

# Risk of swallowing disorder in Chronic Obstructive Pulmonary Disease


Risco de transtorno de deglutição  
em Doença Pulmonar Obstrutiva Crônica

Riesgo de trastorno de la deglución en la  
Enfermedad Pulmonar Obstrutiva Crónica

*Fabiani Rodrigues da Silveira*<sup>1</sup> 

*Roberta Gonçalves da Silva*<sup>2</sup> 

*Diane de Lima Oliveira*<sup>1</sup> 

*Patricia Haas*<sup>3</sup> 

*Marcos José Machado*<sup>1</sup> 

*Ana Maria Furkim*<sup>1</sup> 

## Abstract

**Introduction:** Pulmonary emphysema and chronic bronchitis are lung conditions known as chronic obstructive pulmonary disease (COPD). Symptoms include dyspnea and coughing, which can impact the breathing/swallowing coordination, possibly impairing eating. **Objective:** To report the association of the risk of swallowing disorders (RSD) in patients with COPD without speech-language-hearing follow-up. **Method:** Cross-sectional, retrospective study (2001-2011) with secondary data analysis from patients at a pulmonology outpatient clinic. The variables analyzed were sex, age, time since disease diagnosis, and comorbidities. Having at least one of the following criteria was considered as RSD: change in the food consistency, change in the oral intake volume, use of an alternative feeding route, and home oxygen. **Results:** RSD was found in 60% of the analyzed medical records. It was associated with age ( $p=0.009$ ) and pulmonary involvement due to emphysema ( $p=0.041$ ). Patients with RSD had a prevalence of home

<sup>1</sup> Universidade Federal de Santa Catarina, Florianópolis, SC, Brazil.

<sup>2</sup> Universidade Estadual Paulista, Marília, SP, Brazil.

<sup>3</sup> Universidade Federal da Fronteira Sul, RS, Chapecó, Brazil.

### Author's contributions:

FRS: conception, design, article writing;

RGS, DLO, PH: article corrections in final versions, research monitoring;

MJM: statistical analysis;

AMF: conception, corrections, analyses, research monitoring.

**E-mail for correspondence:** [diane.oliveira@ufsc.br](mailto:diane.oliveira@ufsc.br)

**Received:** 02/20/2024

**Accepted:** 07/12/2024

oxygen use (46.7%;  $p < 0.001$ ) compared to those without RSD. **Conclusion:** Patients with COPD in outpatient follow-up had a high prevalence of risk of swallowing disorders, associated with older patients and impairment due to pulmonary emphysema. Some publications relating COPD to dysphagia have addressed the importance of speech-language-hearing assessment. However, more publications on the subject are needed to raise health professionals' awareness of these patients' care needs.

**Keywords:** Deglutition; Deglutition Disorders; Dysphagia; Pulmonary Disease, Chronic Obstructive; Respiratory Diseases

## Resumo

**Introdução:** O enfisema pulmonar e a bronquite crônica são condições pulmonares conhecidas como Doença Pulmonar Obstrutiva Crônica (DPOC). Dentre os sintomas tem-se a dispnéia e a tosse, o que pode impactar na coordenação entre a respiração e a deglutição, com provável comprometimento na alimentação. **Objetivo:** Relatar a associação do risco de transtorno de deglutição (RTD) em pacientes com DPOC sem acompanhamento fonoaudiológico. **Método:** Estudo transversal, retrospectivo (2001-2011) com análise de dados secundários de pacientes do ambulatório de pneumologia. As variáveis analisadas foram sexo, idade, tempo de diagnóstico da doença e comorbidades. Foi considerada como RTD a presença de pelo menos um dos critérios: modificação na consistência do alimento ingerido, alteração no volume da ingestão por via oral, uso de via alternativa de alimentação e oxigênio domiciliar. **Resultados:** Verificou-se RTD em 60% dos prontuários analisados. O RTD foi associado à idade ( $p = 0,009$ ) e ao comprometimento pulmonar relacionado ao enfisema ( $p = 0,041$ ). Pacientes com RTD apresentaram prevalência de utilização de oxigênio domiciliar (46,7%;  $p < 0,001$ ) comparados àqueles sem RTD. **Conclusão:** Pacientes com DPOC em seguimento ambulatorial apresentaram alta prevalência de risco para transtorno de deglutição, estando estes riscos associados a pacientes com maior idade e com comprometimento relacionado ao enfisema pulmonar. Sabemos que há publicações relacionando DPOC e disfagia, sobre a importância da avaliação fonoaudiológica, mas ainda há necessidade de mais publicações sobre o tema, para aumentar o alerta dos profissionais de saúde, da necessidade dos atendimentos desses pacientes.

