

Oral Health in Patients with Chronic Obstructive Pulmonary Disease

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Abstract:

Background: The chronic obstructive pulmonary disease is a major cause of morbidity and mortality worldwide, with significant impact on general health and, therefore, oral health.

Aim: To identify the relationship between the prevalence of dental caries and tooth loss in patients with Chronic Obstructive Pulmonary Disease.

Methods: Epidemiological cross-sectional study including 80 individuals aged 32-93 years. Data were collected using the DMFT index. Mann-Whitney U test, Chi-squared and Fisher's Exact test were used for data analysis with statistical significance set at $p < 0.05$.

Results: COPD stages of patients were classified into severe/very severe (52.5%) and mild/moderate (47.5%). The DMFT index was 29.8, with a strong relationship between missing teeth and severe/very severe COPD ($p = 0.019$), and required extraction and mild/moderate COPD ($p = 0.022$). Statistical significance was found between COPD and loose teeth ($p = 0.032$). Patients with severe/very severe COPD had a median of 41 years of smoking habit, 38 years of drinking and smoked 40 cigarettes a day.

Conclusions: Patients with COPD presented a high DMFT index; in addition, missing teeth and required extraction were strongly related with COPD.

Keywords: Chronic Obstructive Pulmonary Disease; DMFT index; Tooth decay.

1. INTRODUCTION

Epidemiology provides the basis for the analysis of the distribution and magnitude of health problems in the population. It provides essential data for situational strategic planning and takes into account the local health needs for the definition of actions and provision of services [1,2].

In Brazil, there are four national epidemiological studies on oral health. The last one, the *Projeto Saúde Bucal Brasil 2010 – SB Brasil* (National Research on Oral Health), finished in 2010, shows that

dental caries is still the main disease affecting the oral cavity. Its results showed that nearly 56.0% of 12-year-old Brazilian children still have at least one decayed permanent tooth. It also reports that people aged 35-44 years have a mean decayed, missing and filled teeth index – DMFT Index – of 16.3%. According to the results of *SB Brasil*, one of the main risk factors for edentulism is early tooth loss, and the missing component is the main responsible for the high DMFT score[3].

The national results show a heterogeneous distribution of caries at ages 12, 15-19 and 35-44 years, with differences between macroregions: a higher rate of caries in the Northeast region and a lower rate in the South [4,5].

Brazil's oral health status reflects large existing socioeconomic inequalities and the poor access to dental care due to the limited provision of public services and the high cost of private care for most of the population [6].

The World Health Organization (WHO, 1999) defines oral health as a state of being free from mouth and facial pain, oral and throat cancer, oral infection and sores, birth defects, periodontal disease, tooth decay, tooth loss, and other diseases that affect the oral cavity. In this context, oral health is part of the general health and well-being of an individual and is considered essential to a good quality of life[7,8].

At this juncture, dental caries is the most prevalent disease worldwide and constitutes a major public health problem even in developed countries, being considered an infectious disease caused by a combination of multiple risk factors: poor oral hygiene, environmental factors, habits and nutritional factors[7,9]. The oral microbiota, particularly the periodontal disease pathogens, have been reported as major factors causing or triggering various diseases, including respiratory infection [10].

However, factors such as advanced age, dental biofilm, number of compromised teeth, use of medication, oral hygiene methods and frequency, tobacco and alcohol should be considered when discussing the association between respiratory infection and oral health [11]. Lung diseases constitute a public health problem, and the most common diseases affecting the population are the Community-acquired Pneumonia, the Hospital-acquired Pneumonia and the Chronic Obstructive Pulmonary Disease – COPD [12,13,11].

According to Gold [13], the chronic obstructive pulmonary disease (COPD) is a disease characterized by a progressive airflow limitation that is not fully reversible and has a multifactorial etiology involving genetic factors, exposure to risk factors and abnormal inflammatory response of the lungs; additionally, it is a major cause of morbidity and mortality worldwide.

In 2011, COPD was the third leading cause of death in the United States of America (USA) and it is predicted to be the third leading cause of death worldwide by 2030[13]. In Brazil, the number of COPD deaths was approximately 8:100,000 inhabitants in the 1980s and went up to 19 per 100 thousand inhabitants in the 1990s [14].

Among risk factors, smoking is the leading cause of COPD, as it is associated with abnormal inflammatory response of the lungs and/or inhalation of toxic particles or gases. However, factors such as occupational exposures may also lead to the development of the disease[13,14].

