Review / Derleme

Asthma and Its Impacts on Oral Health

Astım ve Ağız Diş Sağlığı Üzerindeki Etkileri

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Abstract

Asthma is a chronic inflammatory disease characterized by airway hyperresponsiveness and reversible airflow obstruction. Genetic factors and environmental factors may play a role in the etiology of asthma. An approximately 300 million people worldwide have been diagnosed with asthma and there may be an additional 100 million diagnosis by 2025. Studies conducted in Turkey reported a prevalence between 1.5% and 9.4%. In the literature, there are many studies investigating the impacts of the medications used for asthma, which has a tendency to increase in our country and in the world, on oral health. However, no consensus has yet been established regarding whether these medications affect oral health. It is important to have knowledge about the impacts of asthma medications on oral and dental health and to take the necessary precautions in order to maintain oral and dental health. In this review, in addition to investigation of the impact of asthma medications on oral health, possible measures that can be taken were also evaluated.

Keywords
Asthma, dental caries, oral health, dry powder inhaler

Öz

Astım, hava yollarının aşırı duyarlılığı ve hava yollarının geri dönüşümlü tıkanmasıyla karakterize, kronik enflamatuvar bir hastalıktır. Genetik ve çevresel faktörler astım etiyolojisinde rol oynayabilir. Dünyada yaklaşık 300 milyon insan astım tanısı almıştır ve 2025 yılına kadar 100 milyon yeni tanı olması beklenmektedir. Ülkemizde yapılan çalışmalarda astım prevalansının %1,5 ile % 9,4 aralığında olduğu saptanmıştır. Literatürde dünyada ve ülkemizde artma eğiliminde olan astımın tedavisinde kullanılan ilaçların ağız ve diş sağlığı üzerindeki etkilerini inceleyen çok sayıda çalışma mevcuttur. Bununla beraber, bu ilaçların ağız diş sağlığına etkileri konusunda fikir birliği yoktur. Astım ilaçları ve ağız diş sağlığı üzerindeki etkileri konusunda bilgi sahibi olmak ve gerekli önlemleri almak ağız diş sağlığını korumak için önemlidir. Bu derlemede, astım ilaçlarını ağız diş sağlığı üzerindeki etkilerinin değerlendirilmesine ek olarak alınabilecek önlemler de değerlendirilmiştir.

Anahtar Kelimeler
Astım, ağız sağlığı, diş çürükleri, kuru toz inhaler

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Introduction

Asthma is a chronic inflammatory disorder of the airways characterized by attacks of bronchoconstriction causing shortness of breath, coughing, chest tightness, and rapid breathing. Severity of asthma can be classified as mild, moderate or severe (1). It presents an increased prevalence in preschool children and, one out of every 10 preschool-age children has asthma disorder. Prepubertal boys have twice the prevalence of asthma than prepubertal girls. However,

postpubertal prevalence is equal in both genders.

Asthma currently affects 300 million people worldwide and an additional 100 million people are estimated to get affected by 2025 (2). The prevalence of asthma in Turkey is higher in coastal cities, metropolises and in the socioeconomically deprived areas. Investigations conducted in our country have shown that the prevalence of asthma has a tendency to increase in our population (3,4).

The causes of the airway obstruction in asthma are bronchoconstriction led by the contraction of the bronchial smooth muscles, inflammation of the bronchial walls, and increase in mucus secretion. Asthma symptoms can be relieved by various medications. Medications used for asthma are β-adrenergic agonists, corticosteroids, cromolyn and nedocromil, ipratropium, montelukast, teofilin, zafirlukast, and zileuton (5,6).

In addition to side effects on general health, asthma has been reported to cause poor oral health, however, contradictory aspects exist. While some researchers have reported that asthma has no effect on oral health, many studies revealed the impacts of asthma on oral health (7,8).

