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## Frequency and factors associated with dysphagia in stroke

### *Frequência e fatores associados à disfagia após acidente vascular cerebral*

### ABSTRACT

**Purpose:** To investigate the frequency of dysphagia in acute stroke and the possible associated clinical and sociodemographic features. **Method:** A cross-sectional study was performed including 100 stroke patients who were admitted to the Minas Gerais Regional Public Hospital. Sociodemographic and clinical data were collected, and the patients underwent clinical evaluation through the Gugging Swallowing Screen (GUSS). **Results:** The frequency of dysphagia was 50%, and most patients had severe swallowing disorders. Only a previous history of stroke was associated with dysphagia ( $p=0.02$ ). Other sociodemographic and clinical variables were not associated with dysphagia, suggesting that the location and the pathophysiology of stroke did not influence its occurrence and severity. **Conclusion:** The frequency of dysphagia after stroke is high, being a previous stroke an important risk factor for subsequent stroke.

### RESUMO

**Objetivo:** Verificar a frequência de disfagia em pacientes acometidos por acidente vascular cerebral (AVC) e investigar possíveis fatores sociodemográficos e clínicos associados. **Método:** Trata-se de estudo descritivo do tipo transversal em que foram avaliados 100 pacientes admitidos com o diagnóstico de AVC no Hospital Público Regional de Minas Gerais. Dados sociodemográficos e clínicos foram obtidos, e os pacientes, submetidos à avaliação clínica da deglutição por meio da escala *Gugging Swallowing Screen* (GUSS). **Resultados:** A frequência da disfagia foi de 50%, sendo que a maioria dos pacientes apresentou alteração grave da deglutição. Apenas história pregressa de AVC mostrou associação com disfagia ( $p=0,02$ ). Outras variáveis sociodemográficas e clínicas não se associaram com disfagia, indicando que a localização e a fisiopatologia do AVC não influenciaram sua ocorrência e gravidade. **Conclusão:** A frequência de disfagia após o AVC é elevada, sendo o histórico de AVC importante fator de risco.

Study carried out at the Universidade Federal de Minas Gerais – UFMG – Belo Horizonte (MG), Brazil.

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**Conflict of interests:** nothing to declare.

## INTRODUCTION

In Brazil, the cerebrovascular accident, popularly known as stroke, is one of the leading causes of death, being responsible for over 90,000 deaths/year, the highest rate in Latin America<sup>(1,2)</sup>. In addition to the high mortality, it is a highly incapacitating condition, being a major public health problem<sup>(3-6)</sup>.

Among the many factors associated to disability by stroke, the neurogenic oropharyngeal dysphagia stands out<sup>(7)</sup>. This may be defined as a disorder of swallowing resulting from loss of functionality and independence to feed oneself, bringing losses in terms of nutrition, hydration, pulmonary function, pleasure, and social balance of the individual<sup>(8-11)</sup>. The mortality rate after stroke is also associated to dysphagia<sup>(3,4,9)</sup>. It is noteworthy that a safe and efficient swallowing depends on the interaction of different functions, such as taste, tactile and proprioceptive sensitivity, tone and muscle strength, and the integrity of various neuronal systems, as the afferent pathways of the stimuli in the central nervous system and its efferent pathways<sup>(12-16)</sup>.

The frequency and factors associated to dysphagia after a stroke is quite varied. For example, the frequency of dysphagia after a stroke is reported between 14 and 94% among the different studies<sup>(12-14,17-23)</sup>. Dysarthria, age above 70 years, *diabetes mellitus*, poor dental conservation, facial paralysis, and location and extension of the neurological damage were identified as possible risk factors in some, but not all studies<sup>(23-25)</sup>. The criticisms related to the great variability in its frequency and in the factors related to dysphagia after stroke in the studies include several methods to evaluate swallowing, size of the sample, as well as the absence of standardization of the protocols used to characterize and describe the stroke (location and extension)<sup>(2,10,17-22,26)</sup>. Therefore, the factors related to dysphagia after a stroke are not clearly defined, since Brazilian studies on the subject are still scarce<sup>(17-22)</sup>.

