

Symptoms of dysphagia in patients with COPD*

Sintomas indicativos de disfagia em portadores de DPOC

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Abstract

Objective: To identify symptoms of dysphagia in individuals with COPD, based on their responses on a self-perception questionnaire. **Methods:** The study comprised 35 individuals with COPD and 35 healthy individuals, matched for age and gender. The study group was assessed regarding COPD severity; sensation of dyspnea; body mass index (BMI); and symptoms of dysphagia. The control group was assessed regarding BMI and symptoms of dysphagia. **Results:** The most common symptoms of dysphagia in the study group were pharyngeal symptoms/airway protection ($p < 0.001$); esophageal symptoms/history of pneumonia ($p < 0.001$); and nutritional symptoms ($p < 0.001$). Positive correlations were found between the following pairs of variables: FEV₁ and BMI ($r = 0.567$; $p < 0.001$); pharyngeal symptoms/airway protection and dyspnea ($r = 0.408$; $p = 0.015$); and esophageal symptoms/history of pneumonia and pharyngeal symptoms/airway protection ($r = 0.531$; $p = 0.001$). There was a negative correlation between nutritional symptoms and BMI ($r = -0.046$; $p < 0.008$). **Conclusions:** Our results show that the individuals with COPD presented with symptoms of dysphagia that were associated with the pharyngeal and esophageal phases of swallowing, as well as with the mechanism of airway protection, a history of pneumonia, and nutritional symptoms.

Keywords: Deglutition disorders; Pulmonary disease, chronic obstructive; Pathological conditions, signs and symptoms.

Resumo

Objetivo: Identificar os sintomas indicativos de disfagia em indivíduos portadores de DPOC a partir de um questionário de autopercepção. **Métodos:** Foram avaliados 35 indivíduos portadores de DPOC e 35 indivíduos sem a doença pareados por gênero e idade. O grupo de estudo foi avaliado quanto a gravidade da doença, sensação de dispneia, índice de massa corpórea (IMC) e sintomas de disfagia. O grupo controle foi avaliado quanto a IMC e sintomas de disfagia. **Resultados:** Os sintomas mais frequentes de disfagia apresentados pelos participantes do grupo de estudo foram sintomas faríngeos/proteção de vias aéreas ($p < 0,001$), sintomas esofágicos/histórico de pneumonia ($p < 0,001$) e sintomas alimentares ($p < 0,001$). As seguintes variáveis apresentaram correlações positivas: VEF₁ e IMC ($r = 0,567$; $p < 0,001$); sintomas faríngeos/proteção de vias aéreas e dispneia ($r = 0,408$; $p = 0,015$); e sintomas esofágicos/histórico de pneumonia e sintomas faríngeos/proteção de vias aéreas ($r = 0,531$; $p = 0,001$). Houve correlação negativa entre sintomas alimentares e IMC ($r = -0,046$; $p < 0,008$). **Conclusões:** Os resultados mostraram que os participantes com DPOC apresentaram sintomas de disfagia relacionados à fase faríngea e esofágica da deglutição; ao mecanismo de proteção das vias aéreas; ao histórico de pneumonia e aos sintomas alimentares.

Descritores: Transtornos de deglutição; Doença pulmonar obstrutiva crônica; Condições patológicas, sinais e sintomas.

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Introduction

The purpose of swallowing is to move food from the oral cavity to the stomach in a safe manner, maintaining the nutritional status and protecting the airway.⁽¹⁾ Swallowing is considered a complex activity that comprises voluntary and involuntary actions and requires the coordination of many muscles and brain areas.⁽²⁾ Swallowing consists of four phases: the oral preparatory phase; the oral phase; the pharyngeal phase; and the esophageal phase. The oral preparatory and oral phases correspond to the preparation of food in the oral cavity and the transportation of the food bolus to the pharynx. In the pharyngeal phase, food is transported to the esophagus. This phase involves a series of involuntary actions aimed at airway protection. The esophageal phase corresponds to the transportation of the bolus to the stomach.⁽³⁾

