



# Screening of Dysphagia in Patients with Pulmonary Disease

## Rastreamento do Risco de Disfagia em Pacientes com Doenças Pulmonares

## Detección del Riesgo de Disfagia en Pacientes con Enfermedades Pulmonares

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### Abstract

**Introduction:** Lung diseases are often associated with increased morbidity and mortality due to ventilatory impairment and a negative impact on lower airway protection, in addition to favoring a desynchrony between swallowing and breathing, compromising function, pleasure, quality of life, and possibility of death. **Objective:** To identify the risk of dysphagia in patients with lung diseases. **Method:** Cross-sectional, descriptive study, carried out from March 2016 to July 2019, in a University Hospital. Patients aged 18 years or over, of both sexes, regardless of associated factors, with sufficient alertness to respond to the instrument were included, and patients with difficulties in understanding sentences and/or instructions, with previous screenings, undergoing speech therapy, unavailability to participate in the study, out of bed or with instability of the clinical condition were excluded. Sociodemographic data and clinical variables were collected, and the Eating Assessment Tool (EAT-10) was applied. For statistical analysis, a 5% level of significance was considered. **Results:** 99 patients participated with a prevalence of males (54.5%), aged over 60 years (57.6%) and diagnosed with tuberculosis (16.1%). There was risk of dysphagia in 15 (15.2%) patients with a prevalence of pulmonary emphysema (26.6%) and pneumonia (20%). There was no association between risk of dysphagia and sex, age, orotracheal intubation, tracheostomy, alternative feeding route, gastroesophageal reflux, dysphonia and underlying

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#### Authors' contributions:

LMP: Data interpretation and article writing.

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lung disease. **Conclusion:** Through a quick and simple screening tool, the presence of risk of dysphagia was observed in 15.2% of patients with lung diseases.

**Keywords:** Deglutition; Deglutition Disorders; Lung Diseases; Mass Screening.

### Resumo

**Introdução:** As doenças pulmonares são frequentemente associadas com aumento da morbidade e mortalidade pelo comprometimento ventilatório e impacto negativo na proteção de via aérea inferior, além de favorecer uma dissincronia entre a deglutição e respiração comprometendo a função, prazer, qualidade de vida, podendo levar ao óbito. **Objetivo:** Identificar o risco de disfagia em pacientes com doenças pulmonares. **Método:** Estudo transversal, descritivo, realizado de março/2016 a julho/2019, em um Hospital Universitário. Foram incluídos pacientes com idade igual ou superior a 18 anos, de ambos os sexos, independente de fatores associados, com estado de alerta suficiente para responder o instrumento; e excluídos pacientes com dificuldades quanto à compreensão das sentenças e/ou instruções, com rastreios prévios, em acompanhamento fonoaudiológico, indisponibilidade para participar do estudo, ausência no leito ou instabilidade do quadro clínico. Foram coletados os dados sociodemográficos, as variáveis clínicas e aplicado o instrumento *Eating Assessment Tool* (EAT-10). Para análise estatística foi considerado o nível de 5% de significância. **Resultados:** Participaram 99 pacientes com prevalência do sexo masculino (54,5%), idade acima de 60 anos (57,6%) e diagnóstico de tuberculose (16,1%). Houve risco de disfagia em 15 (15,2%) pacientes com prevalência de enfisema pulmonar (26,6%) e pneumonia (20%). Não foi observada associação entre risco de disfagia e sexo, idade, intubação orotraqueal, traqueostomia, via alternativa de alimentação, refluxo gastroesofágico, disфония e doença de base pulmonar. **Conclusão:** Por meio de uma ferramenta rápida e simples de rastreamento foi observada a presença do risco de disfagia em 15,2% dos pacientes com doenças pulmonares.

