Original Article

Association between Asthma and Periodontal Disease

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Abstract:

Objective: An association between poor oral health and chronic lung disease has recently been reported. The purpose of this study was to explore this potential association between asthma and periodontal disease.

Materials and Methods: This is a descriptive case controlled study. The samples were selected from patients referred to respiratory disease clinic in a hospital in Tehran, Iran. The study population comprised of one hundred individuals: fifty asthmatics and fifty asthmatic controls evaluated for Plaque index (PI), Gingival index (GI), Papillary Bleeding index (PBI), Periodontal Disease index (PDI) and Calculus index (CI). The data were analyzed by SPSS software.

Results: There were significant differences between asthmatics and non-asthmatic samples in PI, GI, BOP, and PDI ($P<0.01$). However, there was no such differences in CI between the two groups ($P=0.084$).

Conclusion: The results of the present study support recent published reports advocating a relationship between respiratory disease and periodontal health status.

Key Words: Asthma; Periodontal Diseases; Oral Health; Periodontal Index

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INTRODUCTION

Asthma is a chronic inflammatory disease of the respiratory system characterized by being hyper-responsive and episodic, reversible symptoms of air flow abstraction [1]. The prevalence of asthma has been increasing across all age, gender, and racial groups and is found to be higher among children than adults [2]. Many cells and cellular elements play a role in asthma, in particular, eosinophils, T lymphocytes, neutrophils and epithelial cells. In susceptible individuals, the inflammation causes recurrent episodes of coughing, wheezing, chest tightness and difficult breathing, especially at night and in the early morning; however, asthma is a disease with many faces [1].

Periodontal disease has been known as an inflammatory disease with a reaction to bacterial plaque causing chronic inflammation, gingival bleeding, increasing pocket depth, and ultimately, alveolar bone loss. In fact, bacterial antigens irritate the immune response of the host leading to the effects of the disease [3]. As in asthma, the immune response is the mechanism involved in the pathogenesis and progression of the disease. Although the disease is mostly associated with adults, a significant portion is seen in children and young adults as well [3].

One of the effective defense elements of the oral cavity is saliva including antibacterial, antiviral, and antifungal actions [4]. In addition, immunoglobulin and growth factors are

Table 1. Mean and Srandard Deviation (SD) of Plaque Index (PI).

PI (tooth number)	Asthmatic patients		Non-asthmatic patients		Total	
	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)
PI (16)	50	1.42 (0.84)	50	2.34 (0.98)	100	1.88 (1.02)
PI (21)	50	1.20 (0.78)	50	1.54 (1.09)	100	1.37 (0.96)
PI (24)	50	1.40 (0.81)	50	1.86 (1.09)	100	1.63 (0.97)
PI (36)	50	1.56 (0.81)	50	2.32 (0.94)	100	1.94 (0.95)
PI (41)	50	1.38 (0.83)	50	1.86 (1.14)	100	1.62 (1.02)
P1 (44)	50	1.54 (0.86)	50	2.04 (1.24)	100	1.79 (1.09)

N=number

also found in saliva and mucin, playing a protective role for the mucosa. Saliva also promotes mineralization of the teeth [5-7]. The main factor in diminishing the periodontal disease is the interaction between bacterial and immunological factors. Thus, saliva affects the severity of the periodontal disease remarkably [8]. On the other hand, drugs affecting salivary secretion, such as the ones used to treat or control asthma, may negatively influence periodontal health.

One of the most important functions of saliva is the secretary IgA (SIgA) actively secreted by the salivary glands [9]. SIgA acts as a first line of defense for the mucosa and has a major role in restricting the periodontal disease [10]. On the other hand, in some studies, reduction of SIgA level in saliva of asthmatics has been reported [11]. Hyyppä depicted that the allergic immunoglobulin, IgE, was elevated in patients with asthma when compared with the healthy control group [12].

