ORJİNAL ARAŞTIRMA

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KİSTİK FİBROZİS DIŞI BRONŞEKTAZİ HASTALARINDA AĞIZ HİJYENİ, AĞIZ SAĞLIĞI ve PERİODONTAL SAĞLIK

Oral Hygiene, Oral Health and Periodontal Health in Non-Cystic Fibrosis Bronchiectasis Patients

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ÖZ

GİRİŞ ve AMAÇ: Bu çalışmanın amacı, kistik fibrosis dışı bronşektazi (KFDB) hastalığı olan ve herhangi bir hastalığı olmayan çocukların ağız hijyeni, ağız ve periodontal sağlığı ile ilgili parametreleri karşılaştırmaktır.

YÖNTEM ve GEREÇLER: Bu çalışma Nisan 2015-Temmuz 2015 tarihleri arasında yapılan 0-16 yaş arası 151 çocuğun dahil olduğu kesitsel bir çalışmadır. Çalışma grubu 151 çocuktan (KFDB 111 çocuk, bronşektazi veya kronik hastalığı olmayan 40 çocuk) oluşturuldu. KFDB hastalarının tek seferlik oral muayenesi yapıldı ve panoramik radyografik incelemeler istendi. Bu hastalarda oral ve periodontal sağlık kriterleri iki grupta hesaplandı. Çocukların ebeveynlerinden 6 çoktan seçmeli soruyu cevaplamaları istendi.

BULGULAR: Süt dişi dolgu yüzeyi sayısı çalışma grubunda kontrol grubuna göre daha yüksekti. Molar diş sayısı ve sağlıklı diş sayısı kontroller için çalışma grubuna göre anlamlı olarak yüksekti. Diş sağlığı ile ilgili diğer parametreler açısından gruplar arasında fark bulunmadı.hipertansiyon saptanmadı.

TARTIŞMA ve SONUÇ: Ağız hijyeni parametrelerinin çoğunluğu açısından gruplar benzer olsa da, periodontal muayene ile tespit edildiği gibi diş sağlığının bozulmasının KFDB hastalarında anlamlı olarak daha yaygın olduğunu bulduk.

Anahtar Kelimeler: Çocuk, Bronşektazi, Periodontal Hastalıklar, Diş Hastalığı, Ağız Hijyeni

ABSTRACT

INTRODUCTION: The aim of the study was to compare the parameters related to oral hygiene, oral and periodontal health of children with and without non-cystic fibrosis bronchiectasis (non-CF BE).

MATERIALS and METHODS: This is a cross-sectional study of 151 children aged between 0-16 years, conducted from April 2015 to July 2015. The study group consisted of 151 children (111 children with non-CF BE, 40 children who did not have bronchiectasis or any chronic disease). One-time oral examination of patients with non-CF BE was performed and panoramic radiographic examinations were requested. Oral and periodontal health criteria were calculated in these patients in two groups. The childrens' parents were asked to answer 6 multiple-choice questions.

RESULTS: Deciduous tooth filling surface count was higher in the study group than controls. Molar tooth count and healthy tooth count were significantly higher for controls than study group. No difference was found between the groups in terms of other parameters of dental health.

CONCLUSIONS: We have found that, although groups were similar in regard to the majority of oral hygiene parameters, deterioration of dental health as measured by periodontal examination was significantly more common in those with non-CF BE.

Key words: Child, Bronchiectasis, Periodontal Diseases, Tooth Disease, Oral Hygiene

INTRODUCTION

Bronchiectasis (BE) is characterized by irreversible dilatation of the respiratory tract associated with inflammatory destruction of bronchial and peribronchial tissue (1). In developed countries, the most important cause of clinical bronchiectasis is Cystic Fibrosis (CF) (2). Recurrent respiratory infections, immunodeficiency, foreign body aspiration, asthma, tuberculosis and primary ciliary dyskinesia are some of the factors that may be effective in the development of non-cystic fibrosis bronchiectasis (non-CF BE), which is common in developing countries (1). Improved hygiene and nutrition, broader vaccine coverage and early antibiotic therapy have been effective in reducing the prevalence of non-CF BE in developed countries which has reduced it to the "orphan disease" classification. However, in developing countries, non-CF BE remains as a major cause of respiratory morbidity (2).

