Index (CCI) were used for the eligible admitted patients with acute stroke.

Data collection procedure

The researcher followed the newly admitted stroke patients to the department and checked whether the inclusion criteria were met. The investigator introduced herself to the admitted stroke patients and their families and explained the study purpose and dysphagia screening procedure. While talking to the patient, the GCS was assessed to check the patient's level of consciousness. An information sheet was given at the same time to the patients and/or to their family member regarding the nature of the study, and sufficient time was also provided to think about the participation role. Then, if the stroke patient agreed to participate in the study, informed consent was obtained. After consenting, the eligible acute stroke patients were assessed for the presence of dysphagia within 24–72 hours of admission using the GUSS. The stroke patients were monitored and assessed until 72 hours multiple times by a speech and language therapist, and patients were counted as dysphagic at any point up to 72 hours. If the record confirmed dysphagia, the investigator added the

dysphagics patient in the prevalence list. Then, the Charlson Comorbidity Index, presence of the selected factors, and patient demographic data were retrieved from the records and/or interviewed.

Data analysis

Several steps were carried out in this study for data management and analysis, including data cleaning, verification, and descriptive and inferential analysis using the 'IBM SPSS Statistics 23' Statistical Packages for Social Sciences (SPSS) version 23 software program. A Chi-square test was performed for dichotomous variables, and Fisher's exact test was computed for cells that scored less than 5 points. The independent *t*-test was computed to assess the relationship between the dependent variable (post-stroke dysphagia) with two categories and independent continuous variables such as age. Binary logistic regression was processed to describe the predictors of dysphagia after an acute stroke.

Ethical approval and consent to participate

This study was conducted after obtaining ethical approval from the Research and Ethics Committee of the College of Nursing at Sultan Qaboos University (CON/MSN/2021/1); Medical Research Ethics Committee, College of Medicine, and Health Sciences at Sultan Qaboos University (SQU-EC/392/2021 MREC #2413); and the Research and Ethical Review and Approve Committee, Ministry of Health, Oman (SRC#20/24410).

Result

Table 1 summarizes key characteristics of 274 study participants. It provides insights into the prevalence and severity of dysphagia, with 192 (70.1%) experiencing dysphagia. Participants' ages range from 20 to 98 years, with a mean age of 61.14. Most participants are Omani, 241 (88%), and predominantly male 170 (62%). Approximately 96 (35%) of participants have a history of previous stroke. The Charlson Comorbidity Index averages 2.58, and co-morbidities include hypertension, 197 (71.9%), and diabetes mellitus, 160 (58.4%). A subset of participants smokes, 70 (25.5%), drinks alcohol, 24 (8.8%), and is obese, 73 (26.6%). The majority have an ischemic type of stroke, 224 (81.8%), with varying stroke locations [right hemisphere 99 (36.1%), left hemisphere 112 (40.8%), bilateral 32 (11.6%), brainstem 31 (11.3%)]. GCS scores vary, with 116 (42.3%) scoring 15/15. Thrombolysis/thrombectomy was performed in 41 (14.9%) of cases, and hemorrhagic transformation occurred in 26 (9.5%) of participants. This table offers a succinct overview of participant characteristics and health factors in the study.

In Table 2, the study's findings regarding post-stroke dysphagia and its associations with various risk factors are summarized. Notable points include the lack of a significant gender-based difference in dysphagia, while a history of previous stroke was associated with a higher prevalence. Lower GCS scores were significantly linked to higher rates of dysphagia. Co-morbidities, particularly hypertension (HTN), were significantly associated with increased dysphagia rates. Various medical conditions and lifestyle factors showed variable associations with dysphagia, though not all were statistically significant. The type and location of the stroke were important, with right hemisphere, left hemisphere, bilateral, and brainstem locations showing significant links to dysphagia. Furthermore, thrombolysis or thrombectomy was significantly associated with dysphagia, while the presence of hemorrhagic transformation was not significantly related. These findings contribute valuable insights into the factors influencing post-stroke dysphagia in this study.