**Palavras-chave:** Deglutição; Transtornos de Deglutição; Disfagia; Doença Pulmonar Obstrutiva Crônica; Doenças respiratórias

## Resumen

**Introducción:** El enfisema pulmonar y la bronquitis crónica son afecciones pulmonares conocidas como enfermedad pulmonar obstructiva crónica (EPOC). Los síntomas incluyen disnea y tos, que pueden repercutir en la coordinación entre la respiración y la deglución, con probable afectación de la alimentación. **Objetivo:** Informar sobre la asociación entre el riesgo de trastornos de la deglución (RTD) en pacientes con EPOC sin seguimiento logopédico. **Método:** Estudio transversal, retrospectivo (2001-2011) analizando datos secundarios de pacientes de la consulta externa de neumología. Las variables analizadas fueron sexo, edad, tiempo desde el diagnóstico y comorbilidades. Se consideró RTD la presencia de al menos uno de los siguientes criterios: cambio en la consistencia de los alimentos ingeridos, cambio en el volumen de ingesta oral, uso de una vía de alimentación alternativa y oxígeno domiciliario. **Resultados:** Se encontró RTD en el 60% de los pacientes. El RTD se asoció con la edad ( $p = 0,009$ ) y con el deterioro pulmonar relacionado con el enfisema ( $p = 0,041$ ). Los pacientes con RTD presentaban una mayor prevalencia de uso de oxígeno domiciliario (46,7%;  $p < 0,001$ ) en comparación con aquellos sin RTD. **Conclusión:** Los pacientes con EPOC en seguimiento ambulatorio presentaron una alta prevalencia de RTD, y estos riesgos se asociaron a pacientes de mayor edad y a alteraciones relacionadas con el enfisema pulmonar. Sabemos que existen publicaciones que relacionan EPOC y disfagia, sobre la importancia de la valoración logopédica, pero aún son necesarias más publicaciones sobre el tema, para concienciar a los profesionales sanitarios de la necesidad de atender a estos pacientes.

**Palabras clave:** Deglución; Trastornos de la deglución; Disfagia; Enfermedad Pulmonar Obstrutiva Crónica; Enfermedades respiratorias

## Introduction

Chronic obstructive pulmonary disease (COPD) is the third leading cause of death worldwide, with more than three million deaths per year<sup>1,2,3</sup>. It is estimated that by 2050 there will be a relative increase of up to 23% in the number of cases, leading to 600 million people affected by the disease. Moreover, being a female is one of the causes of this increase<sup>2</sup>.

COPD is characterized, among other changes, by emphysema and/or chronic bronchitis, with chronic obstruction or limited airflow, progressing slowly and irreversibly, mainly affecting males over 40 years old<sup>3,4</sup>. Airflow limitation is associated with an abnormal inflammatory lung response to harmful gas particles, with smoking being the main cause of disease development<sup>5</sup>. Moreover, microaspiration of oropharyngeal secretions can contribute to respiratory infections<sup>6</sup>.

Breathing and swallowing are intrinsically related. In adults, breathing is usually interrupted during swallowing and resumed during the expiratory phase, which is considered a protective mechanism to prevent aspiration<sup>7</sup>. The apneic pause during swallowing also complies with this lower airway protection mechanism<sup>8</sup>.