In this context, the quality of life of patients with COPD is associated with dyspnea and its severity [15]. Meanwhile, studies show that the infection does not affect only the lungs and respiratory muscles; there is also a significant systemic compromise that manifests as malnutrition, reduced strength, peripheral muscle weakness and decreased exercise tolerance [13,16,17].

Given the characteristics of patients with COPD and the currently adopted measures on dental caries, the present research aims to identify the relationship between oral health in patients with Chronic Obstructive Pulmonary Disease.

2. METHODS

This is a descriptive and analytical epidemiological cross-sectional study.

The study population consisted of patients treated at the COPD out patient center of the *Hospital de Messejana Dr. Carlos Alberto Studart Gomes – HM*, located in Messejana neighborhood, in the city of Fortaleza, Northeastern Brazil. The number of patients was determined by a census of patients attending medical consultations with pulmonologists on wednesday and thursday mornings. The study included patients attending their first consultation and those already receiving treatment in the center. These participants did not receive regular dental care or information on preventive actions.

Data collection took place during the months of September 2015 and February 2016. Information on the stage classification of COPD were obtained from the medical records of patients after being diagnosed by a pulmonologist.

The information were obtained through a questionnaire containing sociodemographic data (age, gender, education), time of diagnosis and deleterious habits, applied and filled by the researcher before intraoral examination.

The oral health status of patients with COPD was assessed using the DMFT index and the diagnostic criteria recommended by the WHO Oral Health Survey [2]. The intraoral examination was performed by the researcher in the HM dental clinic under natural and artificial light. In addition to personal protective equipment (PPE), the researcher used procedure gloves, gauze and properly sterilized kits consisting of dental instrument tray, dental mouth mirror No. 05 and a WHO-621 periodontal probe.

Klein and Palmer[18] developed the DMFT index, which is the most widely used index worldwide and serves as the basic reference point for the diagnosis of permanent teeth conditions for the development and evaluation of oral health programs. DMFT stands for Decayed, Missing and Filled Teeth. The mean DMFT is obtained from the sum of decayed, missing and filled teeth divided by the number of people examined.

The Mann-Whitney U test, the Chi-squared test and Fisher's Exact test were used for data analysis. Results were considered statistically significant if $p < 0.05$.

The present study was approved by the HM Research Ethics Committee under Opinion No. 1187877.

The study is in compliance with ethical principles in research, and the information collected through the questionnaire was anonymous, voluntary and confidential, without any nominal reference to the participants.

3. RESULTS

Participants were 80 patients aged 32-93 years, with a mean age of 62 years. There were 32 men and 48 women. The stages of COPD in patients were severe/very severe [42 (52.5%)] and mild/moderate 38 (47.5%). Participants reported seeking dental care when feeling pain.

Table 1 shows the demographic characteristics, education and deleterious habits of patients with COPD. There was no statistical association between the degree of COPD and these variables.

Table1. Distribution of participants according to the degree of COPD versus sociodemographic variables and deleterious habits. Fortaleza, Ceará, 2016.

Variables	Severe/Very COPD	Severe	Mild/Moderate COPD	OR (95%CI)	p value
	n (%)	n (%)			
Gender					
Men	17 (53.1)		15 (46.9)	1 (0.4 - 2.6)	0.927*
Women	25 (52.1)		23 (47.9)	1	
Education					
Illiterate	24 (60)		16 (40)	2.3 (0.3 - 15.0)	0.272**
Primary Education	16 (45.7)		19 (54.3)	1.3 (0.2 - 8.5)	
Secondary / Higher Education	2 (40)		3 (60)	1	
Smoking					
Yes	4 (80)		1 (20)	3.9 (0.4 - 36.5)	0.362**
No	38 (50.7)		37 (49.3)	1	
Ex-smoker					
Yes	36 (50)		36 (50)	1	0.269**
No	6 (75)		2 (25)	3 (0.6 - 15.9)	
Drinker					
Yes	1 (100)		-	-	1.000**
No	41 (51.9)		38 (48.1)	-	
Ex-drinker					
Yes	16 (57.1)		(42.9)	1.3 (0.5 - 3.4)	0.641**
No	26 (50)		26 (50)	1	

Source: Research data. * Chi-squared test; ** Fisher's Exact test.