Table 3 summarizes the associations between post-stroke dysphagia and two key variables: age and the Charlson Comorbidity Index in a study involving 274 participants. The table shows that both age and the Charlson Comorbidity Index have a highly significant relationship with post-stroke dysphagia, with *P* values less than 0.001. These findings underscore the importance of these variables in understanding and assessing post-stroke dysphagia in the study.

Table 4 summarizes the predictors of post-stroke dysphagia in the study. Age significantly impacts post-stroke dysphagia, with higher age associated with reduced odds of dysphagia ($P = 0.007$). Medical co-morbidities and HTN show no significant impact. Obesity significantly reduces the odds of post-stroke dysphagia ($P = 0.039$). tPA/thrombectomy does not significantly influence dysphagia. The GCS has a strong impact on post-stroke dysphagia, with higher GCS scores significantly reducing the odds of dysphagia ($P < 0.001$). The Charlson Comorbidity Index does not significantly affect dysphagia. Stroke location has varying associations, with unilateral stroke showing marginal significance and bilateral and brainstem strokes showing no significant impact. These results shed light on the key factors influencing post-stroke dysphagia in the study, including age, obesity, GCS, and stroke location.

Discussion

This study revealed that the prevalence of post-stroke dysphagia was 70.1%. We found significant relationships (at the bivariate level) between age, obesity, having a history of medical co-morbidity, stroke location, level of GCS, use of thrombolysis/thrombectomy, and post-stroke dysphagia. Furthermore, old age, obesity, and low GCS score were predictors of post-stroke dysphagia.

Table 1: Characteristics of the study participants (*n*=274)

Characteristics	Category	*n* (%)	*M*	*SD*	Min-Max
Prevalence and severity of dysphagia	Dysphagic	192 (70.1)			
	Severely dysphagic	72 (37.5)			
	Moderately dysphagic	60 (31.25)			
	Mildly dysphagic	60 (31.25)			
	Non-dysphagic	82 (29.9)			
Age (Years)			61.14	14.831	20-98
Nationality	Omani	241 (88)			
	Non-Omani	33 (12)			
Gender	Male	170 (62)			
	Female	104 (38)			
H/O previous stroke	Yes	96 (35)			
	No	178 (65)			
Charlson Comorbidity Index			2.5803	1.56511	0-7
Comorbidities	None	25 (10.1)			
	HTN	197 (71.9)			
	DM	160 (58.4)			
	DLP	81 (29.6)			
	AF	18 (6.6)			
	HF	20 (7.3)			
	IHD	55 (20.1)			
	CKD/ESRD	31 (11.3)			
Smoking	Yes	70 (25.5)			
	No	204 (74.5)			
Alcoholism	Yes	24 (8.8)			
	No	250 (91.2)			
Obesity	Yes	73 (26.6)			
	No	201 (73.4)			
Type of stroke	Ischemic	224 (81.8)			
	Hemorrhagic	50 (18.2)			
Stroke location	Right hemisphere	99 (36.1)			
	Left hemisphere	112 (40.8)			
	Bilateral	32 (11.6)			
	Brainstem	31 (11.3)			
GCS	15/15	116 (42.3)			
	14/15	70 (25.5)			
	13/15	63 (23)			
	12/15	25 (9.1)			
thrombolysis/thrombectomy	Yes	41 (14.9)			
	No	233 (85)			
Hemorrhagic transformation	Yes	26 (9.5)			

SD=Standard deviation, Min=Lower limit, Max=Upper limit

The prevalence of this study is considered high compared to previous international studies that might be related to the time of screening (some screened within 24 hours and other after 24 hours). Some stroke patients presented very late to the emergency department (after 24–72 hours of stroke onset). We excluded transient ischemic attack and cerebral venous thrombosis patients and involved many severe-moderate cases of stroke (as referral cases from other hospitals). We also excluded patients who had a GCS score of 13 and below and who did not follow simple verbal commands because patients must be alert and able to follow the examiner instruction during dysphagia screening. All stroke patients underwent systematic dysphagia screening and used just one clinical tool without any instrumental examination (such as video fluoroscopic swallowing study) to confirm dysphagia, which in turn may have over-estimated the true prevalence of post-stroke dysphagia.

