Oral findings in asthmatic children

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ABSTRACT

Asthma is a chronic inflammatory condition that causes the airways to constrict and produce excess mucus which makes breathing difficult. It is reversible, either spontaneously or can be controlled with the help of drugs. Asthma medication consists of bronchodilators, corticosteroids and anticholinergic drugs. The effect of these drugs on oral health is the subject of concern among dental practitioners. Asthmatic patients taking medication show higher risk of developing dental caries, dental erosion, periodontal diseases and oral candidiasis. Hence, patients with bronchial asthma on medication should receive special prophylactic attention. This article aims to review the oral problems encountered in patients with asthma under medications and suggests some precautionary measures.

INTRODUCTION

Asthma is a major global health problem and it’s prevalence is increasing in most countries, especially among children. It is a leading cause for childhood hospitalisation. According to Global Alliance against Chronic Respiratory Diseases, in the year 2010, worldwide, 1 billion people suffered from chronic lung diseases, of which 300 million were affected with asthma.

DEFINITION

Asthma is a disorder defined by its clinical, physiological and pathological characteristics as follows. "Asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role. The chronic inflammation is associated with airway hyper responsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness, and coughing, particularly at night or in early morning. These episodes are usually associated with widespread, but variable, airflow obstruction within the lungs that is often reversible either spontaneously or with treatment".

Asthma treatment has two main objectives: to control, as well as to reduce the airway inflammation, and reopen the airways. The treatment of asthma starts with avoidance of stimuli, but controlling the symptoms with anti-asthmatic medicines is the main component of most asthma treatments. Drugs that achieve the first objective are called controllers and those that achieve the second are called relievers. Controllers are medications taken daily on a long term basis to keep asthma under control mainly through anti-inflammatory effects. They include anti-inflammatory agents, long acting beta agonist (LABA) and leukotriene modifiers. Relievers are medications used on an as-needed basis, which act quickly to reverse bronchoconstriction and relieve its symptoms. They are also known as rescue medications and consist of short-acting beta-agonists (SABA), systemic corticosteroids and anticholinergic drugs. They relieve the symptoms of asthma by relaxing the muscles that tighten around the airways. This action rapidly opens the airways, letting more air come in and out of the lungs. As a result, breathing improves.

Although the pathophysiology is well understood, morbidity and mortality rates are increasing. This high prevalence of childhood asthma necessitates that dental practitioners be familiar with this disease and the effects of asthma medication on oral health. This paper will review some of the oral problems encountered in patients with asthma under medications.

ASTHMA AND DENTAL CARIES.

Epidemiological studies investigating the effect of asthma on dental caries are conflicting. However, majority of the studies conclude that asthmatic children have higher dental caries prevalence. A study by Stensson et al indicated that preschool children with asthma have a higher prevalence of caries than children without asthma. McDerra et al. pointed out that asthmatic children have more tooth decay affecting permanent teeth. Ersin et al. showed that, through its disease status and its pharmacotherapy, includes some risk factors such as a decrease in the salivary flow rate and salivary pH for caries development. A study by Reddy et al. also suggested that asthmatic children have a high prevalence of caries and this increases with the severity of bronchial asthma. Shashikiran and co-workers revealed that asthmatic patients, especially those using salbutamol inhalers, have more caries than the control group. A study by Milano et al. showed that increased frequency of asthma medication use was associated with increased likelihood of caries experience.

Studies have shown that prolonged use of beta 2 agonist can decrease the salivary flow. Ryberg et al. observed that the secretion rates of whole and parotid saliva decreased by 26% and 36% respec-
tively in asthmatics on Beta - 2 agonist when compared to non asthmatics control group. The increase in risk of dental caries in asthmatic children medicated with beta-2 agonist was most often associated with a decrease in the salivary flow rate and the increase in Lactobacilli and Streptococcus mutans. The diminished flow rate also decreases the availability of biologically active antibacterial components like amylase, calcium ions, secretory Ig A, peroxidase and lysozyme which in turn favors both bacterial colonization (increase in lactobacilli and Streptococcus Mutan in oral cavity.) and plaque growth, leading to increase in caries rate.14

Low pH is a risk factor for demineralization of the tooth. Adolescents and young adults with asthma showed lower plaque initial pH values and plaque pH drop after a sucrose rinse compared to the control group.7 Kargul et al15 showed significant decrease in the pH of saliva and plaque, below critical pH of enamel demineralisation of 5.5, 30 minutes after treatment with beta-2 agonist inhalers. This is because beta-2 agonist can cause relaxation of smooth muscles such as lower esophageal sphincter leading to gastro esophageal reflex symptoms.16 Frequent consumption of acid beverages to compensate for reduced salivary flow and dry mouth is common among asthmatic children17. Both these factors contribute to the further decrease in salivary pH.

