

## Asthma: Pediatric Dentistry Perspective - A Review

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### Abstract

Asthma is a disease of airways that is characterized by increased responsiveness of the tracheo bronchial tree to a multiplicity of stimuli. It is manifest by a widespread narrowing of the air passages and clinically by paroxysms of dyspnoea, coughing, and wheezing and 10% of children are affected. Females have a higher rate than males, although the prevalence is higher during childhood in boys. It is mainly due to allergy-like dust, pollen, respiratory infection, emotional distress, chocolates and change of climate. Oral manifestations are high caries rate, gingivitis, high palatal vault, posterior crossbite, increased over jet; gingivitis may occur in response to poor oral hygiene. Complete medical history like frequency of attacks, the severity of an attack, and medication, etc. Seat the child in an upright position for dental procedures. Treat a child soon after the medication is given. If the child is using inhaler, it should be brought along with him for the dental appointments in case of an attack. Rubber should be used judiciously as it can accentuate the asthmatic attack. Carious lesions, bacteria loaded aerosols, ultrasonically triggered water, aeroallergens such as enamel dust, acrylate are potent precipitants. Sedation and general anesthesia can be given if indicated. The patient who is receiving corticosteroid therapy should double or triple the dosage. Use of aspirin, NSAID and penicillin are contraindicated. Local anesthesia can be given. Use of nitrous oxide-oxygen sedation is most desirable. In case of an asthmatic attack in emergency administer 100% oxygen with patient sitting position leaning forward and subcutaneous administration of 0.3 ml of 1:1000 epinephrine. This article discusses about the etiology, clinical features, and management aspects of children with asthma.

**Keywords:** Asthma; Children; Oral Health; Dental Management

### Introduction

Asthma is a relatively common allergic reaction in which there is a spasm of bronchi and bronchioles which narrows the lumen and which is accompanied by edema and secretion of mucous. It produces dyspnoea and wheezing and frequently there is sweating, coughing and vomiting. The paroxysms vary considerably in severity and may be infrequent and short with complete relief between, or they may be persistent and severe, in which case the bronchial linings eventually become thickened, and chronic emphysema may occur. In long-standing case, posture is affected, with the back becoming rounded and a prominent sternum, to increase the chest expansion [1].

The prevalence of childhood asthma ranges from 4 -32%, Asthma saw in boys as compared to girls with 2:1 ratio until puberty; however, this ratio becomes 1:1 in females until puberty, but after puberty, it is thought to be more prevalent in women [2].

**Etiology**

Important allergens exploit this condition or house dust, pollens foods and sometimes nonspecific respiratory infections, though in many cases no specific allergens have been identified. There is frequently a history of emotional stress preceding the attack and some degree of physiological involvement is often present. Many patients give a history of infantile eczema before the onset of asthma but are usually ceases by the age of two or three years, though in some it continuous and two or concurrent. There is a very high familial association with the other allergic manifestations.

In some children, there is a tendency for asthma to improve about puberty but treatment can usually control the majority of cases during childhood so that they can lead the relatively normal life. There are, however, some who are handicapped to a variable degree. Treatment is aimed primarily at avoidance of identified allergens, or materials which are known to be common allergens. Apart from this the patient is treated symptomatically and may take drugs in the epinephrine group antihistamines, aminophylline or corticosteroids the last of this only used in severe cases when other measures have failed to control the paroxysms. Some patients can take one of the barbiturates and regularly as a tranquilizer. When respiratory infection is present a course of antibiotics usually prescribed but this does not affect asthma itself [3].

Patients with respiratory disorders may be identified by their medical history and physical examination. The medical history often reveals breathing difficulties, frequent upper respiratory infections, a smoking habit, and environmental or occupational exposure to respiratory irritants.

Visual examination of the chest and neck is also helpful in identifying these patients because the thoracic cage surrounding the lungs has a predictable size and shape. Abnormalities in its morphology are indicative of certain respiratory disorders [4].

A barrel-shaped chest with an increased anterior, posterior diameter caused by hyperinflation disorder such as emphysema and asthma.

Once a patient has identified as having a pulmonary disorder, direct referral to their physician should be made Asthma is seasonal respiratory disorder characterized by airway hyperactivity to various stimuli. It produces chronic bronchial smooth muscle spasm, inflammation, and swelling of the bronchial mucosa, hypersecretion of viscous mucus, and sputum plugging. The result is extensive spread narrowing of the airways, decreased ventilation, and increased airway resistance, especially to expiration [3-5].