Patients with COPD tend to resume swallowing during the inspiratory phase, which may increase the risk of aspiration<sup>9,10</sup>. Oropharyngeal dysphagia in this population can range from 12 to 20%<sup>11</sup>. Factors such as dyspnea, gastroesophageal reflux disease (GERD), xerostomia, sputum contaminated with bacteria, low physical capacity, and recurrent pneumonia are considered risk factors for dysphagia in these patients<sup>12</sup>. Swallowing and breathing are intrinsically and synchronously related; hence, respiratory changes and disease exacerbations can determine recurrent hospitalizations, swallowing disorders, health system costs, and the patient's suffering.

Speech-language-hearing pathologists are trained to evaluate, diagnose, and treat oropharyngeal swallowing disorders. However, COPD outpatient clinics and hospital inpatient units do not always have these professionals. Therefore, more research is needed to characterize this population, taking the topic further among the health professionals involved.

Thus, this study aimed to report the association of the risk of swallowing disorders (RSD) in patients with COPD without speech-language-hearing follow-up.

## Material and method

### Sample

This retrospective cross-sectional study used a convenience sample with secondary data, analyzing medical records of COPD patients treated at a highly complex pulmonology outpatient clinic at a university hospital between January 2001 and December 2011 – when these patients did not have speech-language-hearing follow-up available at the institution. The study was approved by the institution's Research Ethics Committee (number 200.419), complying with the human research ethics legislation. All participants signed an informed consent form.

### Inclusion and exclusion criteria

The study included secondary data from medical records of individuals of both sexes, over 18 years old, with a medical diagnosis of COPD – i.e., with pulmonary involvement due to emphysema and/or chronic bronchitis. It excluded data from medical records with a previous diagnosis of neurological disease, head and neck cancer, or orofacial-cervical surgeries, as well as medical records whose data relevant to the research were incomplete.

### Data collection

The study evaluated 210 medical records of patients diagnosed with COPD and treated at the institution's pulmonology outpatient clinic – of which 60 met the inclusion criteria. A speech-language-hearing pathologist (FRS) collected the data, verified by another one (AMF).

Data were collected regarding sex, age, medical diagnosis, time since COPD diagnosis, and comorbidities. Having at least one of the criteria in the medical records was considered as RSD: the need to change the consistency and volume of food/liquids ingested orally, the need for an alternative feeding route, and/or the use of home oxygen.

### Statistical analysis

Statistical analyses were performed using the MedCalc® software, version 12.7.2. They used Fisher's exact test, chi-square test for proportions, and chi-square test for contingency or "r x s" tables, setting the significance level at 5% ( $p < 0.05$ ). Patients with "no risk of swallowing disorders" (NRSD) and "at risk of swallowing disorders"

(ARSD) were compared. Age and disease duration were also evaluated regarding sex, constituting four groups, comparing their medians with the Kruskal-Wallis test, and then comparing these groups with the Conover test (post-hoc analysis) two by two. Odds ratios (OR) were calculated from contingency tables (2 X 2), and the z-test was used to calculate the p-value. Logistic regression was performed to assess ORs adjusted for sex, age, disease duration, presence of diabetes mellitus, and COPD with pulmonary involvement due to emphysema, which occurred more often.

## Results

There was a prevalence of males (51.7%), and a median age of 65 years, ranging from 44 to

82 years. The time since disease diagnosis ranged from 2 to 29 years, with a mean of 7.8 years. Mild obstruction (GOLD 1) was found in 38 patients (63%), moderate obstruction (GOLD 2) in 13 patients (22%), and moderate degree (GOLD 3) in 9 patients (15%)<sup>3</sup>. Systemic hypertension (SH) (98.3%), smoking (91.7%), and congestive heart failure (CHF) (53.3%) were prevalent comorbidities, and 5% of patients had at least one case of community-acquired pneumonia. No description of aspiration pneumonia was observed.