**Palavras-chave:** Deglutição; Transtornos de Deglutição; Pneumopatias; Programas de Rastreamento.

### Resumen

**Introducción:** Las enfermedades pulmonares se asocian con un aumento de la morbimortalidad por deterioro ventilatorio y un impacto negativo en la protección de las vías respiratorias inferiores, además de favorecer una disincronía entre la deglución y la respiración, comprometiendo la función, el placer, la calidad de vida y pudiendo conducir a la muerte. **Objetivo:** Identificar el riesgo de disfagia en pacientes con enfermedades pulmonares. **Método:** Estudio transversal, descriptivo, realizado de marzo/2016 a julio/2019, en un Hospital Universitario. Se incluyeron pacientes con edad igual o superior a 18 años, de ambos sexos, independientemente de los factores asociados, con estado de alerta suficiente para responder al instrumento, y se excluyeron pacientes con dificultades en la comprensión de frases y/o instrucciones, con tamizaje previo, en tratamiento logopédico, indisponibilidad para participar en el estudio, ausencia en la cama o inestabilidad del cuadro clínico. Se recogieron datos sociodemográficos y variables clínicas y se aplicó el *Eating Assessment Tool* (EAT-10). Para el análisis estadístico se consideró un nivel de significación del 5%. **Resultados:** Participaron 99 pacientes con predominio del sexo masculino (54,5%), mayores de 60 años (57,6%) y diagnosticados de tuberculosis (16,1%). Hubo riesgo de disfagia en 15 (15,2%) pacientes con predominio de enfisema pulmonar (26,6%) y neumonía (20%). No hubo asociación entre riesgo de disfagia y sexo, edad, intubación orotraqueal, traqueotomía, vía alternativa de alimentación, reflujo gastroesofágico, disфония y enfermedad pulmonar subyacente. **Conclusión:** A través de una herramienta de tamizaje **rápida y sencilla** se observó la presencia de riesgo de disfagia en el 15,2% de los pacientes con enfermedades pulmonares.

**Palabras clave:** Deglución; Trastorno de Deglución; Enfermedades Pulmonares; Tamizaje Masivo.

## Introduction

Characterized by airway obstruction and increased resistance to expiration with an inflammatory response in the lungs, pulmonary disease affects 5% to 15% of the adult population and, in 90% of cases, is related to smoking<sup>1</sup>. There is a set of clinical conditions included in this group of diseases, such as chronic bronchitis, pulmonary emphysema, asthma, bronchiectasis, chronic obstructive pulmonary disease (COPD), pneumonia, cystic fibrosis, tuberculosis, and lung cancer, which represent an important cause of morbidity and mortality in the population<sup>2</sup>.

Swallowing and breathing are two complex processes that require an interaction of shared anatomical structures and physiological functions whose coordination is an important mechanism to prevent pulmonary aspiration<sup>3</sup>. In this sense, the literature shows that there is a correlation between chronic respiratory diseases and oropharyngeal dysphagia<sup>3-5</sup> due to changes in the breathing pattern, thus affecting the coordination between breathing and swallowing, reducing apnea time and laryngeal closure, and causing a predisposition to laryngotracheal penetration and aspiration. There may be a reduction in cough strength and alteration in laryngeal sensitivity due to episodes of chronic coughs, leading to the occurrence of silent aspirations<sup>6,7,8</sup>.

Dysphagia observed in patients with pulmonary disease has been reported as a risk for worsening and exacerbations of the respiratory condition, since it increases the risk of airway penetrations, impairing lung conditions<sup>9,10</sup> and making patients prone to their complications, which can be minimized with improved swallowing function<sup>11</sup>.

Specifically in the hospital environment, dysphagia is related to the increase in length of stay, costs to the health system and the risk of mortality. In patients with pulmonary disease such as COPD, there is a relationship between dysphagia and aspiration during hospitalization<sup>12</sup>. Therefore, the oropharyngeal dysphagia must be understood as a factor that burdens the health system and needs immediate recognition and appropriate treatment<sup>10,13</sup>.

It should be noted that there are clinical guidelines that recommend the early identification of the risk of dysphagia. In this sense, the use of specific instruments for screening represents a practical and low-cost alternative for the early identification and referral of the patient for a speech-language

pathology assessment, allowing an efficient and safe oral intake associated with the maintenance of the lung health<sup>10,14</sup>.

In this context and understanding that hospitalized patients with lung diseases, at different ages, may have some degree of dysphagia, this study aimed to identify the risk of dysphagia in patients with lung diseases.