Periodontal diseases are reported to significantly increase the risk for systemic diseases or alter the natural course of systemic conditions (3). There are several mechanisms that can potentially relate respiratory diseases to periodontitis. The most widely accepted one is the mechanical one. With this mechanism, aspiration of oral contents including microbial pathogens into the airway is followed by respiratory tract inflammation, adhesion, deterioration of immunity, colonization and the emergence of pulmonary infections. In patients with chronic health problems, aspiration of oral secretions containing bacterial pathogens may not always be resolved. In these cases, the periodontium may serve as a bacterial hotspot. For Chronic Obstructive Pulmonary Disease (COPD), recurrent infections causing exacerbations have been reported to increase the decline in lung function (4).

COPD is the most studied lung disease related to periodontal diseases (5). Treatment of periodontal diseases is reported to reduce the number of COPD exacerbations per year (6). The pathophysiology of bronchiectasis involves mucociliary changes resulting in bacterial colonization and subsequent chronic inflammation which damages the bronchi. Despite the clinical and pathophysiological similarities between COPD and bronchiectasis, there is no study in the literature evaluating the relationship between bronchiectasis development/progression and periodontal disease (5). Based on these data, the hypothesis we established is that oral hygiene, oral and periodontal health is worse in those with non-CF BE compared to healthy children. In order to confirm this, it is important to compare the oral and periodontal characteristics of those with and without non-CF BE. The aim of the current study

was to compare parameters related to oral hygiene and periodontal health in children with and without non-CF BE.

MATERIALS and METHODS

Study Population: This is a cross-sectional study of 151 children between the ages of 0-16 who applied to Bezmialem Vakıf University Faculty of Medicine and Faculty of Dentistrybetween April 1, 2015 and July 1, 2015.

The study group consisted of 111 children with non-CF BE who were followed at the Pediatric Pulmonology Clinic at Bezmialem Vakif University Faculty of Medicine.

In terms of etiology, primary ciliary dyskinesia (PCD) was detected in 45 patients (40%), postinfectious BE in 17 (15%) patients, bronchiolitis obliterans in 10 (9%) patients, asthma in three (3%) patients, immunodeficiency in five (5%) patients, and idiopathic bronchiectasis in 31(28%) patients.

The control group consisted of 40 children who were admitted to the Department of Pedodontics of Bezmialem Vakif University Faculty of Dentistry for routine check-up and did not have bronchiectasis or any other chronic disease.

Necessary permissions and ethics committee approval were obtained for conducting the research (Bezmi Alem University Clinical Research Ethics Committee, Date: 02.04.2014, No: 7/9). In order to conduct this study, patients were informed about the purpose and subject of the study. Children (and their caretakers) were told about the extent of the procedures they would undergo during the study and written consent was obtained from the families of the children who agreed to participate.

Inclusion Criteria: The criterion for patient inclusion was being aged under 18 years and attending regular follow-up at the Pulmonary Diseases Clinic of our Pediatrics department due to non-CF BE. For the control group, participants were selected among those with no bronchiectasis or other chronic disease (eg, Coronary Artery Disease, Diabetes Mellitus, Chronic Hepatic Failure, Chronic Renal Failure, Autoimmune Diseases, COPD, etc.). In addition, agreeing to participate in the study was determined as an inclusion criteria for both groups.

Exclusion criteria: Subjects who refused to participate in the study, those who were older than 18 years, and those who had bronchiectasis or chronic disease in the control group were excluded from the study group.