Swallowing disorder, or dysphagia, is the impairment of any of the phases of swallowing, as a result of neurological, mechanical, or psychogenic impairment.⁽⁴⁾ Temporal coordination of swallowing and respiration is essential to preventing pulmonary aspiration,⁽⁵⁾ as well as to maintaining adequate nutrition and hydration.⁽⁶⁾ In healthy individuals, breathing is interrupted during swallowing and resumes in the expiratory phase.⁽⁷⁾ This is a protective mechanism that prevents laryngeal aspiration.⁽⁸⁾ The inspiratory pattern after swallowing, in which the vocal folds open, can facilitate the entrance of food and saliva into the larynx during or after swallowing.⁽⁹⁾

Changes in the pattern of breathing or ventilation can influence the coordination of swallowing and respiration, the synchrony between the two being essential for adequate protection of the lower airway.⁽¹⁰⁾ Patients with COPD can be susceptible to changes in the coordination of swallowing due to impaired lung function.⁽¹¹⁾ In this context, it has been reported that patients with COPD tend to interrupt breathing during swallowing and resume it in the inspiratory phase, which can therefore increase the risk of aspiration.⁽¹²⁾ In a study involving 14 patients with COPD, the participants were reported to have reduced ability to use pulmonary air to clear the larynx and ensure airway protection, which resulted in an increased risk of aspiration.⁽¹³⁾ In another study, patients with COPD were reported to

present with changes in the swallowing reflex, such changes being considered a risk factor for disease exacerbation.⁽¹⁴⁾

In the national and international literature, there have been few studies attempting to clarify swallowing changes in patients with COPD. A recent systematic review of the literature showed that it is difficult to compare studies investigating the relationship between COPD and swallowing because of the methodological differences, principally regarding the selection and inclusion criteria (lack of data regarding COPD diagnosis and severity, as well as inclusion of individuals with comorbidities).⁽¹⁵⁾

The objective of the present study was to identify symptoms of dysphagia in individuals with COPD, based on their responses on a self-perception questionnaire.

Methods

The study group comprised 35 participants, selected from a total of 287 patients being clinically followed at the obstructive pulmonary disease outpatient clinic of a tertiary care hospital. The inclusion criteria were as follows: having been diagnosed with COPD in accordance with the diagnostic criteria established by the Global Initiative for Chronic Obstructive Lung Disease⁽¹⁶⁾; being in the 50-65 year age bracket; being under optimized clinical and pharmacological treatment; and being clinically stable (no symptom exacerbation for at least 30 days.).

Patients who were oxygen-dependent were excluded, as were those with a history of neurological disease, severe heart disease, neoplasia, other pulmonary diseases, or oropharyngeal/laryngotracheal surgery.

The control group comprised 35 healthy volunteers, recruited from among employees of the institution or from among members of the community, who were matched to the COPD patients for age and gender. Individuals were selected by means of an interview focusing on general health status, history of smoking, and occupational history, as well as on current and previous diseases. The control group exclusion criteria were as follows: being a current or former smoker; having been hospitalized in the last 12 months; having a sedentary lifestyle; having a history of pulmonary diseases, including childhood asthma or bronchitis (or

both); having a history of neurological disease, heart diseases, neoplasia, oropharyngeal surgery, or laryngotracheal surgery; and having a history of occupational exposure to toxic substances.

The study was approved by the local research ethics committee (protocol no. 0074/08). All of the participants gave written informed consent.

The study group was assessed regarding the following variables: COPD severity; sensation of dyspnea; body mass index (BMI); and symptoms of dysphagia. Disease severity was characterized by FEV₁, as measured by spirometry. Dyspnea was quantified by the Modified Medical Research Council (MMRC) scale, which comprises 5 questions (for which the scores ranged from 1 to 5) based on the different degrees of physical activity that cause shortness of breath. A higher score translates to a greater degree of dyspnea.⁽¹⁷⁾ The BMI was calculated by dividing weight (in kg) by height (in m²). The index was expressed in kg/m², in accordance with the norms of the National Institutes of Health and of the National Heart, Lung and Blood Institute. The BMI was included as a variable because patients with COPD present with weight loss and a low BMI.⁽¹⁸⁾

For the identification of symptoms of dysphagia, we adopted an international questionnaire that was translated to Brazilian Portuguese and culturally adapted for use in Brazil by the authors of the present study. The questionnaire comprises 15 questions. There are three possible responses to each question, and, on the basis of the responses, the symptoms are categorized as moderate (very frequent), mild (infrequent), or absent (no symptoms). To perform the required analyses, we scored the responses 0, 1, or 2, representing the absence of symptoms, the presence of mild symptoms, and the presence of moderate symptoms, respectively. We maintained the original format of the questionnaire (i.e., the items that constitute the questionnaire and the order in which the questions are presented). The standard procedure in the administration of the questionnaire was reading the questions to all patients (Appendix 1).⁽¹⁹⁾