RSD was found in 60% of patients. ARSD patients had a prevalence of COPD with emphysema-related lung involvement (58.3%;  $p = 0.002$ ) and home oxygen use (46.7%;  $p < 0.001$ ), compared to NRSD patients (Table 1).

**Table 1.** Clinical variables of patients (n = 60) at risk and with no risk of swallowing disorders (2001-2011).

Variable	Total		NRSD		ARSD		p-value $\alpha$	p-value $\beta$
	n	%	n	%	n	%		
<b>Sex</b>								
Males	31	51.70	16	26.70	13	21.70	0.021*	0.034*
Females	29	48.30	8	13.30	23	38.30		
<b>COPD + emphysema</b>								
No	9	15.00	8	13.30	1	1.70	0.001*	0.002*
Yes	51	85.00	16	26.70	35	58.30		
<b>SH</b>								
No	1	1.70	0	0	1	1.70	0.414	1.000
Yes	59	98.30	24	40.00	35	58.30		
<b>CHF</b>								
No	28	46.70	15	25.00	13	21.70	0.046*	0.065
Yes	32	53.30	9	15.00	23	38.30		
<b>Diabetes mellitus</b>								
No	32	53.30	14	23.30	10	16.70	0.529	0.602
Yes	28	46.70	18	30.00	18	30.00		
<b>Dyslipidemia</b>								
No	56	93.30	23	38.30	33	55.00	0.529	0.643
Yes	4	6.70	1	1.70	3	5.00		
<b>Pneumonia</b>								
No	56	94.90	23	39.00	33	55.90	0.792	1.000
Yes	4	5.10	1	1.70	2	3.40		
<b>Alcohol consumption</b>								
No	50	83.30	20	33.30	30	50.00	1.000	1.000
Yes	10	16.70	4	6.70	6	10.00		
<b>Smoking</b>								
No	5	8.30	3	5.00	2	3.30	0.344	0.380
Yes	55	91.70	21	35.00	34	56.70		
<b>Home oxygen</b>								
No	31	51.70	23	38.30	8	13.30	<0.001**	< 0.001**
Yes	29	48.30	1	1.70	28	46.70		

Caption: NRSD: no risk of swallowing disorders, ARSD: at risk of swallowing disorders. SH: systemic hypertension, CHF: congestive heart failure, p-value $\alpha$ : chi-square test, p-value $\beta$ : Fisher's exact test. \* significant p-value < 0.050; \*\* significant p-value < 0.001.

The median disease duration differed between male ARSD patients (median of 8 years with interquartile range [IQR] of 6-12 years), male NRSD patients (median of 3 years with IQR of 3-3.75 years), and female NRSD patients (median of 5 years with IQR of 3.0-5.75 years). Female ARSD

patients had a median of 11 years with IQR of 2.75-12.5 years, differing from male NRSD and female NRSD patients in the Kruskal-Wallis test ( $p = 0.003479$ ) and the post-hoc analysis with the Conover test ( $p < 0.025$ ). Moreover, ARSD patients were older than NRSD patients (Table 2).

**Table 2.** Disease duration and age in relation to sex of COPD patients with emphysema characteristics (n = 52) (2001-2011).

Variable	RSD	Median (IQR)	Post hoc analysis**
Disease duration	(1) NRSD females	5.0 (3.00 - 5.75)	(2)(4)
	(2) ARSD females	11.0 (2.75 - 12.50)	(1)(3)
	(3) NRSD males	3.0 (3.00 - 3.75)	(2)(4)
	(4) ARSD males	8.0 (6.00 - 12.00)	(1)(3)
	p*	0.003479	
Age	(1) NRSD females	62.0 (57.00 - 62.75)	(2)(3)(4)
	(2) ARSD females	65.0 (62.00 - 71.00)	(1)(4)
	(3) NRSD males	65.0 (64.75 - 68.00)	(1)(4)
	(4) ARSD males	72.0 (68.00 - 77.00)	(1)(2)(3)
	p*	0.000005	

Caption: NRSD: no risk of swallowing disorders, ARSD: at risk of swallowing disorders. IQR: interquartile range. \*significant p-value < 0.050, Kruskal-Wallis test. \*\* significant p-value < 0.0025, post hoc with Conover test, different from the line number (RSD).