The increased susceptibility to dental caries can also be due to the frequent use of anti-asthmatic medications containing fermentable carbohydrate. Some dry powder inhalers contain sugar – lactose monohydrate, so that the patient can tolerate the taste when it is delivered. Although it is one of the least cariogenic sugars, frequent oral inhalation of these sugar containing drugs combined with decrease in salivary flow rate may contribute to an increase risk of caries.18. Reddy et al19 has pointed out that highest caries prevalence in asthmatic is seen in those children taking medication in syrup form. Associations between increasing prevalence of caries and lower salivary flow rate with increasing severity of asthma were observed, most likely due to the increased dosage and frequency of medication required to treat more severe asthma.9,19,20

Shashikaran et al20 analysed the drug-related effect and observed that beclamethasone inhaler showed an increase in caries but not very significant when compared to salbutamol inhaler and salbutamol tablets. The salbutamol tablets showed an increase in caries more than beclamethasone inhaler but less than salbutamol inhaler. This can be attributed to its systemic effect on the salivary secretions. Salbutamol inhaler showed higher degree of caries than beclamethasone inhaler and salbutamol tablets. It could be due to its local effects of decreased pH and altered salivary secretion levels and salivary composition.

Frequent consumption of sweet drinks and sweets between meals can also be one of the reasons for the increase in caries rate in asthmatic children.9 This increase in intake of the drinks may be either an attempt to wash away the taste of inhaled medications, or to counter the desiccating effect of mouth breathing and decrease in the salivary flow caused by beta-2 agonist.9,22

Often asthmatic children lead restricted life style and are not able to participate in normal childhood activities. McDerra et al7 reported that families may indulge children with frequent consumption of sweets, leading to an increase in caries rate. Moreover, increased attention to their general asthmatic condition may result in oral hygiene being neglected.15

In recent studies investigating the oral health of younger asthmatics, it was concluded that it was not the disease per se that caused a higher caries prevalence but rather caries-related factors, such as a lower salivary secretion rate, frequent mouthbreathing and a higher consumption of sugary drinks.

**ASTHMA AND ORAL CANDIDIASIS**

Oro-pharyngeal candidiasis is often associated with the use of inhaled corticosteroids.21 This adverse effect may be attributed to the topical effect of these drugs on the oral mucosa, as only 10%-20% of the inhaled drug reaches lungs, rest remains in oro pharynx. This is seen mainly among patients who use high dose of inhaled corticosteroids regularly.24 Most commonly seen as a pseudomembrane lesion (thrush) which clinically presents as white, soft plaque that leaves a painful erythematous eroded or ulcerated surface. The common sites are buccal mucosa, oropharynx and lateral aspect of the tongue.

Generalized immunosuppressive and anti-inflammatory effect of steroids is thought to play a major role in pathogenesis of candidiasis. Fukushima et al25 showed in a study that ICS can decrease salivary IgA, which can contribute to the development of oral candidiasis.

Knight and Fletche26 reported a higher level of salivary glucose in asthmatics treated with ICS than the control group. Also, many of the dry powder inhalers contained lactose monohydrate as the carrier vehicle in proportion of 10–25 mg per dose.18 This higher glucose concentration can also promote growth, proliferation and adhesion of Candida to the oral mucosal cells.27 As mentioned earlier, asthmatics who are medicated with beta-2 agonist show a decreased salivary flow rate. This decreased salivary flow rate can be associated with higher oral Candida counts.28

**ASTHMA AND PERIODONTAL DISEASES.**

Increased level of gingivitis has been observed with the use of LABA and ICS.29,30 This can be explained by an altered immune response and the dehydration of
alveolar mucosa due to mouth breathing. The key factor in destruction of the periodontal tissues is the interaction between bacterial and immunological factors. Saliva contains secretory IgA (sIgA) actively secreted by the salivary glands, which acts as the first line of defense for the mucosa by binding to the soluble and particulate antigen. Stimulated whole and parotid saliva from patients with chronic periodontal disease was shown to contain elevated levels of sIgA, and the concentration of sIgA tended to be correlated with the severity of disease. Moreover, in some studies, reduction of sIgA level in saliva of asthmatics has been reported. In contrast, Hyyppa found that allergic rhinitis may negatively influence periodontal health.