For the statistical analysis, we used the programs Statistical Package for the Social Sciences, version 16 (SPSS Inc., Chicago, IL, USA), and Minitab, version 15 (Minitab Inc.,

State College, MA, USA). The test of equivalence of two proportions was used in order to compare the groups in terms of the distribution of gender. The Mann-Whitney test was used to compare the groups regarding age, BMI, and factor analysis. Cronbach's alpha coefficient was used to determine the internal consistency of the questionnaire data. Factor analysis for the exploration of the questionnaire data and the creation of multivariate factors through the variability and intrinsic correlations among variables was performed after the suitability of the data to factor analysis was determined by the Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of sphericity. Spearman's and Pearson's correlation coefficients were used to correlate all of the variables within the groups. The level of statistical significance was set at $p < 0.05$ for all tests.

Results

Because the groups were matched for gender and age, there were no significant differences in terms of those variables ($p = 1.00$). There were significant differences between the two groups in terms of the mean BMI, which was lower in study group than in control group ($p < 0.01$). The participants with COPD presented with a mean FEV₁ of $43.4 \pm 19.5\%$ of predicted. Among study group participants, all of the different stages of disease severity were represented, the most common being stage III. These results can be seen in Table 1.

Table 2 shows a comparison between the two groups in terms of the symptoms of dysphagia. In the study group, the number of individuals who gave a response that was equivalent to "moderate symptom of dysphagia" was greater for question 1 than for any other question, as well as being greater, for question 1 alone, than the number of control group individuals who gave an equivalent response. Question 1 refers to a history of pneumonia, and the response can be influenced by the high frequency of respiratory infections in individuals with COPD. Because the response to question 1 could interfere with the results, we performed two statistical analyses of the questionnaire. In one of the analysis, question 1 was included, whereas in the other, it was not. The two statistical analyses yielded similar results. Therefore, we decided to maintain question 1 in the questionnaire.

¹ Questionnaire published here in Portuguese only; original (English-language) version available in Kawashima et al.⁽¹⁹⁾

Table 1 – Characteristics of the participants.^a

Variable	COPD	Control	p
	n = 35	n = 35	
Gender, M/F	17/18	17/18	1.00
Age, years	58 ± 4	58 ± 4	1.00
BMI, kg/m ²	25 ± 6	28 ± 5	0.005
GOLD, I/II/III/IV	3/5/20/7	-	-
Dyspnea, MMRC	3 ± 1	-	-

BMI: body mass index; GOLD: Global Initiative for Chronic Obstructive Lung Disease; and MMRC: Modified Medical Research Council (scale). ^aValues expressed as mean ± SD, with the exception of gender and GOLD stage, which are expressed as n.

The internal consistency of the questionnaire was high, as evidenced by a Cronbach's alpha of 0.866. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.804, and Bartlett's test of sphericity yielded a value of $p < 0.001$. These results demonstrated a satisfactory suitability of the data for factor analysis.

The purpose of factor analysis is to group questions with similar content into factors, thus reducing the number of study variables. In the present study, four factors were obtained. The factors were characterized by the predominance of symptoms. The factors were characterized as follows:

- Factor I: pharyngeal symptoms and airway protection
- Factor II: esophageal symptoms and history of pneumonia
- Factor III: nutritional symptoms
- Factor IV: impaired oral control

The results of the comparison between the two groups in terms of the four factors can be seen in Table 3. There were significant differences between the two groups, factor I, II, and III symptoms of dysphagia being more common in the participants with COPD.

Table 4 shows the correlations among the study variables in the study group. Positive

Table 2 – Distribution of the responses on the dysphagia screening questionnaire.