Regarding feeding characteristics, 61.1% had changes in the food consistency ingested orally ( $p < 0.001$ ), and 44.4% had changes in the intake

volume. An alternative feeding route associated with the oral route was found in 27.8% of patients (Table 3).

**Table 3.** Association between feeding and swallowing in patients with COPD (2001 to 2011).

Variable	Total		NRSD		ARSD		p-value $\epsilon$	p-value $\beta$
	n	%	n	%	n	%		
<b>Change in oral intake volume</b>								
No	44	73.30	24	100.00	20	55.60	<0.001**	<0.001**
Yes	16	26.70	0	0	16	44.40		
<b>Use of alternative feeding route</b>								
No	49	81.70	23	95.80	26	72.20	0.021*	0.037*
Yes	11	18.30	1	4.20	10	27.80		
<b>Change in food consistency</b>								
No	38	63.30	24	100.00	14	38.90	<0.0001**	<0.001**
Yes	22	36.70	0	0	22	61.10		
<b>Feeding route</b>								
Mixed	10	16.70	0	0	10	27.80	0.005*	0.004*
Oral route	50	83.30	24	100.00	26	72.20		

Caption: NRSD: no risk of swallowing disorders, ARSD: at risk of swallowing disorders.  $p\epsilon$  = chi-square test;  $p\beta$  = Fisher's exact test. \* significant p-value < 0.050. \*\* significant p-value < 0.001.

Older patients and those with pulmonary involvement due to emphysema had a higher probability of RSD (Table 4). No association was

observed between RSD and disease duration, considering the adjustment for sex, age, and other variables in the logistic regression (Table 4).

**Table 4.** Association between sex, clinical conditions, and risk of swallowing disorders (n = 60) (2001-2011).

Variable	Crude OR	95% CI	P-value	Adjusted OR*	95% CI	P-value
<b>Sex</b>						
Females	1.00			1.00		
Males	3.54	1.19-10.50	0.023	0.32	0.03-2.89	0.308
<b>Disease duration</b>						
x	1.00			1.00		
x + 1 year	nd	nd	nd	1.30	0.91-1.86	0.147
<b>COPD + emphysema</b>						
No	1.00			1.00		
Yes	17.50	2.02-151.96	0.009	62.66	1.19-3300.01	0.041
<b>Diabetes Mellitus</b>						
No	1.00			1.00		
Yes	1.40	0.49- 3.97	0.527	0.22	0.03- 1.43	0.113
<b>Age (years)</b>						
x	1.00			1.00		
x + 1 year	nd	nd	nd	1.60	1.13- 2.28	0.009

\*OR obtained with logistic regression with adjustment for the factors listed in the table. Model – Dependent Variable = swallowing changes; \*Method Enter, Overall Model Fit, Significance level  $P < 0.0001$  Constant -34,227; Hosmer & Lemeshow test, Significance level  $P = 0.8914$ ; Area under the ROC curve (AUC) = 0.937 (95% CI 0.843-0.983). X = any value, X + 1 = value plus 1 year. Nd = valor not defined.

## Discussion

COPD with emphysema-related involvement was more prevalent in this study. This condition is considered the main COPD marker, characterized by a rapid decline in lung function, with worsening symptoms such as dyspnea<sup>3</sup>. This is in line with the fact that RSD was observed in 60% of the analyzed medical records, likewise reported in other studies, although with different screening methods<sup>13,14</sup>. It is interesting to note that 60% of patients were ARSD, and the majority were diagnosed with GOLD 1 – Mild COPD, which reinforces the need to expand work in this area and provide guidance to interdisciplinary teams.

The most common comorbidities were SH, CHF, diabetes mellitus, and smoking, with no differences between ARSD and NRSD patients. The literature reports that COPD is generally related to smoking, cardiovascular diseases, and diabetes mellitus<sup>15</sup>.