## Method

This is a cross-sectional and descriptive study that was carried out from March/2016 to July/2019, in a University Hospital, and it was approved by the Research Ethics Committee of the Institution, under the opinion No. 1,655,313 and CAAE 54342716.9.0000.5071.

This study was carried out in a medium-sized hospital with 249 beds in different wards, including the beds intended for Pulmonology. The clinical staff of the hospital includes six speech-language pathologists, three of whom work directly with adult dysphagia, and the care is provided through a request for medical opinion and through an active search of patients with needs for referral and/or speech-language pathology intervention.

The sample was selected for convenience and included patients hospitalized in the Pulmonology Sector, aged 18 years or older, of both sexes, and with sufficient capacity to respond to the instrument. However, the study did not include hospitalized patients with difficulties in understanding sentences and/or instructions, who were accompanied by the Speech-Language Pathology care team prior to the screening, patients readmitted with previous screenings, as well as those who were unable to participate in the study, patients who were not in bed at the time of screening or who had an unstable clinical condition. All subjects enrolled in the research were previously informed of the procedures and signed the Informed Consent Form (ICF).

The study used the analysis of medical records to obtain sociodemographic data, the underlying disease and the following variables: dysphonia, gastroesophageal reflux (GER - involuntary movement of gastric contents to the esophagus), orotracheal intubation (OTI - procedure in which a tube is passed through the mouth and vocal apparatus into the trachea to keep the route open to the lung and ensure adequate ventilation through a respirator), tracheostomy (TQT - surgical procedure that allows

the patient's upper airways to be unobstructed) and alternative feeding route (AFR- feeding route used to guarantee the nutritional needs of the patient in case it is impossible to eat orally, such as nasogastric tubes or gastrostomies included in this study). These variables were selected due to their relationship with the swallowing function and the possibility of exacerbation of the clinical condition.

Information related to dysphagia risk screening was obtained through the application of the Eating Assessment Tool (EAT-10)<sup>14</sup>, which is a self-assessment instrument and is also used for the purpose of dysphagia risk screening in patients with different diagnoses. In this sense, the researchers decided to use it as a screening tool in this study. The instrument has ten simple questions and is quick to apply, in addition to not requiring analog visual measurements and formulas for calculations<sup>14</sup>. The EAT-10 also has excellent internal consistency, reproducibility and validity based on criteria of 0.85 and 0.82 of sensitivity and specificity, respectively<sup>15</sup>. The EAT-10 can be applied by different health professionals, which may favor the increase in referrals to a speech-language pathology assessment, thus contributing to earlier multidisciplinary interventions, reducing treatment costs and improving quality of life. The instrument has a cut-off point of 3, which indicates the risk of dysphagia and, consequently, the need for a formal speech-language pathology assessment<sup>14-16</sup>.

Due to the socioeconomic conditions of the patients who attend the University Hospital, the study chose to train the researcher who was responsible for collecting data, and the questions were read and explained to each patient to ensure that they understood the screening-related questions.

Then, all data were tabulated in a database created in Microsoft Office Excel<sup>®</sup> for statistical analysis. The results of the patients' characteristics were

described by absolute and relative frequencies. Finally, Fisher's exact test was used to investigate the association between demographic and clinical variables and the risk of dysphagia, and a significance level of 5% was adopted for all analyzes.

## Results

Although the researchers selected 117 patients with pulmonary diseases, 18 patients were excluded due to readmission with previous screening, difficulties in understanding and/or instrument instructions, and changes that made the application of the instrument unfeasible. As a result, the sample consisted of 99 (100%) individuals, whose clinical and demographic characteristics are shown in Table 1.

There was a prevalence of males (54.5%) and age over 60 years (57.6%). In addition, the researchers found a wide variability of pulmonary diseases as underlying diseases. Due to the great variability, it was decided to group the underlying diseases that had a very small value (N) in the item "others". In this sense, this group (45.6%) included chronic fibrosis, infection, cancer, embolism, emphysema, hypertension, pleural effusion, aspergillosis, abscess, bronchiectasis, and coccidioidomycosis. Although tuberculosis was the most prevalent disease (16.1%) in the total sample, followed by pneumonia (15.1%), the most prevalent diseases in patients identified as at risk of dysphagia were pulmonary emphysema (26.6%) and pneumonia (20%).