**Classification**

linical classification of severity of Asthama showing in table 1 [6].

Severity	Symptom frequency	Nighttime symptoms	% FEV of predicted	FEV Variability
Intermittent	< 1 per week	> 2 per month	> 80%	< 20%
Mild persistent	> 1 per week but < 1 per day	> 2 per month	> 80%	20 - 30%
Moderate persistent	Daily	> 1 per week	60 - 80%	> 30%
Severe persistent	Daily	Frequent	< 60%	> 30%

**Table 1:** FEV - Forced Expiratory Volume in 1 Second.

Based on the severity of asthma it is divided into four stages [6].

Types of Stages	Description	Symptoms	Signs	Management for children	Management for Adults
<b>Stage 1:</b> Mild intermittent Asthma	Least severe type, Asymptomatic with normal lung function in between the exacerbations. -Night symptoms occur less than twice a month			-No daily medication is advocated. -Short-acting bronchodilator for symptomatic relief. -Use of short-acting beta-2 antagonist more than twice a week indicate long-term control therapy.	No daily medication required. 100 mg of salbutamol (2 puffs) to taken via an inhaler. An interval between 2 puffs should not be less than 2 minutes.
<b>Stage 2:</b> Mild Persistent Asthma		-Symptoms can be seen more than once a week but less than once a day. -Exacerbation affecting sleep and activity. -Night symptoms more than twice a month. -PEFR was higher than 80% with the variability of 20-30%.	-Patient may find it difficult to breathe after physical activity, irritable and lie down. Heart rate less than 100 beats. -Moderate breathing. Auscultation reveals moderate breathing Pulsus paradoxus is absent An accessory muscle of respiration not used.	For immediate relief: > Short-acting bronchodilators in the form of inhalers will be Increasing sufficient frequency suggests the need of long-term therapy Long-term therapy: Low dose inhaled corticosteroids for and inflammatory action (cromolyn 1-2 puffs bid) Nedocromil (1-2 puffs bid /QID) Leukotriene may use as the first line of drug for children.	Low dose inhaled corticosteroids Cromolyn 2-4 puffs bid/qid Nedocromil 2-4 puffs bid/qid.
<b>Stage 3:</b> Moderate Persistent Asthma		Daily presentations of symptoms. Night symptoms occurring more than once in a week.	Increased respiratory rate, Heart rate 100-120 beats/minute -Oxyhemoglobin saturation with room air is 91-95% -Expiratory wheezing can heard -Accessory muscles of respiration are used -Pulsus paradoxes may be present. -PEFR is 60-80% with variability more significant than 30%.	Daily anti-inflammatory treatment in the form of inhaled corticosteroid medium dose or. Low/medium dose corticosteroid + long-acting bronchodilator/ leukotriene antagonist especially for night symptoms > Children: 1-2 puffs q 12 hrs	Two puffs q 12 hrs

<p><b>Stage 4:</b> Severe Persistent Asthma</p>		<ul style="list-style-type: none"> <li>-Continuous symptoms</li> <li>Frequent exacerbations</li> <li>-Frequent night symptoms</li> <li>Patient is breathless even at rest Can talk only in words</li> <li>-Prefers to sit upright and Patient is usually irritable</li> </ul>	<ul style="list-style-type: none"> <li>-Respiratory rate is approximately 30 breath minutes. Heart rate is more than 120 beats minutes</li> <li>-Both inspiratory and expiratory wheezing can be heard</li> <li>Oxyhemoglobin saturation is less than 91%</li> <li>Accessory muscles are usually used.</li> <li>-Pulsus paradoxus is typically present</li> <li>PEFR less than 60% with variability more significant than 30%.</li> </ul>	<p>Short-acting bronchodilator in the form of inhaled beta two agonists for the symptomatic control 2-4 puffs.</p>	
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**Table 2:** Showing stages of Asthama.

**Oral manifestations**

Oral manifestations although no oral lesions occur directly from asthma, indirect effects of asthma drug therapy can cause clinical lesions. Patients most prone to oral manifestations are chronic asthmatics who use corticosteroid inhalants. The incidences of oral candidiasis vary from 1 - 77% with inhaled corticosteroids. Repeated contact of the steroid inhalant on the oral mucosa can result in the development of acute pseudomembranous candidiasis because of fungal overgrowth in an area of localized immunosuppressant. This steroid induced infection consists of *Candida albicans* colonies that appear as curdy, white lesions located commonly on the soft palate and oropharynx. The lesions are usually asymptomatic, but wiping the plaques reveals a red, raw or bleeding mucosal surface. Dysphonia may be concurrent and serves as an additional sign of persistent steroid inhalant use [6,7].