Home oxygen use was associated with RSD in this population. Home oxygen use is associated with more severe COPD and may be necessary to reduce tissue hypoxia, help stabilize or reduce the progression of pulmonary hypertension, increase exercise endurance, and decrease hospitalizations due to dyspnea<sup>3,16,17</sup>. On the other hand, its con-

tinuous use can affect the sensory receptors of the laryngopharyngeal mucosa, decreasing its sensitivity, and complicating swallowing<sup>18,19</sup>. This study contributes to the literature by showing that even patients with mild COPD (most of the sample) are ARSD and need to use home oxygen.

The changes in food consistencies and volumes described in the medical records were not strategies guided by a speech-language-hearing pathologist; rather, they were performed spontaneously by the patients to facilitate the maintenance of the oral route. It is known that stable patients may have changes in swallowing biomechanics<sup>20</sup>, as COPD can affect the breathing/swallowing coordination due to dyspnea and/or abnormalities in thoracoabdominal biomechanics, negatively influencing the patient's swallowing process<sup>21</sup>. Resuming the inspiratory phase during swallowing can facilitate the entry of food and saliva into the larynx, thus increasing the risk of aspiration<sup>13,22</sup>. Changes in airway protection during swallowing may also occur due to reduced laryngeal vestibule closure time and early opening of the upper esophageal sphincter in patients with COPD<sup>23</sup>. Pharyngeal residues after swallowing are also associated with such changes in sphincter opening<sup>23,24</sup> – only detectable through specialized evaluation with the help of instrumental exams; hence, they are often underdiagnosed in the



absence of a speech-language-hearing pathologist on the team. The results of this study reinforce the warning to health professionals about the risk of malnutrition and aspiration due to the biomechanical changes mentioned above.

Patients diagnosed with COPD for longer may have worse clinical conditions, depending on the stage of the disease, the maintenance of harmful habits, and treatment adherence. The adjusted analysis that considered sex and age in this study found no association between RSD and time since disease diagnosis. Studies analyzing the relationship between dysphagia and COPD have presented limitations regarding sample selection, swallowing assessment criteria, and the various ages of the research subjects<sup>25</sup>. Nevertheless, they highlight the relationship between swallowing disorders and chronic respiratory diseases<sup>14,25</sup>.

It is important to emphasize that aging can change the swallowing dynamics, affecting its safety and efficiency<sup>26</sup>. Although patients over 60 years old were not analyzed separately, it was observed that RSD increased with age. Changes in swallowing dynamics in older patients with COPD may predispose to oropharyngeal dysphagia, with a potential risk of health complications<sup>14,27</sup>.

Although publications have addressed changes in swallowing and eating in COPD patients, clinical practice does not follow this reality. The recent presentation of a swallowing screening instrument in patients with lung diseases, including COPD, found a risk of dysphagia in 15.2% of patients<sup>28</sup>.

### Study limitations

This study had limitations regarding its retrospective design, COPD staging, and sample heterogeneity and size. There was also a lack of swallowing assessment data and the use of specific screenings, as the institution provided no specialized speech-language-hearing care during the period in question. Thus, the RSD analyses were limited to the medical record data, not considering the period of disease exacerbation.

Further studies are needed to relate the swallowing biomechanics to disease staging, with standardized and validated protocols, also considering existing comorbidities. Although the literature seems saturated with the topic (COPD patients developing RSD), there is a gap regarding the validation of screening protocols and clinical evaluation of swallowing for these patients.

### Conclusion

Patients with COPD in outpatient follow-up had a high prevalence of RSD, associated with older patients and impairment related to pulmonary emphysema. Despite the existing publications relating COPD to dysphagia and highlighting the importance of speech-language-hearing evaluation, there is still a need for more publications on the subject to raise further awareness among health professionals regarding these patients' need for care.