Clinical evaluation: Patients with non-CF BE who were referred from the pulmonary diseases clinic underwent panoramic radiographic imaging and a one-time oral examination. Clinical examinations were performed to determine the number of teeth affected by caries and other characteristics of oral hygiene. Oral and periodontal health criteria (number of caried teeth, number of filled teeth, number of healthy teeth, number of deciduous teeth, number of molar teeth, etc.) were recorded. In the control group, 40 patients who were admitted to the dentistry clinic underwent the same procedures and investigations.

Pulp calcification: Pulp calcification was defined as the presence of calcifying mass in the pulp, which can be seen in deciduous, permanent, healthy, and defective teeth. Radiography is the only method that can detect clinical and non-invasive calcification (7). Pulp calcification was evaluated by panoramic radiography.

Plaque index (PI): Plaque index calculations were performed by the evaluation of soft sediment deposition at the gingival margin and interproximal area. Patients' average PI was calculated as the mean value of all teeth. Plaque index classification was defined as follows:

0: Following air drying, plaque is not visible nor cannot be wiped off with an explorer

1: Following air drying, plaque is not visible but can be wiped off with an explorer

2: Plaque is visible along gigival marjin, with or without air drying (no need to probe)

3: Thick plaque is visible along gigival marjin (no need to probe) (8).

Gingival index (GI): GI was calculated based on the evidence of inflammation in gingival tissues characterized by redness, swelling and bleeding. Each of the four gingival areas of the tooth (buccal, caesal, distal, and lingual) were scored between 0-3 based on the Löe Gingival Index System. This classification is as follows:

0: Healthy gingiva

1: Slight inflammation, slight discoloration, edema, no bleeding on probing

2: Moderate inflammation, gingival shiny, red, edema, bleeding on probing

3: Severe inflammation, marked redness and edema, spontaneous bleeding means.

The GI score for the tooth was obtained by dividing values obtained from each tooth by the number of teeth examined(9).

Theparents of the children were asked to complete a total of 6 multiple-choice questions that assessed whether children had appropriate access to oral care, dental health services and whether they received family support.

Statistical Analysis: All analyses were performed on SPSS v21 (IBM, Armonk, NY, USA). For the normality check, the Shapiro Wilk test was used. Comparison of continuous variables

were done by using the student's t-test or the Mann Whitney U test with regard to normality of distribution. Categorical variables were analyzed by Chi-square tests. P<0.05 values were accepted to show statistically significant results.

RESULTS

Mean age was 10.66 ± 3.58 years in this study. There were no significant differences between our groups regarding age and gender. Deciduous tooth filling surface count was higher in the study group than controls (p<0.001). Molar tooth count and healthy tooth count was significantly higher for controls than patients with bronchiectasis. There were no significant differences between our groups regarding other variables associated with dental health (Table 1)

Table 1. Summary of Patients' Characteristics Regarding Groups

	Bronchiectasis		**Control**		**Total**		**p**
	n	**Descriptive**	**n**	**Descriptive**	**n**	**Descriptive**	
Age	111	10.94 ± 3.93	40	9.9 ± 2.26	151	10.66 ± 3.58	0.116
Gender							
Female	62	55.86%	17	42.50%	79	52.32%	0.206
Male	49	44.14%	23	57.50%	72	47.68%	
Tooth	107	22 (0 - 28)	40	15 (0 - 28)	147	18 (0 - 28)	0.261
Milk Tooth	107	2 (0 - 20)	40	7 (0 - 20)	147	5 (0 - 20)	0.248
Caries	95	1 (0 - 14)	39	1 (0 - 4)	134	1 (0 - 14)	0.087
Caries Surface	95	1 (0 - 21)	39	1 (0 - 15)	134	1 (0 - 21)	0.113
Lost Tooth							
0	78	82.98%	39	100.00%	117	87.97%	0.056
1	12	12.77%	0	0.00%	12	9.02%	
2	1	1.06%	0	0.00%	1	0.75%	
3	3	3.19%	0	0.00%	3	2.26%	