Oral candidiasis readily responds to local antifungal therapy. Nystatin is the drug of the first choice. It may administer as a tablet, liquid preparation, or pastille. A 2week course of antifungal therapy is required to resolve the condition. Patients should also receive an instruction of proper use of inhaler because oral candidiasis may be the result of improper usage placement of the mouthpiece too far into the mouth or too frequent applications) [5,7,8].

**Oral infection**

Effect of medications can also consider as a contributing factor toward periodontitis. It also advocated that asthmatic children have a higher affinity to develop calculus as compared to healthy children this could endorse to increased levels of calcium and phosphorus found in the salivary glands of children. Gingivitis and periodontitis have been related intensely with bronchial asthma. However, this could be due to mouth breathing pattern in asthmatic children causing to dehydration and desiccation of oral mucosa. It subsequently leads to gingivitis and periodontitis [9].

Asthmatic children have a higher affinity to develop calculus compared to healthy children; this could attribute to increased levels of calcium and phosphorus seen in the salivary glands of these children.

The association of caries development has been established by many studies in asthmatic children. The higher prevalence rate of dental caries in asthmatic children than normal children has been reported. The most probable cause could be the prolonged use of beta two agonist that reduces the salivary secretion, subsequent in xerostomia. Another reason for high caries could be the use of antiasthmatic medication containing fermentable carbohydrates and sugar (cough syrup). These children have more tooth decay affecting permanent teeth especially those using salbutamol inhalers [8-10].

In asthmatic children there is reduced salivary flow is also supplemented by increased colonization of lactobacilli and Streptococcus mutans that are responsible for the demineralization of hard tissue. And a noticeable decline of pH below 5.5 makes the entire environment of the oral cavity to be acidic predisposing to enamel demineralization. However, some dry powder inhalers contain sugar (lactose monohydrate) so that hence the child can tolerate the taste of the drug when it is delivered. Also, asthmatic children may have a restricted lifestyle where they miss school and are not participate to play sports and take part in other normal childhood activities [11,12].

Other hard tissue changes include erosion of the cervical portion of the teeth; this could be due to the development of gastro-oesophageal reflux disease (GORD) in asthmatics that have been on long-term beta-agonist therapy.

The association of asthma and orofacial abnormality has been evaluated and deliberated for years, the reason being the impaired nasal-respiratory function in these patients leading to dentofacial anomalies. These children reported having a long face, increased vertical height, constricted airways, enlarged adenoids, high palatal arch, V-shaped maxillary arch, increased overjet, posterior cross-bite, incompetent lips, and mouth breathing possible. This appearance is typically known as adenoid faces.

### Dental management

Case history and diagnosis the precipitating substances the rate of recurrence and severity of attacks the times of day when attacks take place whether this is a recent or earlier period problem how attacks usually are managed whether the patient has received emergency treatment for an acute attack.

A new of the part which may be played by nonspecific infections and the general principles of elimination of septic foci, any infected teeth should be removed or treated. Patients who have had corticosteroids therapy must have suitable precautions in the event of extractions local anesthesia presents no problems, but for general anesthesia, any severe cases should admit to hospital. The milder types may be done as ordinary outpatients, but those on sedatives should be warned to take the standard dose as usual provided there are not on sympathetic mimetic drugs [10].

Asthmatic patients tend to have anxieties and may be particularly apprehensive about dental treatment. Regular dental attendance should be encouraged and familiarized the child with the procedures and visits should be kept short, and as a traumatic as possible, those children who have had frequent upper respiratory infections may have marked tetracycline stains which may require treatment to improve aesthetics [12].

### Dental management

To minimize complications during treatment of the asthmatic patient, stress reduction measures should be emphasized to reduce anxiety-induced asthma attacks. Appointments should be short and in the morning. Anxiolytic agents should be quickly used when the patient is anxious about treatment. Patients who use an inhaler should have the product readily accessible during all appointments. Before ORA procedures 11 IV, and V, one to two puffs of the inhaler immediately before treatment recommended.

Psychological disturbances have been shown to be more common in patients with severe asthma than in healthy children. For example, Mrazek found that 25% of severe asthmatics suffered from emotional disturbances. Some authors suggest a "vicious cycle": asthma contributes to the development of behavioral problems, which, in turn, trigger or exacerbate asthmatic symptoms.