### References

1. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2013; 380: 2095–128. doi: 10.1016/S0140-6736(12)61728-0.
2. Boers E, Barret M, Su JG, Benjafield AV, Sinha S, Laye L, et al. Global Burden of Chronic Obstructive Pulmonary Disease Through 2050. *JAMA Network Open*. 2023. 6(12): e2346598. doi: 10.1001/jamanetworkopen.2023.46598.
3. Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Lung Disease 2024 Report. *Estados Unidos da América*; 2024 [citado 23 jun 2024]. Disponível em: <https://goldcopd.org/2024-gold-report/>.
4. Ratanachina J, Amaral AFS, Matteis S, Lawin H, Mortimer K, Obaseki D, et al. Association of respiratory symptoms and lung function with occupation in the multinational Burden of Obstructive Lung Disease (BOLD) study. *Eur Respir J*. 2023; 61(1): 2200469. doi: 10.1183/13993003.00469-2022.
5. Celli BR, MacNee A, August A, Anzueto A, Berg B, Buist AS, et al. Standards for the diagnosis and treatment of patients with COPD: a summary of the ATS/ERS position paper *Eur Respir J*. 2004; 23: 932-46. doi: 10.1183/09031936.04.00014304.
6. Terada K, Muro S, Ohara T, Kudo M, Ogawa E, Hoshino Y et al. Abnormal swallowing reflex and COPD exacerbations. *Chest*. 2010; 137: 326-32. doi: 10.1378/chest.09-0482.
7. Martin-Harris B, Brodsky MB, Michel Y, Ford CL, Walters B, Heffner J. Breathing and swallowing dynamics across the adult lifespan. *Arch Otolaryngol Head Neck Surg*. 2005;131(9): 762–70. doi: 10.1001/archotol.131.9.762.
8. Logemann JA. Dysphagia: evaluation and treatment. *Folia Phoniatr Logop*. 1995; 47(3): 140-64. doi: 10.1159/000266348.
9. Chaves RD, Carvalho CRF, Cukier A, Stelmach R, Andrade CRF. Sintomas Indicativos de Disfagia em Portadores de DPOC. *J Bras Pneumol*. 2011; 37(2):176-183. doi: 10.1590/S1806-37132011000200007.
10. Shaker R, Li Q, Ren J, Townsend WF, Dodds WJ, Martin BJ, et al. Coordination of deglutition and phases of respiration: effect of aging, tachypnea, bolus volume, and chronic obstructive pulmonary disease. *Am J Physiol*. 1992; 263(5 Pt 1): G750-5. doi: 10.1152/ajpgi.1992.263.5. G750.
11. Mokhlesi B, Logemann JA, Rademaker AW, Stangl CA, Corbridge TC. Oropharyngeal deglutition in stable COPD. *Chest*. 2002;121(2): 361-9. doi: 10.1378/chest.121.2.361.