We found that old age was an independent risk factor for dysphagia following a stroke. The current study also reported that the mean age of dysphagic patients (in both types of strokes) was higher than the mean age of non-dysphagic patients, which was consistent with the results of other studies.[2,15,16] The reason behind this could be that aging is associated with a decline in

Table 2: Association between risk factors and poststroke dysphagia (*n*=274)

Variables	Category	Dysphagia		Chi-Square/Fisher's Exact	
		Yes *n* (%)	No *n* (%)	χ^2/*F*	*P*
Gender	Male	120 (43.8)	48 (18.2)	0.359	0.549
	Female	72 (26.3)	34 (11.7)		
H/O previous stroke	Yes	73 (27.4)	23 (7.7)	3.514	0.061
	No	119 (42.7)	59 (22.3)		
GCS	15/15	91 (33.2)	25 (9.1)	10.351	0.016
	14/15	42 (15.3)	28 (10.2)		
	13/15	39 (14.2)	24 (8.8)		
	12/15	19 (7.3)	6 (1.8)		
Comorbidities	None Yes	9 (3.3)	16 (5.8)	12.285	<0.01
	No	183 (66.8)	66 (24.1)		
	HTN Yes	147 (53.6)	50 (18.2)	8.379	0.004
	No	45 (16.4)	32 (11.7)		
	DM Yes	118 (43.1)	42 (15.3)	1.438	0.231
	No	74 (27.0)	40 (14.6)		
	DLP Yes	61 (23)	20 (6.6)	2.614	0.106
	No	131 (47.1)	61 (23.4)		
	AF Yes	15 (5.5)	3 (1.1)		0.289*
	No	177 (64.6)	79 (28.8)		
	HF Yes	17 (6.2)	3 (1.1)		0.203*
	No	175 (63.9)	79 (28.8)		
	IHD Yes	42 (16.1)	13 (4)	3.135	0.077
	No	150 (54)	69 (25.9)		
	CKD/ESRD Yes	22 (8)	9 (3.3)	0.029	0.864
	No	170 (62)	73 (26.6)		
Smoking	Yes	51 (18.6)	19 (6.9)	2.808	0.094
	No	141 (51.5)	63 (23)		
Alcoholism	Yes	20 (7.3)	4 (1.5)	1.608	0.166*
	No	172 (62.8)	78 (28.5)		
Obesity	Yes	60 (20.8)	13 (5.8)	4.895	0.027
	No	132 (49.3)	69 (24.1)		
Type of stroke	Ischemic	154 (56.2)	70 (25.5)	0.426	0.514
	Hemorrhagic	38 (13.9)	12 (4.4)		
Stroke location	Right	52 (19.0)	47 (17.2)	22.030	<0.01*
	Left	88 (32.1)	24 (8.8)		
	Bilateral	26 (9.5)	6 (2.2)		
	Brainstem	26 (9.5)	5 (1.8)		
Thrombolysis/thrombectomy	Yes	35 (12.4)	6 (2.6)	11.597	<0.01
	No	157 (57.7)	76 (27.4)		
Hemorrhagic transformation	Yes	21 (7.7)	5 (1.8)		0.264*
	No	171 (62.4)	77 (28.1)		

H/O=History of, χ^2=Chi-square value, *F=Fisher's exact value, *P*=Significance level

Table 3: Association between risk factors and poststroke dysphagia (*n*=274)

Variables	Post-stroke dysphagia (independent *t*-test)	*P*
Age	4.447	<0.001
Charlson Comorbidity Index	18.580	<0.001

Association is significant at the 0.001 level (2-tailed)

swallowing function, which might be triggered by a reduction in mucosa sensation and muscle tone, reduced saliva production, and loss of elasticity of the connective tissue.[16] Additionally, with advancement in age, co-morbidities increase, which also predisposes stroke patients to dysphagia. Therefore, old age is a predictor of post-stroke dysphagia.