Question	Symptoms					
	Moderate		Mild		Absent	
	COPD	Control	COPD	Control	COPD	Control
	n	n	n	n	n	n
1	19	2	7	6	9	27
2	5	0	10	4	20	31
3	4	0	11	7	20	28
4	4	0	15	5	16	30
5	3	0	11	6	21	29
6	4	0	11	1	20	34
7	2	0	10	5	23	30
8	15	4	4	7	16	24
9	6	0	7	1	22	34
10	0	0	4	2	31	33
11	0	0	4	1	31	34
12	3	0	13	9	19	26
13	2	0	13	2	20	33
14	5	0	10	6	20	29
15	5	0	19	12	11	23
Mean	5.13	0.40	9.93	4.93	19.93	29.67
SD	5.18	1.21	4.25	3.19	5.92	3.60
p	< 0.001		< 0.003		< 0.001	

Table 3 – Symptoms of dysphagia, grouped by factor.

Statistics	Factors							
	I		II		III		IV	
	Pharyngeal symptoms/ airway protection		Esophageal symptoms/ history of pneumonia		Nutritional symptoms		Oral control	
	COPD	Control	COPD	Control	COPD	Control	COPD	Control
Mean	2.74	0.60	3.71	1.23	2.09	0.57	0.11	0.06
SD	2.58	1.12	2.55	1.52	1.80	0.95	0.32	0.24
p	< 0.001		< 0.001		< 0.001		0.397	

correlations were found between the following pairs of variables:

- FEV₁ and BMI, a lower FEV₁ translating to a lower BMI
- Factor I and dyspnea, a higher factor I score translating to a greater degree of dyspnea
- Factor II and factor I, a higher factor II score translating to a higher factor I score

Table 4 also shows that there was a negative correlation between factor III and BMI, a higher factor III score translating to a lower BMI.

Discussion

In the present study, the participants with COPD presented with symptoms of dysphagia that were associated with the pharyngeal and esophageal phases of swallowing, as well as with the mechanism of airway protection, a history of pneumonia, and nutritional symptoms. These findings corroborate the data in the literature.

Pharyngeal dysfunction in individuals with COPD has been identified in previous

studies, reduced elevation of the pharynx during swallowing and cricopharyngeal muscle dysfunction having been reported.^(20,21) In one retrospective study, videofluoroscopy was employed in order to evaluate swallowing in COPD patients, who were found to present with laryngeal penetration and aspiration.⁽²²⁾

Data regarding the mechanism of airway protection in individuals with COPD can also be found in the literature. One study showed that patients with COPD present with reduced respiratory muscle strength and reduced ability to use pulmonary air to clear the larynx and protect the airway.⁽¹³⁾ Two groups of authors used plethysmography to evaluate the coordination of swallowing and respiration in individuals with COPD. The results of those studies show that swallowing most often occurred during the inspiratory phase of respiration, and that this promoted the occurrence of aspiration.^(12,23) One interesting finding is the prolonged apnea observed in patients with COPD; this was considered to constitute a spontaneous compensatory strategy to protect the airway.^(20,23)

Table 4 – Correlations among the study variables.

Variable	Values	BMI	FEV ₁	Dyspnea	Factor I	Factor II	Factor III
FEV ₁	r	0.57					
	p	< 0.001					
Dyspnea	r	0.13	0				
	p	0.480	0.999				
Factor I	r	0.12	0.11	0.41			
	p	0.506	0.529	0.015			
Factor II	r	0.23	0.36	0.40	0.53		
	p	0.201	0.837	0.018	0.001		
Factor III	r	-0.45	-0.25	0.25	0.30	0.22	
	p	0.008*	0.149	0.141	0.083	0.196	
Factor IV	r	0.23	0.29	0.15	0.28	0.33	0.21
	p	0.195	0.097	0.382	0.099	0.055	0.228

BMI: body mass index; factor I: pharyngeal symptoms and airway protection; factor II: esophageal symptoms and history of pneumonia; factor III: nutritional symptoms; and factor IV: symptom of impaired oral control.

Previous studies have also reported the presence of esophageal symptoms in patients with COPD. Those patients complained that they experienced heartburn and reflux at least once a week. Swallowing disorders were also common in patients with COPD who presented with gastroesophageal reflux.^(24,25)

Regarding a history of pneumonia, the literature shows that patients with COPD commonly present with lower respiratory tract infections, the cause of which goes undetected in many cases.^(16,26) One possible cause of exacerbations in patients with COPD is the high rate of changes in the swallowing reflex among such individuals; this might account for recurrent pneumonia.^(14,27)

Weight loss and malnutrition have been reported to be clinical signs in patients with COPD, as well as being risk factors for mortality.⁽¹⁸⁾ In our study, the participants with COPD presented with nutritional symptoms principally related to solid food intake. To our knowledge, that finding has not been previously reported, and the variable therefore requires further, specific, investigation.