12. Li W, Gao M, Liu J, Zhang F, Yuan R, Su Q, et al. The prevalence of oropharyngeal dysphagia in patients with chronic obstructive pulmonary disease: a systematic review and meta-analysis. *Expert Rev Respir Med.* 2022; 16(5): 567-74. doi: 10.1080/17476348.2022.2086123.
13. Gross RD, Atwood CW Jr, Ross SB, Olszewski JW, Eichhorn KA. The coordination of breathing and swallowing in Chronic Obstructive Pulmonary Disease. *Am J Respir Crit Care Med.* 2009; 179: 559-65.
14. Prestes D, Bilheri DFD, Nascimento JR, Righi NC, Baldissera C, Silva AFS da, et al. Relação entre o risco de disfagia e o estado de saúde de indivíduos com a doença pulmonar obstrutiva crônica. *CoDAS.* 2020; 32(4): e20190036. doi: 10.1590/2317-1782/20202019036.
15. Chen H, Luo X, Du Y, He C, Lu Y, Shi Z, et al. Association between chronic obstructive pulmonary disease and cardiovascular disease in adults aged 40 years and above: data from NHANES 2013–2018. *BMC Pulm Med.* 2023; 31; 23(1): 318. doi: 10.1186/s12890-023-02606-1.
16. Castellano MVCO, Pereira LFF, Feitosa PHR, Knorst MM, Salim C, Rodrigues MM, et al. 2022 Brazilian Thoracic Association recommendations for long-term home oxygen therapy. *J Bras Pneumol.* 2022; 48(5): e20220179 29. doi: 10.36416/1806-3756/e20220179.
17. Freitas CG, Pereira CAC, Viegas CAA. Capacidade inspiratória, limitação ao exercício, e preditores de gravidade e prognóstico, em doença pulmonar obstrutiva crônica. *J Bras Pneumol.* 2007; 33(4): 389-96. doi: 10.1590/S1806-37132007000400007.
18. Kobayashi S, Kubo H, Yanai M. Impairment of the swallowing reflex in exacerbations of COPD. *Thorax.* 2007; 62(11): 1017. doi: 10.1136/thx.2007.084715.
19. Garand KL, Strange C, Paoletti L, Hopkins-Rossabi T, Martin-Harris B. Oropharyngeal swallow physiology and swallowing-related quality of life in underweight patients with concomitant advanced chronic obstructive pulmonary disease. *Int J Chron Obstruct Pulmon Dis.* 2018; 29 (13): 2663-71. doi: 10.2147/COPD.S165657.
20. Mancopes R, Rosa FBD, Tomasi LL, Pasqualoto AS; Steele CM. Chronic obstructive pulmonary disease and dysphagia: what have we learned so far and what do we still need to investigate? Perspectives of the ASHA Special Interest Groups. 2021; 6(5): 1212-21. doi: 10.1044/2021\_PERSP-20-00288.
21. Steidl E, Ribeiro CS, Gonçalves BF, Fernandes N, Antunes V, Mancopes R. Relação entre Disfagia e Exacerbações em Crônicos: Doença Pulmonar Obstrutiva: Uma Revisão da Literatura. *Int Arch Otorhinolaryngol.* 2015; 19(1): 74-9. doi: 10.1055/s-0034-1376430.
22. Lin TF, Shune S. Chronic obstructive pulmonary disease and dysphagia: a synergistic review. *Geriatrics (Basel).* 2020; 24(3): 45. doi: 10.3390/geriatrics5030045.
23. Mancopes R, Steele CM. Videofluoroscopic measures of swallowing in people with stable COPD compared to healthy aging. *Codas.* 2023; 36(1): e20220260. doi: 10.1590/2317-1782/20232022260.
24. Mancopes R, Peladeau-Pigeon M, Barrett E, Guran A, Smaoui S, Pasqualoto AS, et al. Quantitative videofluoroscopic analysis of swallowing physiology and function in individuals with chronic obstructive pulmonary disease. *J Speech Lang Hear Res.* 2020; 63(11): 3643-58. doi: 10.1044/2020\_JSLHR-20-00154.
25. Ghannouchi I, Speyer R, Doma K, Cordier R, Verin E. Swallowing function and chronic respiratory diseases: systematic review. *Respir Med.* 2016; 117: 54-64. doi: 10.1016/j.rmed.2016.05.024.
26. Namasivayam-MacDonald AM, Riquelme LF. Presbyphagia to dysphagia: multiple perspectives and strategies for quality care of older adults. *Semin Speech Lang.* 2019; 40(3): 227-42. doi: 10.1055/s-0039-1688837.
27. Fávero SR, Teixeira PJZ, Cardoso MCAF. Oropharyngeal dysfunction and frequency of exacerbation in Chronic Obstructive Pulmonary Disease patients with exacerbating phenotype. *Audiol Commun Res.* 2020; 25:e2231. doi: 10.1590/2317-6431-2019-2231.
28. Penna LM, Nascimento GSS, Guimarães MF, Nunes JA, Azevedo EHM. Screening of dysphagia in patients with pulmonary disease. *Distúrb Comun.* 2022; 34(2): e53867. doi: 10.23925/2176-2724.2022v34i2e53867.



This work is licensed under a Creative Commons Attribution 4.0 International License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