In mild and moderate types of asthma, decrease in saliva flow, increase in caries and gingivitis, mucosal changes associated with chronic mouth breathing, posterior cross bite, increased overjet, long face, and jaw abnormalities like V-shaped palate can also be observed besides general symptoms (9).

In this review, in addition to investigation of the relationship between asthma and oral health, dental problems caused by asthma medications and possible measures that might be taken were also evaluated.

Asthma and Dental Caries

Dental caries is a multifactorial disease progressing as a result of the mutual interactions between environmental, behavioural and genetic factors (10). Dental caries progress through a complex mechanism which includes demineralization of the enamel by means of the organic acids produced by microorganisms in dental plaque. Chemical dissolution of the enamel occurs at pH 5.5. The normal pH of the oral environment is 7.0.

No consensus has been established yet among the studies investigating the dental caries prevalence in asthmatic children. Some researchers reported an increased caries prevalence in asthmatic children.

Ersin et al. (11) have reported that medications used for asthma induce dental caries by decreasing saliva pH and salivary flow rate.

McDerra et al. (12) revealed that children with asthma have more caries affecting their permanent teeth. Reddy et al. (7) suggested that caries prevalence in children increases depending on the severity of asthma. In their study, Shashikiran et al. (8) showed that asthmatic people using salbutamol have more dental caries compared to controls.

Ryberg et al. (13) have reported that the risk for caries lesion progression increased through the decreased salivary flow rate and increased salivary levels of streptococcus mutants and lactobacillus in patients who use β-2 agonists. Decreased salivary flow rate causes saliva buffering capacity to decrease and the benefit of saliva in elimination of the fermented food from the oral environment cannot be gained (13). Kargul et al. (14) have stated that oral pH decreases below 5.5 which is the critical pH for enamel demineralization during the first 30 minutes of time following the use of β-2 agonist.

Besides indirect side effects of asthma medications such as decreasing the salivary flow rate or saliva pH, fermentable carbohydrates present in asthma medications may also increase the risk for dental caries (15). Some sugar (lactose monohydrate) is added within the composition of some inhalers to promote the tolerance of the patient towards the taste of the medication. Kenny and Somaya (16) suggested that the prolonged use of these kinds of inhalers increase the risk for caries. Reddy et al. (7) have reported that the highest sugar levels were present within the syrup forms of the medications.

Frequent consumption of the cariogenic drinks to remove the taste left by asthma medications in the mouth increases the risk for caries. Ignorance of oral hygiene by patients due to their medical conditions and indulgent attitude of parents towards their children's sugar intake are among the factors that increase the risk for dental caries (7,12,15). Individuals with medical problems and those considered to be at high risk for dental caries need special care and should be checked in less than 6 months. Parents should be incorporated into oral hygiene education of their children and, tooth brushing in preschool children should be performed under parental supervision. Patients should be informed about rinsing their mouth out after each use of the inhaler and also be

recommended to use fluoride-containing mouthwash after brushing. Kargul et al. (14) have suggested that dental plaque pH could be neutralized by chewing sugar-free gums for maximum 1 minute after the inhaler use.

Asthma and Dental Erosion

Medications used for asthma lead to dental erosion risk for patients by decreasing the protective role of saliva against intrinsic and extrinsic acids. Dry mouth is exacerbated due to mouth breathing and bronchodilator use. Thereby, highly acidic drinks with a low pH consumed for quenching thirst can cause dental erosion in asthmatic individuals (17).

Increased incidence of gastroesophageal reflux disease may also be responsible for dental erosion in asthmatic individuals. Harding (18) have reported that asthmatic patients had more noticeable reflux symptoms such as esophagitis and, abnormal increased esophageal acid exposure were frequently encountered in asthmatic patients.