Although some studies reported that asthmatic patients had more gingivitis than healthy patients, others reported no difference in gingivitis prevalence and plaque formation. There is also a controversy about the amount of calculus in asthmatics and healthy individuals [13-17].

In summery, association between asthma and periodontal disease might involve either pathological activation of the immune and inflammatory process, anti asthmatic medications, or an interaction between them [18,19].

The purpose of the present study was to determine if there is a significant difference between the periodontal health parameters in asthmatics when compared to non-asthmatic individuals.

MATERIALS AND METHODS

This descriptive case-controlled study was performed on 50 subjects referred to asthma clinic of Tehran Hospital, Tehran, Iran and the control group (n=50) referred to dermatology clinic of the same hospital (48 male and 52 female, with the average age of 39.62 and 37.16 years respectively) from 2006 to 2007.

All the subjects in the control group were systemically healthy. The inclusion criteria for the test group were as follow: no immune-system disease; not on antibiotics, either systemati-

Table 2. Mean and Srandard Deviation (SD) of Periodontal Disease Index (PDI).

PDI (tooth number)	Asthmatic patients		Non-asthmatic patients		Total	
	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)
PDI (16)	50	3.88 (1.02)	50	4.74 (1.32)	100	4.31 (1.25)
PDI (21)	50	3.10 (0.50)	50	3.48 (0.93)	100	3.29 (0.77)
PDI (24)	50	3.78 (0.93)	50	4.62 (1.21)	100	4.20 (1.15)
PDI (36)	50	3.52 (0.84)	50	4.36 (1.06)	100	3.94 (1.04)
PDI (41)	50	3.32 (0.65)	50	3.54 (0.97)	100	3.43 (0.83)
PDI (44)	50	3.34 (0.72)	50	4.08 (1.21)	100	3.71 (1.06)

N=number

Table 3. Mean and Srandard Deviation (SD) of Papillary Bleeding Index **(**PBI).

PBI (tooth number)	Asthmatic patients		Non-asthmatic patients		Total	
	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)
PBI (16)	50	1.38 (0.69)	50	1.96 (0.94)	100	1.67 (0.87)
PBI (21)	50	1.32 (0.62)	50	1.40 (0.72)	100	1.36 (0.67)
PBI (24)	50	1.38 (0.67)	50	1.76 (0.82)	100	1.57 (0.76)
PBI (36)	50	1.46 (0.78)	50	1.98 (0.97)	100	1.72 (0.92)
PBI (41)	50	1.48 (0.78)	50	1.52 (0.81)	100	1.50 (0.79)
PBI (44)	50	1.38 (0.69)	50	1.64 (0.82)	100	1.51 (0.75)

N=number

cally or topically, during the last 3 months; no systemic disease affecting periodontal health; no smoking habit; and similarity with the control group in gender, education, economical and social aspects.

Systemic and dental examinations were performed by calibrated dentists and physicians. According to the approach described by Halterman et al [20], classification of the presence and severity of asthma was performed as follows: two hospitalizations or four asthma-related acute visits; moderate: one hospitalization or two acute visit or three episodes of wheezing; and mild: no hospitalization, one acute visit, two episodes of wheezing. All the samples in the test group suffered from moderate to sever asthma.

Three types of drugs were commonly used by the asthmatics having xerogenic and anti-inflammatory effects for more than 24 months: anti-asthmatic inhaler, anti-histamines, and corticosteroids.

Periodontal measurements, including Plaque Index (PI), Gingival Index (GI), Papillary Bleeding Index (PBI), Periodontal Disease Index (PDI) and Calculus Index (CI), were made for both the test and the control group. The data were analyzed using SPSS Software.

RESULTS

The amount of plaque accumulation showed statistically significant difference ($P<0.01$) between the test and the control groups (Table 1). A significant difference in PDI ($P<0.01$) was found between the asthmatics and the non-asthmatics (Table 2).