Most patients included in the research did not use OTI (92.9%), TQT (96.0%) and AFR (96.0%). In addition, most patients did not have recorded data on GER (96.0%) and dysphonia (97.0%), but a risk of dysphagia was found in 15 (15.2%) of the screened patients.

**Table 1.** Clinical and demographic characteristics of patients with pulmonary diseases (n=99)

Variable	N	%
<b>Sex</b>		
Female	45	45.5
Male	54	54.5
<b>Age</b>		
<60 years old	42	42.4
>60 years old	57	57.6
<b>Underlying disease</b>		
Tuberculosis	16	16.1
ILD	13	13.1
Pneumonia	15	15.1
COPD	10	10.1
Other	45	45.6
<b>Orotracheal Intubation</b>		
Yes	7	7.1
No	92	92.9
<b>Tracheostomy</b>		
Yes	4	4.0
No	95	96
<b>Alternative Feeding Route</b>		
Yes	4	4.0
No	95	96
<b>Gastroesophageal Reflux</b>		
Yes	4	4.0
No	95	96
<b>Dysphonia</b>		
Yes	3	3.0
No	96	97
<b>Risk of Dysphagia</b>		
Yes	15	15.2
No	84	84.8

Abbreviations: ILD=interstitial lung disease; COPD=chronic obstructive pulmonary disease; Other=chronic fibrosis, infection, cancer, embolism, emphysema, hypertension, pleural effusion, aspergillosis, abscess, bronchiectasis, coccidioidomycosis.

The association between clinical and demographic characteristics of patients hospitalized with pulmonary diseases and at risk of dysphagia is shown in Table 2. No association was found

between risk of dysphagia and sex, age, underlying disease, OTI, TQT, AFR, presence of GER and dysphonia.

**Table 2.** Association between clinical and demographic characteristics of patients hospitalized with pulmonary diseases and at risk of dysphagia (n=15)

Characteristics	Risk of Dysphagia, N (%)	p-value
<b>Sex</b>		
Female	6 (40)	0,781*
Male	9(60)	
<b>Age</b>		
<60 years old	5 (33,3)	0,574*
>60 years old	10 (66,7)	
<b>Underlying Disease</b>		
Tuberculosis	1 (6,7)	0,114*
ILD	1 (6,7)	
Pneumonia	3 (20)	
COPD	1 (6,7)	
Pulmonary Emphysema**	4 (26,6)	
Pulmonary Embolism**	2 (13,3)	
Pulmonary Fibrosis**	1 (6,7)	
Pulmonary Hypertension**	2 (13,3)	
<b>Orotracheal Intubation</b>		
Yes	0	0,590*
No	15 (100)	
<b>Tracheostomy</b>		
Yes	0	0,999*
No	15 (100)	
<b>Alternative Feeding Route</b>		
Yes	2 (13,3)	0,108*
No	13 (86,7)	
<b>Gastroesophageal Reflux</b>		
Yes	1 (6,7)	0,487*
No	14(93,3)	
<b>Dysphonia</b>		
Yes	2 (13,3)	0,059*
No	13(86,7)	

Abbreviations: COPD=chronic obstructive pulmonary disease; ILD=interstitial lung disease. The percentages of underlying diseases refer to patients at risk of dysphagia related to each disease \*Fisher's Exact Test \*\*Pulmonary emphysema, Pulmonary embolism, Pulmonary embolism and Pulmonary hypertension are described as "Others" in the Underlying disease item in Table 1.

## Discussion

The prevalence of dysphagia in patients with lung diseases varies between 52% and 78%<sup>3,5,12,17</sup>, and it can lead to worsening of ventilatory function with a greater chance of hospitalization<sup>3</sup>, and increased morbidity and mortality due to the high risk of aspiration pneumonia and malnutrition<sup>17</sup>. Therefore, it is essential to provide care to prevent clinical complications<sup>3,12</sup> that can be mitigated by screening for swallowing disorders and early intervention. In this way, this care can favor an adequate functional result, provide a better quality of life and reduce institutional costs<sup>10</sup>.