Lost Surface							
0	78	82.98%	39	100.00%	117	87.97%	0.056
5	12	12.77%	0	0.00%	12	9.02%	
10	1	1.06%	0	0.00%	1	0.75%	
15	3	3.19%	0	0.00%	3	2.26%	
Filling							
0	73	65.77%	33	82.50%	106	70.20%	0.131
1 - 2	13	11.71%	3	7.50%	16	10.60%	
≥ 3	25	22.52%	4	10.00%	29	19.21%	
Filling Surface							
0	73	65.77%	33	82.50%	106	70.20%	0.139
1 - 2	10	9.01%	2	5.00%	12	7.95%	
≥ 3	28	25.23%	5	12.50%	33	21.85%	
Molar Tooth Caries							
0	43	45.26%	18	47.37%	61	45.86%	0.561
1	25	26.32%	13	34.21%	38	28.57%	
2	12	12.63%	5	13.16%	17	12.78%	
3	8	8.42%	1	2.63%	9	6.77%	
4	7	7.37%	1	2.63%	8	6.02%	
Molar Tooth Caries Surface							
0	43	38.74%	18	45.00%	61	40.40%	0.077
1 - 2	31	27.93%	16	40.00%	47	31.13%	
≥ 3	37	33.33%	6	15.00%	43	28.48%	
Molar Tooth Lost							
0	86	90.53%	38	100.00%	124	93.23%	0.277
1	7	7.37%	0	0.00%	7	5.26%	
2	1	1.05%	0	0.00%	1	0.75%	
3	1	1.05%	0	0.00%	1	0.75%	
Molar Tooth Lost Surface							
0	86	90.53%	38	100.00%	124	93.23%	0.277
5	7	7.37%	0	0.00%	7	5.26%	
10	1	1.05%	0	0.00%	1	0.75%	
15	1	1.05%	0	0.00%	1	0.75%	

Molar Tooth Filling							
0	80	84.21%	34	89.47%	114	85.71%	0.357
1	7	7.37%	2	5.26%	9	6.77%	
2	5	5.26%	1	2.63%	6	4.51%	
3	0	0.00%	1	2.63%	1	0.75%	
4	3	3.16%	0	0.00%	3	2.26%	
Molar Tooth Filling Surface							
0	80	72.07%	34	85.00%	114	75.50%	0.136
1 - 2	7	6.31%	3	7.50%	10	6.62%	
≥ 3	24	21.62%	3	7.50%	27	17.88%	
Milk Tooth Caries	66	2 (0 - 16)	40	2 (0 - 17)	106	2 (0 - 17)	0.751
Milk Tooth Caries Surface	66	3 (0 - 50)	40	3 (0 - 51)	106	3 (0 - 51)	0.556
Milk Tooth Filling							
0	60	90.91%	34	85.00%	94	88.68%	0.543
1	3	4.55%	3	7.50%	6	5.66%	
2	3	4.55%	2	5.00%	5	4.72%	
3	0	0.00%	1	2.50%	1	0.94%	
Milk Tooth Filling Surface							
0	60	54.05%	34	85.00%	94	62.25%	**<0.001**
1 - 2	2	1.80%	2	5.00%	4	2.65%	
≥ 3	49	44.14%	4	10.00%	53	35.10%	
Fissealant							
0	92	94.85%	39	97.50%	131	95.62%	0.554
1	0	0.00%	0	0.00%	0	0.00%	
2	3	3.09%	0	0.00%	3	2.19%	
3	1	1.03%	1	2.50%	2	1.46%	
4	1	1.03%	0	0.00%	1	0.73%	
Dental Pulp Calc							
Present	2	1.98%	0	0.00%	2	1.42%	0.915
Absent	99	98.02%	40	100.00%	139	98.58%	
Plaque Index	102	2.21 ± 0.53	40	2.29 ± 0.44	142	2.23 ± 0.5	0.398
Gingival Index	102	1.09 ± 0.4	40	1.17 ± 0.3	142	1.12 ± 0.38	0.255