The objective of this study was to thoroughly investigate the frequency and factors related to the neurogenic oropharyngeal dysphagia among patients in the acute phase of stroke.

## METHODS

It is a cross-sectional observational study of descriptive nature with a non-probabilistic sample carried out in a period of 6 months, in which swallowing was evaluated for 100 patients admitted with acute stroke diagnosis consecutively in a Regional Public Hospital. The study was previously approved by the Board of the Public Hospital and by the Research Ethics Committee of the institution according to the process No. ETIC 207/08. The subjects of the research or their respective legal guardians were duly informed and signed the informed consent.

Patients hospitalized with acute stroke diagnosis were included in the study. Patients in a coma and/or assisted ventilation, without possibility of clinical evaluation of swallowing, were excluded.

The collection of data was performed in two stages. The first one consisted of obtaining the sociodemographic and clinical data through a structured interview with patients and/or guardians, neurological clinical evaluation, including

the analysis of additional tests, such as the cranial computed tomography (CCT) within the first 48 hours of ictus. Strokes were classified as ischemic or hemorrhagic, the ischemic one being classified as for their location and pathophysiology, respectively, with the scales of Oxfordshire Community Stroke Project (OCSP)<sup>(27)</sup> and the Trial of Org 10172 in Acute Stroke Treatment (TOAST)<sup>(28)</sup>. According to the OCSP classification, the strokes are categorized into four subtypes: lacunar (LAC), total anterior circulation (TAC), partial anterior circulation (PAC), and posterior circulation (POC). According to the TOAST, strokes are physiopathologically classified into five subtypes: atherosclerosis of a large artery, cardioembolic stroke, occlusion of small arteries (lacunar), other determined etiologies, and undetermined etiology.

The second stage was characterized by clinical evaluation by a speech language pathologist, of swallowing up to 48 hours after the stroke. The Gugging Swallowing Screen (GUSS) scale was used<sup>(29)</sup>, which is the standardized and validated instrument to be used at the bedside of patients who suffered strokes. According to the score obtained in the GUSS, it is possible to classify swallowing into normal/without dysphagia, slight dysphagia with low risk of aspiration, mild dysphagia with risk of aspiration, and severe dysphagia with high risk of aspiration.

Descriptive analysis of the distribution of frequency of the categoric variables and the analysis of measures of central trends and dispersion for the continuous variables were carried out. For the analysis of the data, associations were made between the answer variable "presence of dysphagia" and the explanatory variable "sociodemographic and clinical data, location and physiopathology of the stroke." For such, the  $\chi^2$  test of Pearson or the exact Fisher test (when numbers of events were lower than five) was used. The p value <0.05 was used as statistical level of significance for all tests. The data were organized in spreadsheets by Excel®, and the information processed and analyzed by SPSS IBM Statistics 16.0.

## RESULTS

The study had the participation of 100 adults, 54 females and 46 males, aged 62.6 years old on average. The clinical characterization of the sample and of the types of stroke was presented in detail in a previous publication<sup>(30)</sup>. In short, there were 78% ischemic strokes, involving preferably the area of the middle cerebral artery, being the main physiopathological mechanism the atherosclerosis with 42.3%, followed by cardioembolic stroke (28.3%) and the lacunar one (18%). The most frequent comorbidity was hypertension (81%), followed by heart diseases (30.6%) and *diabetes mellitus* (24.5%). Previous history of stroke was present in 20% of the cases.

The frequency of dysphagia in the sample was 50%, considering that 28% of patients had severe dysphagia (with high risk of aspiration), 11% had mild dysphagia (with risk of aspiration), and 11% had slight dysphagia (without risk of aspiration).

There was no significant difference among the variables of gender, age, marital status, school education, and clinical comorbidities among patients with and without dysphagia (Table 1).

Only the presence of previous history of stroke is associated with the presence of dysphagia ( $p=0.022$ ).