Pulmonary diseases can lead to reduced lung volume, impaired capacity for inspired and expired air, shorter time for swallowing apnea, incoordination between swallowing and breathing, and may favor episodes of stasis and aspiration<sup>2,3,4,6,17</sup>, which can worsen the patient's clinical condition.

It should be noted that, as found in this study, some lung diseases are reported more frequently in males and in the elderly age group<sup>2,18,19</sup>. The prevalence of males can be explained by negligence and/or limited preventive health care<sup>19</sup>.

In turn, with regard to age, it is known that changes in the stomatognathic system resulting from aging can affect the phases of swallowing, such as reduced saliva production, slow oral and oral preparatory phase, and presence of food residue in the digestive tract<sup>13</sup>. Therefore, changes related to aging, associated with the presence of pulmonary alterations, which reduce ventilatory function in these individuals, increase the probability of incoordination between the synchrony of breathing and swallowing, thus increasing the risk of aspiration.

As shown in several studies, the association between lung disease and dysphagia is more investigated in patients with COPD<sup>2,4-6,9,20-24</sup>. As breathing is interrupted during swallowing and resumed in the

inspiratory phase, increasing the risk of aspiration, the change in swallowing biomechanics can lead to exacerbation of the disease<sup>6</sup>. According to Hopkins-Rossabi et al.<sup>25</sup>, the expiratory phase before and after swallowing is reported as the most consistent and common respiratory phase pattern across the age group in healthy and non-dysphagic adults.

This study found a prevalence of tuberculosis (16.0%) among lung diseases, which is believed to be due to the characteristics of the selected study center, which is a reference in the treatment of this disease. The literature reports that tuberculosis is the leading cause of death from infectious disease among adults worldwide, with more than 10 million people affected per year<sup>26</sup>.

However, it should be noted that there is a limitation in the number of studies related to pulmonary tuberculosis and oropharyngeal dysphagia. In another study, by Hussaini et al.<sup>27</sup>, the authors found symptoms of odynophagia in a patient with basis of tongue tuberculosis following pulmonary tuberculosis.

Individuals who have reduced muscle strength, compromised capacity for exhaled air, and decreased pharyngeal and laryngeal sensitivity, may have aspiration pneumonia<sup>21,22,24</sup> due to the lack of protection of the lower airways.

Although pneumonia was the second most frequent lung disease among the patients in this study, no records of aspiration were found as a causal factor. According to Schmidt Leuenberger et al.<sup>28</sup> the early detection of dysphagia in the postoperative period of lung resection can significantly reduce the risk of pneumonia.

In this study, 15.2% (n=15) of patients with pulmonary diseases were at risk of dysphagia in this study, which is in line with the study by Favero et al.<sup>20</sup>, which reported a 48.1% risk of dysphagia using the same instrument in COPD patients with an exacerbating phenotype. It should be noted that COPD is the most reported lung disease in the literature related to swallowing disorders<sup>2-6,9,12,17,18,20-24,29</sup>. This difference is believed to be due to the low N of each disease, since only one of the 10 patients with COPD was at risk of dysphagia.

No association was found between the risk of dysphagia and the variables sex, age, underlying disease, use of OTI, TQT, AFR, GER and dysphonia. It is worth noting that most subjects in the study did not use IOT, TQT and AFR, since these devices increase the risk of dysphagia through dis-

use and atrophy of the laryngeal muscles, reduction of subglottal pressure and reduction of laryngeal sensitivity, favoring the accumulation of secretions and, consequently, related to the risk of compromising the swallowing biomechanics<sup>30</sup>.

In turn, few patients with a history of TQT and OTI use were not at risk of dysphagia. It is believed that these patients were clinically stable after the period of extubation and exacerbation of the disease, which explains the absence of a negative perception of swallowing. As TQT may have been a long-term device for some patients, they would have been well-adapted and had no complaints of dysphagia. In addition, the use of the device alone is not a mandatory factor for the presence of risk of functional alteration, unlike its use within a context that may not have occurred for these patients.