Table 2 shows the distribution of the number of patients according to the degree of COPD and DMFT. It can be noted that the missing component was strongly related to severe or very severe COPD ($p=0.019$) while required extraction ($p=0.022$) and loose teeth ($p=0.032$) were more significantly related to mild or moderate COPD, findings that are relevant to the study.

Table 2. Inertial analysis of patients with COPD in relation to DMFT and oral hygiene habits. Fortaleza, Ceará, 2016.

DMFT components	Severe/Very Severe COPD	Mild/Moderate COPD	OR (95% CI)	p value
Decayed (mean ± SD)	1.9 ± 3.2	2.5 ± 3.4	-	0.234 *
Missing (mean ± SD)	24.5 ± 10.8	19.6 ± 11.6	-	0.019 *
Required extraction (mean ± SD)	2.9 ± 6.3	6.2 ± 8.3	-	0.022 *
Filled (mean ± SD)	0.6 ± 1.7	1.5 ± 3	-	0.081 *
Tooth brushing n (%)				
Yes	36 (51.4)	34 (48.6)	1	
No	6 (60)	4 (40)	1.4 (0.4 - 5.5)	0.741 * *
Tongue brushing n (%)				
Yes	32 (56.1)	25 (43.9)	1.7 (0.6 - 4.4)	0.305 * * *
No	10 (43.5)	13 (56.5)	1	
Loose teeth				
Yes	5 (29.4)	12 (70.6)	1	0.032*
No	37 (58.7)	26 (41.3)	3.4 (1.1 - 10.9)	
Bleeding gums				
Yes	5 (83.3)	1 (16.7)	5 (0.6 - 44.9)	0.204**
No	37 (50)	37 (50)	1	

Source: Research data. Mann-Whitney U test *; Chi-squared test * *; Fisher’s Exact test * * *

Table 3 shows the distribution of patients according to deleterious habits – smoking and drinking. Questions addressed the habit, its duration and the number of cigarettes smoked. There was no statistical significance between the variables related to deleterious habits and having severe/very severe COPD or mild/ moderate COPD, suggesting that they constitute risk factors at any stage of the disease.

Table 3. Distribution of patients with COPD according to deleterious habits. Fortaleza, Ceará, 2016.

Variables	Severe/Very severe COPD				Mild/Moderate COPD				p value
	N	Median	Standard Error	Mín - Máx	N	Median	Standard Error	Mín - Máx	
Time since diagnosis (months)	42	36.0	33.5	1 - 144	38	48.0	23.6	12 - 96	0.140
Duration of smoking habit (years)	40	41.0	12.0	7 - 63	36	41.0	12.5	14 - 66	0.734
Time since quit smoking (years)	39	7.0	6.9	0 - 30	36	6.0	7.3	0 - 30	0.861
Number of cigarettes (units)	40	40.0	26.1	3 - 120	36	35.0	16.4	5 - 60	0.580
Duration of drinking habit	17	38.0	16.4	8 - 63	12	36.5	10.9	15 - 50	0.806
Time since quit drinking	17	7.0	12.3	0 - 45	12	10.0	8.9	2 - 34	0.625

Source: Research data. Mann-Whitney U test

4. DISCUSSION

The study shows that COPD is associated with dental caries, which becomes one more health problem among many others related to this disease.

The prevalence of women in the present research is supported by the results of other studies such as the one by Rodrigues et al[19], who found that the majority of people with COPD were women (70%), and Pisoni[20], who has also reported a prevalence of women and suggested that such prevalence could be explained by the greater women’s longevity given their frequent health care and the early search for diagnoses. On the other hand, another study[21] has reported that such predominance may be a result of the increased prevalence of smoking in this gender.

Regarding education, there was a prevalence of illiterate individuals, which coincides with the results of other studies on COPD, which report that the disease causes major socioeconomic problems and suffering to the patients and has a considerable financial impact on health systems. They report restricted education as a predictor of failure in smoking cessation attempts and of greater number of

cigarettes smoked. In addition, the association with tobacco and the cumulative exposure to biomass burning pointed to lower education as a risk factor for COPD while the prevalence of COPD tends to decrease with increasing education[22,21].