Another significant result from our study was that dysphagic stroke patients were predisposed to lower GCS scores than non-dysphagic patients. This result was consistent with previous studies.[2,14,17-19] For example, Ebrahimian Dehaghani *et al*.[17] (2019) disclosed that dysphagic stroke patients who were not oriented had more aspirations than those who were oriented. Similarly, stroke patients with dysphagia tend to have weaker gag and cough reflexes compared to non-dysphagics.[7,20]

Table 4: Predictors of poststroke dysphagia

Variables	B	SE	Wald	*P*	Exp(B)	95% C.I	
						Lower	Upper
Age	0.040	0.015	7.358	0.007	0.961	0.933	0.989
Medical comorbidities	0.640	0.807	0.629	0.428	1.896	0.390	9.222
HTN	0.008	0.476	0.00	0.986	1.008	0.396	2.565
Obesity	0.950	0.460	4.275	0.039	0.387	0.157	0.952
tPA/thrombectomy	0.244	0.671	0.132	0.717	1.276	0.342	4.756
GCS	3.533	0.534	43.789	<0.001	0.029	0.010	0.083
Charlson Comorbidity Index	-0.017	0.027	0.417	0.518	0.983	0.933	1.036
Stroke location:							
Unilateral stroke [reference to right]	-2.385	1.270	3.526	0.060	0.092	0.008	1.110
Bilateral stroke [reference to right]	-1.612	1.281	1.583	0.208	0.200	0.016	2.457
Brainstem stroke [reference to right]	-0.184	1.241	0.022	0.882	0.832	0.073	9.476

Dependent Variable—poststroke dysphagia

Hence, a reduced level of consciousness, cough, and gag reflexes affect normal swallowing function, which may cause aspiration and related consequences.

Similar to GCS level, this study revealed that obesity was significantly associated with dysphagia following a stroke since obese stroke patients were more prone to develop dysphagia than non-dysphagics. Losurdo *et al*. (2018)[5] found that there was a significant relationship between obesity and dysphagia post-stroke. This indicates that obesity is associated with the development of post-stroke dysphagia. Our result, however, was inconsistent with previous studies,[16,21] which reported that there was no correlation between post-stroke dysphagia and obesity. The most likely reason for this disagreement can be due to population differences. A newly launched book about "Obesity in Oman" by MOH (2021) disclosed that 30% of the Omani population having a body mass index (BMI) of more than 30 and more than ½ of the population are currently overweight or obese, especially among women.[22] In addition, individuals living with obesity are at higher risk of developing cardiovascular diseases including stroke and have a significantly increased risk of premature death as well.[22] The reason behind this association is not yet clear, but da Silva *et al.* (2020 recently found that temporal muscle thickness was an independent risk factor for post-stroke dysphagia among acute stroke patients and that skeletal muscle loss caused by increased thickness can secondarily cause dysphagia in such a population.[23]

Nevertheless, at the bivariate level, our study discovered that post-stroke dysphagia was significantly associated with the presence of some medical co-morbidities (HTN), the Charlson Comorbidity Index, the use of thrombolysis/thrombectomy, and stroke location. Although when these variables were controlled, it was not significant. First, a high score on the Charlson Comorbidity Index was drastically correlated with dysphagia after stroke. This was in agreement with a study performed by Rofes *et al*. (2018)[2] and da Silva *et al*. (2020).[23] However, the Finniss *et al*. (2021)[24] result was inconsistent with this study finding as they found that stroke patients with dysphagia did not have a high Charlson Comorbidity Index or the use of thrombolysis therapy and/or thrombectomy was not associated with dysphagia. In addition, the current study demonstrated that most stroke patients who were not diagnosed with any medical co-morbidity were non-dysphagic. This was consistent with a descriptive exploratory study done by Warda *et al*. (2018) in Egypt to explore post-stroke dysphagia-related health consequences among 70 dysphagic patients with acute stroke. The authors discovered that only seven patients (10%) were not known to have any medical co-morbidity, whereas HTN and DM were more common diseases in almost half 33 (47.1%) of the dysphagic population.[25] It is clear by now that stroke patients who had a history of medical co-morbidities are more prone to have dysphagia. Our study also showed that dysphagia after stroke was more prevalent in patients with HTN significantly associated but had weak association with IHD and HF. This result agreed with the following studies[14,16]; however, Losurdo *et al*. (2017)[5] and Kongsawasdi *et al*. (2019)[19] did not find any relationship between HTN and dysphagia post-stroke. A strong association was also found by Rofes *et al*. (2018)[2] between heart disease patients and dysphagia after stroke, which to some extent is in line with our finding but with weak relationship.