Most of the exacerbations are likely to occur during dental treatment, i.e. immediately or during the administration of local anesthesia, pulp extirpation, extraction, minor surgery, induction of general anesthesia and anxiety of the patient. All these factors are thought to be contributing to the precipitating factors. To avoid such a situation, it should make sure that the patient has taken the newest scheduled dose of medication before the treatment [2].

1. Drugs containing Aspirin (10 - 28% of all asthmatics may not tolerate the latter)
2. Nonsteroidal anti-inflammatory drugs (patients with intrinsic asthma).
3. Macrolide antibiotics in patients treated with theophylline. The serum methylxanthines levels (theophylline) may be increased.
4. Opiates: these can cause respiratory depression and histamine release.
5. Local anesthetics: use solutions without adrenaline or levonordefrin, due to the sulfite preservative contents.
6. If the patient is receiving prolonged systemic corticosteroid treatment, supplements may be needed (prior to dental procedures that might cause stress).
7. Contra indicated aspirin, aspirin containing products, NSAIDs, barbiturates, and narcotics may precipitate an asthma attack
8. Antihistamine should be used judiciously because of their drying effect on oropharyngeal secretions.
9. They may be sensitive to the cardio stimulating effect of epinephrine and the allergenic effect of sulfite preservative contained within local anesthetic carpules. Avoidance of LA containing these substances is advised in the chronic asthmatics.
10. Erythromycin, ciprofloxacin, and clindamycin should be prescribed with caution to patients who take theophylline, because these antibiotics displace the plasma protein bound fraction of theophylline, which can elevate blood levels of the bronchodilator to toxic levels.
11. Patients who take corticosteroid may require steroid supplementation.

**Table 3:** Showing drugs to be avoided in asthmatic patients [13].

-Reduction of stress is the best method for diminishing the likelihood of an asthma mack
-Patients with chronic obstructive pulmonary disease (bronchitis and emphysema)
-Appointments should be scheduled in the morning and kept short.
-An anxiolytic agent that is not a respiratory depressant can be prescribed
-Advise the patient to obtain proper rest the night before treatment and to reduce work and social obligations on the day of the treatment.
-Identify and avoid precipitating factors of attacks including anesthetic gases, sulfites, and aspirin containing analgesics
-Patients taking corticosteroids or those treated with corticosteroids during the last year (e.g. chronic asthmatics and sarcoid patients) may have adrenal suppression and a reduced ability to withstand the stress of dental treatment
-Ascertain the dosage and consult with physician to determine the need for additional steroids

**Table 4:** Viewing stress reduction/anxiolytic guidelines [14].

1. Patients with chronic bronchitis, emphysema, and restrictive pulmonary disease may require modification in the chair position
2. The placement in the supine position may induce breathing difficulties from reduced compliance and mechanical obstruction, the inability to clear mucous secretions
3. Sit the patient who has chronic restrictive pulmonary disease in the upright or semi reclined position

**Table 5:** Exhibiting chair position guidelines [15].

1. Exceptions to the rule are patients with asthma or those with obstructive pulmonary disease who take bronchodilators
2. The vasoconstrictor may stimulate adverse cardiac arrhythmias in the patient with COPD, whereas the sulfites, used to preserve the vasoconstrictor in the local anaesthetic, may precipitate an asthma attack.
3. In patients with COPD or asthma, avoid local anaesthetics that contain epinephrine.
4. Substitute a local anaesthetic that contains a sympathomimetic agent with less cardiac stimulatory activity (Levonordefrin or phenylephrine)
5. Avoid bilateral inferior alveolar nerve blocks that could result in soft tissue swelling and impingement of the airway
6. Be prepared to manage an emergency if an asthma attack occurs; the patient should have ready access to the inhalant

**Table 6:** *Displaying anaesthesia guidelines [16].*

1. Aspirin, aspirin-containing analgesics, and other nonsteroidal anti-inflammatory drugs (NSAID) should be avoided in the patient with asthma because about 10% of these patients have aspirin-induced asthma.
2. Acetaminophen is a safe alternative.
3. Barbiturates and narcotics should be avoided in the asthmatic and the patient with COPD because these drugs may precipitate an asthma attack and depress respiratory function

**Table 7:** *Showing analgesia guidelines [17].*

1. Culture and sensitivity testing is recommended whenever oral infection is present.
2. Penicillin can be used in patients with respiratory disease without problems as long as they are not hypersensitive to the drug.
3. Patients with extrinsic asthma are hypersensitive to many allergens. Inquiry should be made to determine any previous reactions to antibiotics.
4. Erythromycin, ciprofloxacin, and clindamycin should be avoided in patients who take theophylline.
5. These antibiotics can slow the metabolism of theophylline, displace protein bound reactions, elevate blood levels, and increase toxicity.
6. If the patient is on long-term antibiotic therapy for a respiratory illness, management of intraoral infections and the antibiotic prophylaxis regimen may require adjustment.