Molar Tooth Surface							
0	45	40.54%	8	20.00%	53	35.10%	
1 - 2	33	29.73%	15	37.50%	48	31.79%	0.063
≥ 3	33	29.73%	17	42.50%	50	33.11%	
Molar Tooth							
0	38	40.00%	8	21.05%	46	34.59%	
1	22	23.16%	6	15.79%	28	21.05%	
2	14	14.74%	14	36.84%	28	21.05%	**0.040**
3	11	11.58%	5	13.16%	16	12.03%	
4	10	10.53%	5	13.16%	15	11.28%	
Tooth Surface							
0	38	34.23%	9	22.50%	47	31.13%	
1 - 2	30	27.03%	13	32.50%	43	28.48%	0.388
≥ 3	43	38.74%	18	45.00%	61	40.40%	
Tooth							
0	31	27.93%	9	22.50%	40	26.49%	
1 - 2	33	29.73%	18	45.00%	51	33.77%	0.215
≥ 3	47	42.34%	13	32.50%	60	39.74%	
Milk Tooth Surface							
0	40	36.04%	10	25.00%	50	33.11%	
1 - 2	19	17.12%	14	35.00%	33	21.85%	0.058
≥ 3	52	46.85%	16	40.00%	68	45.03%	
Milk Tooth							
0	40	36.04%	10	25.00%	50	33.11%	
1 - 2	20	18.02%	14	35.00%	34	22.52%	0.079
≥ 3	51	45.95%	16	40.00%	67	44.37%	
Healthy Tooth							
0	78	70.27%	0	0.00%	78	51.66%	
1	10	9.01%	0	0.00%	10	6.62%	
≥ 2	23	20.72%	40	100.00%	63	41.72%	**<0.001**

Caries Tooth							
0	88	90.72%	32	82.05%	120	88.24%	0.207
1	4	4.12%	2	5.13%	6	4.41%	
2	4	4.12%	2	5.13%	6	4.41%	
3	1	1.03%	3	7.69%	4	2.94%	
Milk Tooth Extraction							
0	59	88.06%	0	0.00%	59	88.06%	N.A
1	4	5.97%	0	0.00%	4	5.97%	
2	3	4.48%	0	0.00%	3	4.48%	
5	1	1.49%	0	0.00%	1	1.49%	
M							
0	84	86.60%	0	0.00%	84	86.60%	N.A
1	10	10.31%	0	0.00%	10	10.31%	
3	3	3.09%	0	0.00%	3	3.09%	

Data given as mean ± standard deviation or median (minimum - maximum) for continuous variables regarding normality and percentage for categorical variables

The frequency of answer that "I don't know" to the question about their child's dental health was higher in the study group than the control group. No significant difference was found between the study group and control groups in terms of having a toothbrush, daily brushing count, receiving help during tooth brushing, dental visits and the causes of these dental visits of the child. (Table 2).

Table 2. Answers given to the 6-questionquestionnaire with regard to study groups

	Bronchiectasis		**Control**		**Total**		**p**
	n	**%**	**n**	**%**	**n**	**%**	
How is the oral health of the child?							
I don't know	34	31.48%	8	20.00%	42	28.38%	**0.020**
There is a few caries	31	28.70%	21	52.50%	52	35.14%	
There was caries but treated	33	30.56%	11	27.50%	44	29.73%	
Very well	10	9.26%	0	0.00%	10	6.76%	
Who has brushes at home?							
Nobody	0	0.00%	0	0.00%	0	0.00%	0.102
We use together	0	0.00%	1	2.50%	1	0.68%	
Some of us	5	4.63%	0	0.00%	5	3.38%	
Everyone	103	95.37%	39	97.50%	142	95.95%	
Do you help your child for brushing teeth?							
Yes	25	23.81%	12	30.00%	37	25.52%	0.582
No	80	76.19%	28	70.00%	108	74.48%	
Frequency of brushing teeth							
Twice a day	39	36.45%	8	20.00%	47	31.97%	0.056
Once a day	40	37.38%	21	52.50%	61	41.50%	
3 - 4 times weekly	17	15.89%	10	25.00%	27	18.37%	
Rarely	11	10.28%	1	2.50%	12	8.16%	
Frequency of visiting dentist							
Only when had toothache	59	55.14%	26	65.00%	85	57.82%	0.314
Once a year	10	9.35%	5	12.50%	15	10.20%	
Never	38	35.51%	9	22.50%	47	31.97%	
Reason of not visiting dentist							
Have no problem	27	71.05%	7	77.78%	34	72.34%	0.704
Economic reasons	4	10.53%	0	0.00%	4	8.51%	
Have no time	5	13.16%	1	11.11%	6	12.77%	
He / She afraids	2	5.26%	1	11.11%	3	6.38%	