Similarly, the use of thrombolysis/thrombectomy was higher as well in patients with post-stroke dysphagia. In other words, those ischemic stroke patients who were thrombolyzed were more prone to develop dysphagia, which was similar to other studies.[26-28] Pedra *et al*. (2020),[28] for example, conducted a retrospective study of 94 acute stroke patients and found a significantly higher prevalence of dysphagia in the thrombolyzed group than in the non-thrombolyzed patients. The authors also noticed that dysphagic patients who were

thrombolyzed were more likely to develop hemorrhagic transformation, which was consistent with the current study findings. Thrombolysis therapy (the only drug that is administered up to 4.5 hours post-acute ischemic stroke) proposes clot rupture in the cerebral artery by the process of fibrinolysis, which improves blood flow in the affected area.[28] It demonstrates, therefore, a consequent recovery of dysphagia, a decrease in length of hospitalization, and reduced mortality and functional disability of the affected stroke survivors.[26,27] However, we did not verify the thrombolysis/thrombectomy response because we did not examine the severity of stroke. Additionally, the thrombolyzed patients showed worse neurological complications, including dysphagia and functional dependence, than those without thrombolysis.

The present study showed a significant statistical relationship between stroke location and dysphagia after stroke. This study described that post-stroke dysphagia is commonly present in patients with brainstem lesions and left-side and bilateral hemisphere strokes, which is in line with several study results.[16,17,29] Some researchers, however, have specified that right cerebral hemisphere stroke causes dysphagia.[30] Others believe that left-side stroke lesions produce dysphagia.[2] The third group of authors supported the hypothesis that brainstem stroke leads to dysphagia.[16,17] Nevertheless, the majority of studies show weak or no association between stroke location and post-stroke dysphagia.[2,16,21,30,31]

Implications for practice

Considering the high prevalence of dysphagia among acute stroke patients in Oman, dysphagia assessment should be a standard of care to detect positive cases to prevent its complications to improve quality of care delivered in the local hospitals. Routine screening for post-stroke dysphagia using a valid and reliable tool is an effective strategy recommended by Goyal *et al*. (2020).[32] The current study results might be the baseline data for future preventive programs in Oman through implementing a dysphagia screening tool for early identification and management. In this study, predictors of dysphagia were identified that can help in planning a prediction model along with an effective and applicable screening tool (such as the GUSS) that could be used to identify dysphagic stroke patients. Early dysphagia detection in high-risk stroke patients can help healthcare workers implement preventive approaches. Due to the complexity of this disorder, multi-disciplinary team collaboration is essential to prevent dysphagia complications and initiation of a dysphagia team is recommended.

Limitation and recommendation

This is the first study reporting the prevalence of dysphagia post-stroke among acute stroke patients in Oman. Collecting patient data regarding the risk factors helped to describe the relationship between risk factors and the occurrence of post-stroke dysphagia. In addition, the study was conducted in two major tertiary hospitals in Oman, which promoted the generalizability of our study findings. The sampling technique used in the present study is considered a key strength because of its feasibility (cost-effectiveness and time-saving method), which in turn reduced sampling bias and increased the generalizability of the results. In addition, we have used iterative statistical analysis. Thus, the findings of the present study might be utilized as a baseline for the effective development of interventions to prevent post-stroke dysphagia-associated complications to improve patients' quality of life. Based on the results of our study, a checklist of post-stroke dysphagia risk factors can be developed by a clinical stroke nurse and the stroke team to guide the team to identify high-risk stroke patients and to intervene accordingly with dysphagia assessment as early as possible.