Regarding the classification of COPD stage, most of the patients treated at the HM outpatient center with severe/very severe (52.5%) and mild/moderate (47.5%) COPD, it was found that severe/very severe is greater than mild/moderate, a result that was expected in view of the referral criteria established by Brazil's National Health System – also known as the Unified Health System (*Sistema Único de Saúde – SUS*) – in tertiary hospitals[23], considering that the HM is a reference tertiary care hospital for the treatment of lung and heart diseases.

The time between COPD diagnosis in the HM and the first dental consultation carried out by the researcher, with the clinical examination of the oral cavity (DMFT index), predominantly ranged from 1 month to 12 years. Thus, studies show the importance of preventive dental care in order to reduce dental caries in patients with lung disease[4].

The oral health status of patients revealed that tooth brushing was part of the daily activities of the respondents and tongue cleaning stood out as the second oral hygiene measure. However, although respondents reported good oral hygiene habits, the decreased exercise tolerance resulting from the early development of dyspnea and fatigue, which are common among patients with COPD, implies a decreased performance in activities of daily living as well as a reduced quality of life and poor oral hygiene[24,25].

Regarding self-reported oral health, just a few patients reported the occurrence bleeding gums and the presence of loose teeth, a fact that was associated with the absence of teeth in patients.

As for the frequency of dental care-seeking, the vast majority of patients reported seeking dental care when feeling pain, and none of the respondents underwent gingival treatment, a fact that is legitimized in the literature. Haikal et al.[26] reported in their study that, despite the conditions presented in the clinical examination, patients did not perceive the need for dental treatment.

The lack of statistical significance between deleterious habits and Severe/Very severe COPD and Mild/Moderate COPD proves their baleful influence at any stage of COPD. This finding is in line with the publication of the "Millennium Development Goals and Tobacco Control: an opportunity for global partnership", which summarizes its health effects and highlights tobacco as the second major risk factor for death after high blood pressure[27].

Smoking and drinking increase the risk for various oral diseases whereas the lack of access to health services are also considered risk factors for COPD[13,28,21].

In the present study, most patients with severe/very severe and mild/moderate COPD had smoked for about 41 years in both cases. With regard to alcohol consumption, patients reported they had drunk for about 38 years for cases of severe/very severe COPD and 36.5 years for mild/moderate COPD. However, there are patients who still make use of tobacco and alcohol. As for the consumption of cigarettes, patients with severe/very severe COPD consumed an average of 40 cigarettes a day while those with mild/moderate COPD consumed an average of 35. Smoking is considered a risk factor for both COPD and oral diseases. Therefore, the discussion on the association between respiratory infection and oral health should take into account the methods and frequency of oral hygiene, and tobacco and alcohol use[11].

The present research found dental caries in all patients examined and hence a high DMFT index ; in addition, the relationship between COPD and "missing teeth" ($p= 0.019$) and "required extraction" ($p=0.022$) was statistically significant. Galvão et al.[9] point out that tooth decay results from a combination of multiple risk factors: poor oral hygiene, environmental factors, social habits (smoking and drinking) and nutritional factors. Besides that, the oral microbiota, particularly periodontal disease pathogens, have been reported as major factors causing or triggering various chronic diseases – for instance, respiratory infection [10].

Some limitations of the present study should be highlighted. For example, the research sample could have had a greater representation of this population. However, there was a reduction in the number of consultations in the COPD outpatient care center during the period of data collection. In addition,

some information could not be explored because of patients' fragility. It should also be highlighted that the study did not assess the prescription and formula of medications used by the participants.

Although the study is limited to a large reference hospital and the results cannot be extrapolated to the general population, it is expected to highlight the magnitude of the problem at issue and points to the need for further research on the theme in any part of the world.

It is considered important to promote oral health educational activities as strategies to promote health and prevent lung diseases as well as to provide dental care to the health care system users. Similarly, it is important to train health professionals and guide them out preventive actions with patients. In this context, action plans aimed at promoting health and preventing dental caries should include intersectoral actions that are of utmost importance to tackle problems and overcome barriers to the control of the main oral diseases in all ages.

5. CONCLUSION

Patients with COPD in the study sample presented a high DMFT index.

The prevalence of missing teeth and required extraction are strongly related to COPD. The fact that no statistical significance was found between deleterious habits and Severe/Very severe COPD and Mild/Moderate COPD suggests their baleful influence at any stage of COPD.

There is a need for further research to improve the understanding of the high DMFT index in this group. Additionally, oral health promotion and prevention measures should be implemented within this population.

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