The location and the physiopathology of the stroke were not associated with the presence of dysphagia (Tables 2 and 3). Also, there were no significant associations between the severity of the dysphagia, evaluated according to the GUSS scale, and the location and physiopathology of the stroke (Tables 4 and 5).

## DISCUSSION

This study showed frequency of dysphagia in 50% of the patients in the acute phase of stroke. Most dysphagic patients had severe alteration with high risk of aspiration, followed by mild alterations with some risk of aspiration. These results confirm the high incidence of dysphagia with risk of aspiration in the acute stage of the stroke described in the literature, highlighting the relevance of early intervention in order to prevent pulmonary complications and facilitate feeding by a safe oral pathway<sup>(2,7,9-14,23)</sup>.

The occurrence of dysphagia after stroke did not show association of statistical significance with sociodemographic and

**Table 1.** Comparison of sociodemographic and clinical variables among patients after a stroke with and without dysphagia, according to the Gugging Swallowing Screen Scale

Variables	Patients (n=100)		p-value
	Dysphagic n=50	Non-dysphagic n=50	
Gender			
Male	27 (54%)	19 (38%)	0.26
Female	23 (46%)	31 (62%)	
Age (Mean±SD)	63.1±16.7	62.0±16.9	0.61
Marital status			
Single	8 (16.3%)	4 (8.3%)	0.13
Married	27 (55.1%)	29 (60.4%)	
Separated/ divorced	5 (10.2%)	3 (6.2%)	
Widower	9 (18.3%)	12 (25.0%)	
Without information	1	2	
School education (in years) (Mean±SD)	5.1±4.4	4.7±3.9	0.13
Communication			
Without alteration	10	39	0.91
Aphasic	23	4	
Apraxic	0	2	
Dysarthric	11	5	
Without information	6	—	
Previous stroke	14 (28%)	6 (12%)	0.02
Diabetes mellitus	11 (22%)	13 (26%)	0.53
Hypertension	39 (78%)	42 (84%)	0.53
Heart diseases	18 (36%)	12 (24%)	0.22
Alzheimer	1 (2%)	0	0.35
Chagas disease	0	2 (4%)	1
Smoking*	12 (24%)	15 (30%)	0.16
Use of alcohol**	12 (24%)	7 (14%)	0.47

Pearson's  $\chi^2$  or Fisher's exact tests, when the number of events was lower than five.

\*Less than one Pack of cigarettes/day (n=7), one Pack of cigarettes/day (n=16), more than one pack of cigarettes/day (n=4); \*\*eventual use (n=11), abuse (n=8).

**Caption:** SD = standard deviation

**Table 2.** Comparison of the location, from the Oxfordshire Community Stroke Project classification, among post-stroke patients classified into dysphagic and non-dysphagic, according to the Gugging Swallowing Screen scale

Location/swallowing	Dysphagic	Non-dysphagic	Total	p-Value*
LAC	7	11	18	0.37
TAC	23	5	28	
PAC	7	12	19	
POC	4	9	13	
H	9	13	22	
Total	50	50	100	

\*Fisher's exact test.

**Caption:** H = hemorrhagic; POC = posterior circulation; PAC = partial anterior circulation; TAC = total anterior circulation; LAC = lacunar

**Table 3.** Comparison of physiopathology, from the Trial of Org 10172 in Acute Stroke Treatment classification, among post-stroke patients classified into dysphagic and non-dysphagic, according Gugging Swallowing Screen Scale

Physiopathology/ swallowing	Dysphagic	Non-dysphagic	Total	p-value*
Atherosclerosis	17	16	33	0.72
Cardioembolism	14	8	22	
Lacunar	7	11	18	
Others etiologies	0	1	1	
Undetermined etiology	3	1	4	
Total	41	37	78	

\*Fisher's exact test.

**Table 4.** Comparison of the location, from the Oxfordshire Community Stroke Project classification, and total score obtained in the evaluation of swallowing, according to the Gugging Swallowing Screen scale

Location/ swallowing	0-9	10-14	15-19	20	Total	p-value*
LAC	1	4	2	11	18	0.24
TAC	13	6	4	5	28	
PAC	3	1	3	12	19	
POC	4	—	—	9	13	
H	7	—	2	13	22	
Total	28	11	11	50	100	

\*Fisher's exact test.