This study had some limitations. The first limitation was that the frequency of dysphagia assessment in this study participants was assessed once, although it is recommended by Oman national stroke guideline (The diagnosis and management of stroke and transient ischemic attack, launched in 2013) to observe dysphagic patients during each meal by the nurse assigned and re-assess according to patients' condition and/or before discharge.[33-35] Short observation times and the use of convenience sampling techniques are other limitations that limit the generalizability of the results. This was also a cross-sectional study, and the time period may differ in terms of affecting the outcomes. A longitudinal designed study may be helpful to see the association with the outcomes.

Another limitation was that stroke patients were sourced from two major hospitals in Muscat governance only, which might limit the generalizability of the observations to more distant regions of Oman. Second, we used the GUSS alone as a diagnostic tool of dysphagia for all acute stroke patients. Although it is an excellent dysphagia screening tool with good sensitivity and specificity to rule out dysphagia among stroke patients, it is unable to detect silent aspiration. Therefore, there is a need to use a gold standard clinical instrument (such as fiber-optic endoscopic swallowing study) to confirm dysphagia and identify silent aspiration if present among such a vulnerable population. In our study, the prevalence of dysphagia was greater than the projected estimation because we excluded patients with transient ischemic attack and cerebral venous thrombosis. The last important limitation in this study was that there was no study conducted in Oman concerning dysphagia post-stroke, and limited literature from the Middle East

was found that explored dysphagia prevalence among acute stroke patients, although it might be a strength since no one has looked at this before in Oman.

Conclusion

Dysphagia is the most common disorder among acute stroke patients. Due to its negative impacts on patient outcomes and healthcare systems, it has become a global concern. It is essential to identify the risk factors associated with post-stroke dysphagia to reduce dysphagia-associated complications. Implementing new evidence-based strategies to prevent dysphagia complications is the key for improving patients' quality of life since prevention is better than cure. This study is a novel work as it is the first study examining the prevalence of dysphagia and its severity among acute stroke patients in Oman and studying the predictors of dysphagia.

The findings of the present study should be used by decision makers and top managers in the MOH to create policies on dysphagia assessment, management, and complication prevention. This study is a baseline for future research that may focus on the effectiveness of early dysphagia screening and identifying new predicators of post-stroke dysphagia in Oman.

Consent for publication
Not applicable.

Availability of data and materials
The dataset generated and/or analyzed during the current study are not publicly available due to participant privacy but are available from the corresponding author upon reasonable request.

Authors' contributions
All listed authors made substantial contributions to the conception and design, or acquisition of data, or analysis and interpretation of data, and were involved in drafting the manuscript or revising it critically for important intellectual content. They also gave final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. RAM designed the study, collected the data. RAM and ERL analyzed the data, and prepared the manuscript. MAH critically reviewed the manuscript. All authors approved the final version for submission.

Acknowledgements
The study acknowledges all the study participants, the cited authors in the manuscript, and the authors of the tools who designed and permitted their use in various settings.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References