DISCUSSION

In the current study, in non-CF-BE patients, it was found that the number of molar teeth and deciduous tooth filling surface count were higher and healthy teeth count was lower than the control group. The two groups were similar in terms of other oral and periodonal parameters.

To our knowledge, this is the first study to evaluate the association between periodontal health and non-CF-BE in children. COPD is the most frequently studied lung disease with its association with oral and periodontal diseases (5). Although bronchiectasis and COPD have very similar systemic, clinical and immunological findings, to our knowledge, there have been no attempts to study the periodontal status of patients with bronchiectasis; indicating that there is a significant lack of information on this topic. Our study aimed to provide much-needed information on the relationship between periodontal disease and non-CF-BE.

Oral and dental health properties

There is increasing evidence that oral and periodontal diseases affect systemic diseases. If an individual has oral or perodontal disease, the pathogens present in oropharyngeal secretion may be dangerous when aspirated into the lungs, especially the lungs of a patient with chronic disease(s) affecting the lung.It has been stated in various studies that oral and periodontal diseases may cause or exacerbate the natural course of systemic diseases (3, 10-14). In this study, the number of healthy teeth was significantly lower in the bronchiectasis group. No difference was found between the groups in terms of caried tooth, filled tooth, missing tooth, or the number of extracted teeth. Furthermore, no difference was found between the bronchiectasis and control groups in terms of plaque index and gingival index, which is an important indicator of periodontal health. In a study examining the relationship between oral health status and COPD, the number of healthy natural teeth was reported to be higher than in non-COPD patients. On the other hand, tooth caries, tooth extraction, lack of any tooth were more common in COPD patients, and no difference was found between the two groups in terms of filled teeth (15). Scannapieco and Ho (16) reported decreased lung function associated with an increase in periodontal attachment loss. In the study of Liu et al. (17) PI increase was reported to be an effective factor on COPD exacerbations. In another study, PI and GI scores were found to be higher in COPD group than in the control group (18). However, we did not find any difference between the PI and GI scores of patients with and without non-CF-BE in the current study. Even so, the periodontal health of patients with non-CF-BE were found to be worse than those without non-CF-BE, which is similar to the study

by Wang et al. (19) in which patients with COPD had worse periodontal health measures than healthy controls. Community based studies also suggest similar results: in a community-based study in Spain, the prevalence of periodontal disease was reported to be higher in COPD patients than in non-COPD patients (15). In a community-based cohort study by Shen et al. (20) patients with COPD were found to have a higher risk of developing periodontal disease than the general population. Furthermore, treatment of chronic periodontitis was found to significantly reduce COPD exacerbationsin a prospective study by Küçükcoşkun et al. (21). This trend is evident in many studies including major randomized controlled trials such as the pilot study by Zhou et al. (6) in which periodontal therapy was suggested to improve lung function and reduce exacerbation frequency in patients with COPD and chronic periodontitis and treatment was also associated with reduced risk of adverse respiratory events and mortality in patients with COPD (22). Additionally, according to a cohort study conducted in Japan, deterioration of periodontal health was reported as a risk factor that accelerates the decrease in lung function (23).