**Caption:** H = hemorrhagic; POC = posterior circulation; PAC = partial anterior circulation; TAC = total anterior circulation; LAC = lacunar.

**Table 5.** Comparison of the physiopathology, from the Trial of Org 10172 in Acute Stroke Treatment classification, and the total score obtained in the evaluation of swallowing, according to the Gugging Swallowing Screen Scale

Physiopathology/ swallowing	0-9	10-14	15-19	20	Total	p-value*
Atherosclerosis	13	2	2	16	33	0.52
Cardioembolism	5	4	5	8	22	
Lacunar	1	4	2	11	18	
Other etiologies	0	0	0	1	1	
Undetermined Etiology	1	1	1	1	4	
Total	20	11	10	37	78	

\*Fisher's exact test.

clinical data, corroborating some studies in the literature<sup>(23-25)</sup>. In Brazil, a study investigated the association between clinical parameters and penetration/aspiration of liquids. Variables such as dental conservation, tone, and muscle strength of the face were related to the increased risk of dysphagia; however, they were not significant enough in order to be identified as risk factors associated to dysphagia<sup>(17)</sup>. Another Brazilian study evaluated the association between location of the stroke and dysphagia, observing that the location was not related to the presence of dysphagia, considering most dysphagic patients had alterations in the carotid area, especially in the middle cerebral artery<sup>(21)</sup>.

It is well established that most patients with brainstem lesions develop dysphagia because the nuclei of cranial nerves involved in swallowing are located in this area<sup>(15)</sup>. However, the studies do not describe the relation between dysphagia and other brain areas<sup>(10,11,16-23,26)</sup>. In this sense, this study did not find statistically significant associations between the location and/or physiopathology of the stroke and dysphagia. This result may be interpreted by recent hypotheses which demonstrate the absence of a single specific area for swallowing, but instead that the brain circuit would be widely distributed in brain areas. Some studies tried to identify the neural correlates of swallowing with functional magnetic resonance imaging in healthy individuals, finding bilateral activations involving pre- and postcentral spins, prefrontal cortex, cingulate gyrus, Broca's area, and superior temporal gyrus<sup>(16,26)</sup>. Other studies using functional magnetic resonance in patients with stroke showed higher neural activation in the not-affected ipsilateral region of the lesion, possibly indicating the beginning of compensatory recruitment of neighboring neural areas to the injury still in the acute stage of the stroke<sup>(16,26)</sup>. These studies suggest that the extension of the damage after the stroke may be more directly related to dysphagia than to their location and physiopathology<sup>(16,23,26)</sup>. The fact that history of stroke being a risk factor for dysphagia corroborates this hypothesis when representing cumulative damage to the brain and, consequently, impairment or limitation of the functional reserve and the possibility of recruitment of compensatory neural networks<sup>(5,10,11,16,23,26)</sup>.

In this study, patients were classified as dysphagic or non-dysphagic, using the clinical evaluation of swallowing at bedside, not being used an objective evaluation, such as a videofluoroscopy. This is because patients were evaluated during the acute phase of the disease (up to 48 hours after the stroke). The absence of the objective golden-standard test may have influenced the results found; however, the clinical evaluation of swallowing is considered reliable<sup>(5,17-22,26)</sup>. Besides, it is noteworthy that a validated and specific clinical scale was used for post-stroke dysphagia<sup>(29)</sup>, as well as the evaluation of patients being performed by an experienced speech language pathologist.

## CONCLUSION

This study found an increased frequency of dysphagic patients in the acute stage of the stroke with high percentage of risk of aspiration. This emphasizes the importance of early

intervention by qualified speech language and audiology therapists, in order to prevent pulmonary complications and enable feeding by safe oral pathway.

There was no association between the location and/or physiopathology of the stroke and dysphagia. Just the presence of previous stroke was noted as an associated risk factor, indicating that the extent of the post-stroke damage may be directly related to the dysphagia.

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