In analyzing the relationship of pulmonary disease with GER, a recent systematic review<sup>29</sup> found that GER disease is correlated with COPD exacerbation. This finding is in line with this study, since most individuals did not have GER, thus reducing the risk of dysphagia in this population<sup>6</sup>.

It should be noted that dysphonia was not found in most individuals in this study. Although vocal quality assessment data are not available, the absence of dysphonia is related to the hypothesis of complete glottic closure and consequent adequate protection of the lower airway.

As good coordination between breathing and swallowing minimizes laryngotracheal penetration/aspiration episodes, a positive self-perception of swallowing may reflect the clinical stability of patients with investigated lung diseases<sup>4,24</sup>.

In addition, it is noteworthy that patients with lung diseases may have difficulty in identifying the swallowing disorder. As chronic cough is a symptom of the underlying disease, dysphagia is often not reported to the healthcare professional. The literature<sup>5,21</sup> shows a divergence between the subjective reports of patients with COPD, who were evaluated through self-perception questionnaires, in relation to swallowing and their real ability to swallow, which was evaluated through objective tests. This reinforces the relevance of continuing education work and guidance to patients, caregivers and the multiprofessional team, to be developed by speech-language pathologists, regarding the risk of dysphagia, main signs and symptoms, especially in inpatient clinics for pulmonology patients.

The literature shows that the presence of lung diseases changes the physiology of swallowing, affecting its safety and increasing the risk of pulmonary complications<sup>2,4,5,7,9,17,22,24</sup>. Despite methodological limitations, most studies show an association between dysphagia, COPD and obstructive sleep apnea. However, in the absence of randomized controlled trials, further studies are needed to assess the relationship between the pathophysiology of dysphagia and chronic respiratory diseases<sup>3</sup>.

This study had some limitations, such as: (i) the small sample obtained, since the hospital profile is a clinical reference in cardiology, acute abdomen and high-risk maternity; (ii) the unavailability of the objective examination of swallowing in the hospital where the study was carried out; and (iii) the lack of data on the reason for hospitalization and exacerbation of the disease. In addition, the exclusion of previously screened patients could also have been considered a limitation, since the patient's risk changes daily according to their clinical condition.

As individuals with pulmonary alterations are susceptible to different degrees of dysphagia, it is believed that screening for the risk of dysphagia in these patients is essential. Finally, the relevance of studies with more robust designs is reinforced, with a greater number of participants and the possibility of clinical and instrumental evaluation, after identifying the risk of dysphagia. In this way, it would be possible to develop an individualized therapeutic plan, aiming to optimize the functional ability of swallowing, minimize nutritional risks, reduce the risk of pneumonia and hospital stay, and increase the pleasure and quality of life of individuals, in addition to minimizing costs for the health service.

## Conclusion

Based on the screening performed using a quick and simple tool, a risk of dysphagia was found in 15.2% of patients with lung diseases.

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**APPENDIX****Eating Assessment Tool (EAT-10)**

(BELAFSKY et al. 2008; Gonçalves, Remaili and Behlau, 2013)

Date: \_\_\_\_\_ Medical Record No.: \_\_\_\_\_

Name: \_\_\_\_\_

Weight: \_\_\_\_\_ Height: \_\_\_\_\_

Please comment on your swallowing problem.  
\_\_\_\_\_Please list all swallowing tests you have taken (date and results).  
\_\_\_\_\_To what extent are the following scenarios problematic for you?  
Circle the appropriate response

0 = No Problem    4 = Severe Problem					
1. My swallowing problems has caused me to lose weight.	0	1	2	3	4
2. My swallowing problem interferes with my ability to go out for meals.	0	1	2	3	4
3. Swallowing liquids takes extra effort.	0	1	2	3	4
4. Swallowing solids takes extra effort.	0	1	2	3	4
5. Swallowing pills takes extra effort.	0	1	2	3	4
6. Swallowing is painful.	0	1	2	3	4
7. The pleasure of eating is affected by my swallowing.	0	1	2	3	4
8. When I swallow food sticks in my throat	0	1	2	3	4
9. I cough when I eat.	0	1	2	3	4
10. Swallowing is stressful.	0	1	2	3	4
Total EAT-10					