Weight loss and low BMI have been described as clinical signs in the profile of patients with COPD.⁽²⁸⁻³⁰⁾ Studies have reported that the severity of airflow obstruction correlates directly with the risk of malnutrition.^(29,30)

In the present study, dyspnea correlated positively with factors I and II. Therefore, the degree of dyspnea is associated with the presence of pharyngeal and esophageal symptoms, as well as with impaired airway protection and a history of pneumonia. Dyspnea is a typical symptom of COPD, and respiratory distress is probably the principal factor limiting activities of daily living.⁽¹⁶⁾ According to the literature,^(13,21-23) patients with COPD present with changes in the coordination of swallowing and respiration, which might explain our findings of gastroesophageal reflux disease and possible dysphagia.

The results of present study contribute to the characterization of symptoms of dysphagia in patients with COPD. However, our results should be considered in light of their application. Although we analyzed a total of 287 patients, the criteria for inclusion in the present study were restrictive in order to obtain a sample that was more homogeneous, with a smaller number of associated variables.

The results of the present study indicate that individuals with COPD present with symptoms of dysphagia. The symptoms reported here were found by administering a self-perception questionnaire. Further studies, employing objective methods (such as videofluoroscopy and endoscopic evaluation of swallowing) should be conducted in order to evaluate the physiological and pathological characteristics of swallowing in patients with COPD.

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Appendix 1 – Questionnaire for dysphagia screening.^a

1. <i>Você já foi diagnosticado como tendo pneumonia?</i>	<i>Mais de uma vez</i>	<i>Uma vez</i>	<i>Não</i>
2. <i>Você sente que está ficando magro?</i>	<i>Muito</i>	<i>Um pouco</i>	<i>Não</i>
3. <i>Você tem alguma dificuldade quando engole?</i>	<i>Muitas vezes</i>	<i>Às vezes</i>	<i>Não</i>
4. <i>Você engasga durante a refeição?</i>	<i>Muitas vezes</i>	<i>Às vezes</i>	<i>Não</i>
5. <i>Você engasga enquanto engole líquidos?</i>	<i>Muitas vezes</i>	<i>Às vezes</i>	<i>Não</i>
6. <i>Você tem dificuldade para tossir o catarro durante ou após a refeição?</i>	<i>Muitas vezes</i>	<i>Às vezes</i>	<i>Não</i>
7. <i>Você tem a sensação de que o alimento parou na sua garganta?</i>	<i>Muitas vezes</i>	<i>Às vezes</i>	<i>Não</i>
8. <i>Você leva mais tempo para comer uma refeição hoje em dia do que levava antes?</i>	<i>Sim</i>	<i>Algumas vezes</i>	<i>Não</i>
9. <i>Você sente que está ficando difícil para comer alimentos sólidos?</i>	<i>Muitas vezes</i>	<i>Às vezes</i>	<i>Não</i>
10. <i>Você derruba alimento da sua boca?</i>	<i>Muitas vezes</i>	<i>Às vezes</i>	<i>Não</i>
11. <i>Você tem a sensação de que a comida está ficando parada na sua boca?</i>	<i>Muitas vezes</i>	<i>Às vezes</i>	<i>Não</i>
12. <i>Você tem a sensação de que o alimento ou o líquido está subindo de volta para a sua garganta?</i>	<i>Muitas vezes</i>	<i>Às vezes</i>	<i>Não</i>
13. <i>Você tem a sensação de que o alimento está parado na parte de baixo da sua garganta?</i>	<i>Muitas vezes</i>	<i>Às vezes</i>	<i>Não</i>
14. <i>Você tem dificuldade para dormir porque tosse durante a noite?</i>	<i>Muitas vezes</i>	<i>Às vezes</i>	<i>Não</i>
15. <i>Você sente que está rouco?</i>	<i>Muitas vezes</i>	<i>Às vezes</i>	<i>Não</i>

^aKawashima et al.⁽¹⁹⁾; translated to Brazilian Portuguese and culturally adapted for use in Brazil.