McDerra and Wotman reported that children with asthma had more calculus than normal children. Higher prevalence of calculus in asthmatic children is due to increased levels of calcium and phosphorous in submaxillary saliva and parotid saliva. This can also contribute to increase in periodontal problems. McDerra and Shaw investigated erosion in children on a found that children with asthma had more dental erosion than healthy controls.

Anti-asthmatic drugs particularly the newer dry powder inhalers can cause tooth erosion in children. The powder versions of preventer therapies e.g. Becotide and Flixiotide and relief bronchodilators e.g. Ventolin and Bricanyl, the mainstays of asthma treatment, are acidic with a pH below 5.5. Reports from clinical experiments demonstrated a fall in the pH of interdental plaque and saliva during the thirty minutes following the use of inhaler medication for asthma. Enamel starts to dissolve below pH 5.5. The powder in the puffers can erode the tooth enamel when used regularly.

It is also possible that there will be an increased consumption of drinks to compensate for oral dehydration, often drinks with a low pH, which could also cause erosion. Many studies have shown that higher the frequency of consumption of carbonated drinks like cola and other soft drinks, higher the severity score for erosion.

Another possible explanation for erosion in asthmatic patient is that they have a high incidence of gastro-esophageal reflux. It has been established that 50-60% of children who are asthmatic suffer from acid regurgitation. The mechanism of development of gastro-esophageal reflux in asthmatic patients include an increase in the pressure gradient differential between thorax and abdomen, alteration in the diaphragm function, autonomic dysregulation and high prevalence of hiatal hernia. One of the important factor which promotes gastro-esophageal reflux in asthmatic patients may be the asthmatic drugs itself. Al-Dlaigan YH et al revealed in his study that certain inhaled beta-2 adrenoceptor drugs which are partly swallowed when used, may decrease the lower esophageal sphincter pressure and the esophageal contraction amplitude. The relaxation is associated with GOR. The relationship between dental erosion and GOR is well documented.

**MISCELLANEOUS FINDING**

**Ulcerations**: this is mainly due to xerostomia and immunosuppression caused by inhaled drugs.

**Altered taste**: xerostomia results in incomplete food solubilization and diminishes the transport of taster molecules to taste buds.

**Halitosis**: this could be due to oral infection and xerostomia.

**PRECAUTIONARY MEASURES**

1. Educate asthmatic patients about their susceptibility to oral health problems and encourage regular dental check-ups. Adopt caries preventive measures like fluoride supplements and pit and fissure sealants.

2. Patients may also be advised to use saliva substitutes, sip plain water and use a fluoridated mouthrinse daily to compensate for xerostomia. A study by Kargul et al. showed that chewing sugar-free gum for at least one minute after using an inhaler can neutralize the interdental plaque pH. Therefore, the use of sugar-free chewing gum to stimulate salivary flow and buffer oral acids is encouraged.

3. It has been shown that dry powder inhalers used for asthma have an acidic pH. Hence, patients should be encouraged to rinse their mouth with neutral pH or basic mouthrinses, such as liquid antacids, sodium bicarbonate in water, milk or neutral sodium fluoride mouthrinses immediately after using inhalers. Patients should also be instructed not to brush their teeth immediately after exposure to acids as it may damage the already weakened enamel.

4. Train patients to use their inhaler properly. Advice the use of a spacer device which can be attached to the inhalers by minimizing the oropharyngeal deposition of the drug and maximizing the lung deposition, thereby reducing the local effect of steroids in causing oral candidiasis. By providing a spacer between the inhaler and the mouth, the velocity of the powder is reduced, thus reducing the ferocity of the impact of the powder on the oropharynx. This time lag in delivery permits more of the propellant to evaporate; hence more particles are inhaled into the lung.
5. Use of antimicrobial mouthrinses helps to prevent colonisation of candida. Controlled administration of topical antymycotics, such as nystatin, is also shown to prevent oral candidiasis.

REFERENCES

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