1. Palli C, Fandler S, Doppelhofer K, Niederkorn K, Enzinger C, Vetta C, *et al*. Early dysphagia screening by trained nurses reduces pneumonia rate in stroke patients. Stroke 2017;48:2583-5.
2. Rofes L, Muriana D, Palomeras E, Vilardell N, Palomera E, Álvarez-Berdugo D, *et al*. Prevalence, risk factors, and complications of oropharyngeal dysphagia in stroke patients: A cohort study. Neurogastroenterol Motil 2018:30(8);e13338. doi: 10.1111/nmo. 13338.
3. Sherman V, Greco E, Martino R. The benefit of dysphagia screening in adult patients with stroke: A meta-analysis. J Am Heart Assoc 2021;10:e018753. doi: 10.1161/JAHA.120.018753.
4. Mulyatsih E, Glorino Pandin M. Dysphagia screening protocol for acute stroke patient: A literature review. Preprints 2021:2021040476. doi: 10.20944/preprints202104.0476.v1.
5. Losurdo A, Brunetti V, Broccolini A, Caliandro P, Frisullo G, Morosetti R, *et al*. Dysphagia and obstructive sleep apnea in acute, first-ever, ischemic stroke. J Stroke Cerebrovasc Dis 2018;27:539-46.
6. Qawasmeh MA, Aldabbour B, Momani A, Obiedat D, Alhayek K, Kofahi R, *et al*. Epidemiology, risk factors, and predictors of disability in a cohort of Jordanian patients with the first ischemic stroke. Stroke Res Treat 2020;2020:1920583.
7. Brumm J. Impact of Nursing Education on Dysphagia Screening Knowledge. United States -- Minnesota: Walden University; 2020.
8. Davis C, Namasivayam-MacDonald A, Shune S. Contributors to poststroke dysphagia-related caregiver burden. Am J Speech Lang Pathol 2021;30:1061-73.
9. Lal PB, Wishart LR, Ward EC, Schwarz M, Seabrook M, Coccetti A. Understanding barriers and facilitators to speech-language pathology service delivery in the emergency department. Int J Speech Lang Pathol 2023;25:509-22.
10. Meng P, Zhang S-C, Han C, Wang Q, Bai G, Yue S. The occurrence rate of swallowing disorders after stroke patients in Asia: A PRISMA-compliant systematic review and meta-analysis. J Stroke Cerebrovasc Dis 2020;29:105113.
11. Eltringham SA, Kilner K, Gee M, Sage K, Bray B, Pownall S, *et al*. Impact of dysphagia assessment and management on risk of stroke-associated pneumonia: A systematic review. Cerebrovasc Dis 2018;46;97-105.
12. Teuschl Y, Trapl M, Ratajczak P, Matz K, Dachenhausen A, Brainin M. Systematic dysphagia screening and dietary modifications to reduce stroke-associated pneumonia rates in a stroke unit. PLoS One 2018;13:e0192142. doi: 10.1371/journal. pone. 0192142.
13. Benfield J, Michou E. Dysphagia screening and assessment in the stroke unit. Br J Neurosci Nurs 2016;12(Suppl 2):S24-8.
14. Hota S, Inamoto Y, Oguchi K, Kondo T, Otaka E, Mukaino M, *et al*. Outcomes of dysphagia following stroke: Factors influencing oral intake at 6 months after onset. J Stroke Cerebrovasc Dis 2021;30:105971.
15. Zhang M, Li C, Zhang F, Han X, Qi Y, Lin T, *et al*. Prevalence of dysphagia in China: An epidemiological survey of 5943 participants. Dysphagia 2020;36;339-50.
16. Khedr EM, Abbass MA, Soliman RK, Zaki A, Gamea A. Post-stroke dysphagia: Frequency, risk factors, and topographic representation: Hospital-based study. Egypt J Neurol Psychiatry Neurosurg 2021;57:23.