Use of asthma medications is also shown to be a factor in progression of gastroesophageal reflux disease. The strong association between gastrointestinal disorders and dental erosion may explain the tendency to dental erosion in asthmatic patients to some extent (15). Dry powder inhalers used in the management of asthma have an acidic pH. Thereby, patients should be warned to rinse their mouth thoroughly with low pH mouthwashes, sodium bicarbonate, milk or neutral sodium fluoride containing solutions following the use of inhaler.

Asthma and Periodontal Disease

The association between asthma and periodontal disease can be both attributed to the side effects of asthma medications and explained by the pathological activation of the immune and inflammatory mechanisms triggered by asthma.

Hyyppa (19) indicated that gingivitis in asthmatic children develops due to the change in immune response as well as dehydration of the alveolar mucosa related with mouth breathing. Salivary immunoglobulin E levels associated with periodontal destruction were detected to be significantly higher in asthmatic patients (19).

McDerra et al. (12) have reported that children with asthma had significantly more calculus and this was in association with the increase in calcium and phosphate concentrations in parotid and submaxillary saliva.

Side effects of inhaled corticosteroids on bone leading to a decrease in bone mineral density have been reported in some studies (20,21). Han et al. (22) have showed that bone mineral density was decreased especially in the mandible of asthmatic patients with tooth loss who received inhaled corticosteroids for a prolonged time. Paying more attention to oral hygiene as well as increasing the frequency of dental visits might be helpful in maintaining periodontal health in asthmatic patients.

Asthma and Oral Candidiasis

Oropharyngeal candidiasis is commonly associated with the use of nebulised corticosteroids. Approximately 10-20% of the inhaled corticosteroid can reach to the lungs and the rest of the portion is deposited on the oropharynx. This side effect occurs in terms of the regular use of high-dose inhaled corticosteroids (23). Immunosuppressive potency of corticosteroids also plays a role in progression of candidiasis. Additionally, a decrease in salivary immunoglobulins acts as a host-mediated factor (24). High concentrations of glucose related with lactose monohydrate present in the dry powder corticosteroids lead to candida growth, proliferation and adhesion to oral mucosal cells. Additionally, dry mouth caused by β-2 agonists is also a key factor in the progression of candidiasis (25).

Mouth rinsing after the use of dry powder is recommended in order to prevent oral candidiasis. A spacer attached to the inhaler obviates medication to be deposited on the oropharynx and also facilitates an increase in medication concentration in the lungs. Chewing sugar-free gum as well as use of sialogogues may be recommended to avoid dry mouth which has an impact on the progression of candidiasis. Controlled use of topical antimycotics, such as nystatin may also be effective against oral candidiasis (26).

Conclusion

The prevalence of asthma in the world and in our country has reached to a considerable level, however, it has a tendency to increase in our population. Impacts of the asthma medications on oral health have been suggested in several studies. General dental practitioners and pediatrists should have

knowledge about the impacts of these medications on oral health and also should educate their patients about the measures that might be taken. Especially, for patients who do not maintain regular dental visits, dental consultation directed by pediatricians is of importance with regard to protect oral health.

Dental practitioner recommendations for asthmatic patients can be listed as follows;

- Asthmatic individuals are in the group of people who are in need for special care and, thereby, dental visit frequency can be increased,

- Asthmatic children and their parents should be informed about the impacts of the asthma medications on oral health,

- Patients should be informed that they should rinse their mouth thoroughly with mouthwashes with a neutral pH, or sodium bicarbonate, milk or neutral sodium fluoride containing solutions after the use of inhaler,

- Measuring bone mineral density can be recommended for patients using inhaled corticosteroids,

- A spacer can be added to the inhaler in order to decrease the deposition of the medication in the mouth.

Ethics

Peer-review: External and Internal peer-reviewed.

Authorship Contributions

Concept: Sultan Keleş, Design: Sultan Keleş, Data Collection or Processing: Sultan Keleş, Nasibe Aycan Yılmaz, Literature Search: Sultan Keleş, Writing: Sultan Keleş, Nasibe Aycan Yılmaz.

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