Finally,according to a metaanalysis on this topic, which examined 14 observational studies, periodontal diseases were found to be an independent risk factor for COPD progression (24). Furthermore, in a recent study evaluating 14 studies which evaluated the clinical characteristics of oral health, it was concluded that periodontal problems (deeper periodontal pockets, high level of clinical attachment loss, worse oral hygiene, more inflammation and bleeding in the gingival tissue, and lower number of remaining teeth) were worse in COPD patients compared to non-COPD patients (25).

Oral health behaviors and knowledge level

In the current study, no significant difference was found in the bronchiectasis and control groups in terms of having a toothbrush, daily brushing, receiving help from parents during brushing. The frequency of answer that "I don't know" to the question about their child's dental health was higher in the study group than the control group. In a study by Liu et al. (17) it was reported that the number of dailybrushing was an effective factor on COPD exacerbations. In the study of Wang et al. (19) it was reported that daily brushing behavior and oral health knowledge levels were lower in patients with COPD than those without COPD. In a study by Bhavsar et al. (18) it was reported that the number of tooth brushing and oral hygiene scores were lower in COPD patients than controls. Two systematic reviews have been reported that improving oral hygiene is effective in reducing the progression and occurrence of respiratory diseases (14, 26). The current study was conducted with pediatric

patients with non-CF-BE, and during this period, tooth brushing behavior was evaluated according to family reporting and was not observed; thus the lack of any significant difference between our groups may have been caused by this factor. Nevertheless, improving tooth brushing behavior in all children, especially those with chronic lung disease, will undoubtedly benefit overall health.

Frequency of dentist visits and reasons for not visiting the dentist

In the current study, no significant difference was found between the bronchiectasis and control groups in terms of visits to dentists and reasons for not visiting. On the other hand, the most common reason for not visiting a dentist was found to be the lack of evident dental problems (toothache, bleeding, etc.) in both groups. In a community-based study, no difference was found between patients with and without COPD in terms of applying to a dentist within the prior 3 months of the study (15). Another study reported that patients with COPD had fewer visits to dentists than those without COPD (19). Children may show similar tendencies because children may find it difficult to recognize their dental health problems. Additionally, fear of the dentist is rather frequent among children, which may cause them to be unwilling to go to the dentist.

Limitations

The current research has several limitations. Our first limitation isassociated with the study design; cross-sectional studies have low power in terms of explaining causality. The second most important limitation is that our study group did not undergo full-extent evaluations for the diagnosis of periodontal diseases. If such an examination was performed, we may have been able to analyze whether the frequency of periodontal disease was higher in non-CF-BE patients. However, general oral and periodontal findings were evaluated and showed important differences between patients with non-CF-BE and controls. Thirdly, study groups were comprised from patients that applied to a single center; it is quite evident that a community-based research could have provided more reliable results. Even so, to our knowledge, our study is the first to evaluate the relationship between periodontal health and non-CF-BE in pediatric patients; and therefore addresses an important gap in the literature.

Conclusion

This is the first study to evaluate the relationship between oral hygiene and periodontal health in patients with non-CF-BE. The most important result of this study was the finding that the number of healthy teeth was significantly lower in the bronchiectasis group than in the control

group. There were no significant differences between our groups regarding many other variables that are known to be associated with periodontal health.

In the future, larger clinical investigations and structured prospective studies are required to determine the extent of the relationship between oral hygiene and periodontal health and non-CF-BE. Randomized controlled trials to investigate the change in clinical characteristics of patients with bronchiectasis by correcting oral hygiene and periodontal health parameters may help to explain the relationships between these conditions. Improving parents' knowledge of dental care and oral health is important in the prevention and treatment of non-CF-BE in children. Therefore, it is the responsibility of all healthcare providers to help preserve oral health in individuals by providing the best available evidence to patients and their parents. Promoting opportunities for oral care and treatment, particularly in the context of oral and periodontal health protection, can be an effective strategy to reduce the burden of lung dysfunction leading to non-CF-BE.

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