17. Ebrahimian Dehaghani S, Yadegari F, Asgari A, Bagheri Z. The mediator effect of cognition on the relationship between brain lesion location and dysphagia in patients with stroke: Applying a structural equation model. J Oral Rehabil 2019;46:33-9.
18. Dunn K, Rumbach A. Incidence and risk factors for dysphagia following non-traumatic subarachnoid hemorrhage: A retrospective cohort study. Dysphagia 2019;34:229-39.
19. Kongsawasdi S, Klaphajone J, Wivatvongvana P, Watcharasaksilp K. Prognostic factors of functional outcome assessed by using the Modified Rankin Scale in subacute ischemic stroke. J Clin Med Res 2019;11:375-82.
20. Deribe B, Busi S. Prevalence and factors associated with dysphagia among stroke patients in public and private hospitals of Hawassa, Ethiopia. Res. Rev. J. Med. Health Sci.2018; 7:5-14.
21. Kumaresan A, Alagesan J, Vijayaraghavan R, Ramachandran A, Geetha M. Determinants of dysphagia following stroke. Ethiop J Health Dev 2019;33:1-6.
22. Al Ghafri T, Anwar H, Al Hinai E, Al Harthi T, Al Jufaili F, Al Siyabi R, *et al*. Study protocol: Behavior change intervention to promote healthy diet and physical activity in overweight/obese adults with diabetes attending health care facilities in Muscat: A cluster randomized control trial. BMC Public Health 2021;21:1529.
23. Da Silva AF, Moreira EAM, Barni GC, Panza VSP, Furkim AM, Moreno YMF. Relationships between high comorbidity index and nutritional parameters in patients with oropharyngeal dysphagia. Clin Nutr ESPEN 2020;38:218-22.
24. Finniss MC, Myers JW, Wilson JR, Wilson VC, Lewis PO. Dysphagia after stroke: An unmet antibiotic stewardship opportunity. Dysphagia 2022;37:260-5.
25. Warda YM, Ebrahim A. Dysphagia related health consequences among patients with acute stroke in Cairo, Egypt. Med J Cairo Univ 2018;86:4159-67.
26. Jiao J, Geng L, Zhang Z. Do we need to distinguish thrombolysis and nonthrombolysis patients when applying stroke-associated pneumonia predicting scores? An external validation from a 2-center database. Med Sci Monit 2020;26:e924129.
27. Minchell E, Rumbach A, Finch E. The effects of endovascular clot retrieval and thrombolysis on dysphagia in an Australian quaternary hospital: A retrospective review. Int J Lang Commun Disord 2022;57:128-37.
28. Pedra EFP, Pontes VL, Mourão AM, Braga MA, Vicente LCC. Post-stroke patients with and without thrombolysis: Analysis of deglutition in the acute phase of the disease. Pacientes pós-AVC com e sem trombólise: Análise da deglutição na fase aguda da doença. Codas 2020;32:e20180229.
29. Roje-Bedeković M, Dimitrović A, Breitenfeld T, Supanc V, Solter VV. Reliable predicting factors for post-stroke dysphagia: Our experience. Neurol Psychiatry Brain Res 2020;38:97-101.
30. Fernández-Pombo A, Seijo-Raposo I, López-Osorio N, Cantón-Blanco A, González-Rodríguez M, Arias-Rivas S, *et al*. Lesion location and other predictive factors of dysphagia and its complications in acute stroke. Clin Nutr ESPEN 2019;33:178-82.
31. Cabib C, Ortega O, Vilardell N, Mundet L, Clavé P, Rofes L. Chronic post-stroke oropharyngeal dysphagia is associated with impaired cortical activation to pharyngeal sensory inputs. Eur J Neurol 2017;24:1355-62.
32. Goyal M, Ospel J. Challenges to stroke care 5 years after endovascular therapy became the standard. Lancet Neurol 2020;19:210-1.
33. National Collaborating Centre for Chronic Conditions (UK). Stroke: National Clinical Guideline for Diagnosis and Initial Management of Acute Stroke and Transient Ischaemic Attack (TIA). London: Royal College of Physicians (UK); 2008.
34. Dunn K, Rumbach A, Finch E. Dysphagia following non-traumatic subarachnoid haemorrhage: A prospective pilot study. Int J Lang Commun Disord 2020;55:702-11.
35. Xu Z, Gu Y, Li J, Wang C, Rong W, Huang Y, *et al*. Dysphagia and aspiration pneumonia in elderly hospitalization stroke patients: Risk factors, cerebral infarction area comparison. J Back Musculoskelet Rehabil 2019;32:85-91.