In addition, the evaluation of PBI and GI in the two groups showed that there were significant differences between them ($P<0.01$) meaning that gingival inflammation was more seen in the asthmatics (Table 3 and 4). However, there was not any statistically significant difference in CI ($P=0.084$) between the two groups (Table 5).

DISCUSSION

The relationship between asthma and periodontal health has been previously reported by many authors so far. Considering the inflammatory nature of both asthma and periodontal disease, also the presence of variants and covariant affecting the results of such studies,

Table 4. Mean and Srandard Deviation (SD) of Gingival Index (GI).

GI (tooth number)	Asthmatic patients		Non-asthmatic patients		Total	
	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)
GI (16)	50	1.14 (0.86)	50	1.72 (0.78)	100	1.43 (0.89)
GI (21)	50	1.04 (0.88)	50	1.16 (0.91)	100	1.10 (0.89)
GI (24)	50	1.16 (0.82)	50	1.56 (0.97)	100	1.36 (0.92)
G1 (36)	50	1.32 (0.99)	50	1.76 (0.77)	100	1.54 (0.91)
G1 (41)	50	1.30 (0.84)	50	1.30 (0.93)	100	1.30 (0.88)
G1 (44)	50	1.20 (0.92)	50	1.48 (0.95)	100	1.34 (0.95)

N=number

Table 5. Mean and Srandard Deviation (SD) of Calculus Index (CI).

CI (tooth number)	Asthmatic patients		Non-asthmatic patients		Total	
	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)
CI (16)	50	0.96 (1.01)	50	1.24 (0.96)	100	1.10 (0.99)
CI (21)	50	0.12 (0.48)	50	0.38 (0.76)	100	0.25 (0.63)
CI (24)	50	0.60 (0.90)	50	0.72 (0.95)	100	0.66 (0.92)
CI (36)	50	0.64 (0.94)	50	1.14 (0.97)	100	0.89 (0.99)
CI (41)	50	1.20 (0.93)	50	1.46 (0.91)	100	1.33 (0.92)
CI (44)	50	0.72 (0.97)	50	0.78 (0.95)	100	0.75 (0.96)

N=number

proving such an association seems equivocal.

In the present study, uniform test and control groups (gender, age, and socio-economic status) along with application of standard indices eradicated the factors, which could have affected the results.

As the results of the present study showed, there is a significant difference in PI between the asthmatics and the non-asthmatics being in agree with previous studies [14,15]. Hyyppä et al [15] showed that the incidence of gingivitis and the amount of plaque accumulation were higher in asthmatic children than non-asthmatic ones.

A direct relationship between bacterial pneumonia and dental plaque has been reported [21]. As anaerobic bacteria have a remarkable roll in pneumonia, and while periodontal pockets can be a very good shelter for living and growing of such bacteria, the relationship between periodontal disease and inflammatory disease of the respiratory apparatus might seem explainable.

The measurements for PBI and GI indicated that the incidence of gingivitis was higher among the asthmatics, confirming the results of the previous studies [13-15].

The distraction of the periodontium in asthmatics was found to be higher than in non-asthmatics according to PDI being was higher in the test. This finding supported other studies declaring a higher incidence of attachment loss (AL) in patients suffering from chronic respiratory disease [21].

Shulman et al [22] reported that there was not any significant difference in PI, GI, PBI, AL and CI between asthmatic children and healthy ones. However, the difference in the number, age, gender, socio-economic status, education, and severity of the disease may rationalize the discrepancies in the results of different studies.

According to the statistical analysis, there was no significant difference in CI between the two groups. While some studies in the literature have reported that the amount of calculus formation in asthmatic children was higher than in the non-asthmatics [14,17], others have found no relationship between asthma and the amount of calculus formation [22].

CONCLUSION

As both periodontal and respiratory diseases have an inflammatory nature and there are many factors that can affect their incidence and severity, achieving acceptable and explainable results firmly depends on a precise study design. The results of the present study support recent published reports advocating a relationship between respiratory disease and periodontal health status.

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