**Table 8:** *Viewing antibiotic guidelines [18].*

1. The goal is to maintain a patient airway.
2. To minimize breathing difficulties, and to provide supplemental gaseous agents as needed.
3. A rubber dam is ill-advised in patients who have severe obstructive pulmonary disease and/or breathing difficulties.
4. To avoid precipitating an asthma attack, have the patient use their inhaler prophylactically before treatment.
5. Avoid the use of anesthetic gases in the asthmatic patient.

**Table 9:** *Exhibiting airway maintenance and gaseous administration guidelines [19].*

1. The best way of preventing the Spread of respiratory infections is by providing the patient with appropriate Chemotherapy and delaying dental care until a non infectious status is obtained.
2. Normal barrier equipment such as gloves, masks, and eye protection is mandatory when dealing with infectious patients to reduce airborne dissemination of respiratory secretions.
3. Contact with blood, saliva, and aerosols should be minimized by using a rubber dam and high-velocity evacuation, while limiting the use of rotary hand-pieces.
4. Cross - contamination is reduced by wrapping objects subject to touch and keeping all instruments required in a single, sterile package.
5. Contaminated instruments should be cleaned of all bodily fluids prior to sterilization. Contaminated disposable supplies should be discarded in bags labelled "biohazardous".
6. Operatory surfaces should be cleaned and disinfected with the appropriate disinfectant agents. Water lines and the evacuation system should be flushed (with disinfectant if possible) when the patient has been dismissed.
7. Avoid nasal administration of gaseous agents in patients with infectious respiratory disease.

**Table 10:** Displaying infection control guidelines [20-23].

	In Office	At Home
1	Consult with pulmonary care specialist and key family members to accurately assess the child’s reaction to dental treatment.	
2	Assignment of health status and assessment of medicines and oral health risk levels.	Use of space appliance with inhaler
3	Culturally responsive evaluation and treatment plan	Daily use of fluoride mouth rinse
4	Minimize anxiety and avoid irritating or triggering asthma attacks	Avoid tooth brushing immediately after using an inhaler. Rinse with a neutral or high pH mouth rinse or water, drink milk, or eat cheese or sugar-free yogurt after using inhaler
5	Familiarize staff with emergency management of asthma attack	
6	Placement of pit and fissure sealants	Use of soft tooth brush and low abrasive fluoride tooth paste
7	Regular topical fluoride treatments	Use of sugar free chewing gum during gastroesophageal events
8	Early orthodontic intervention	After using an inhaler, stimulate salivary flow with sugar free chewing gum or lozenges.
9	Frequent recall visits based on cares risk	

**Table 11:** Viewing preventive programme to manage asthma related oral conditions in children [38,39].

**Dental materials-aggravating asthma**

Fluoride trays and cotton rolls also have been attentive with promoting asthmatic events. Dental treatment can raise a significant decrease in pulmonary function among asthmatic patients. Rubber dams should be used judiciously to avoid possible respiratory

hypertensive heart disease. Prolonged supine positioning, bacteria-laden aerosols from plaque or from carious lesions and ultrasonically nebulized water also can be triggers in the dental setting.

An additional concern with vasoconstrictors is their interaction with specific medications commonly used by asthmatic patients. Vasoconstrictors may add to the effect of beta2agonists, causing excessive adrenergic activity that results in palpitations, increased blood pressure and dysrhythmias. Patients who have nocturnal asthma must schedule for late-morning appointments, when attacks are less likely. Avoid operatory odorants (e.g. methyl methacrylate) should be reduced before the patient treated. Patients instructed to bring their inhalers (bronchodilators) to each appointment and to inform the dentist at the early sign or symptom of an asthma attack. Prophylactic inhalation of a patient's bronchodilator at the commencement of the appointment is a valuable method of preventing an asthma attack. The use of a pulse oximeter also is useful for decisive the patient's oxygen saturation level. In healthy patients, this value remainder between 97% and 100% whereas a drop to 91% or below indicates a poor oxygen exchange and the need for intervention. Due to stress implicated as a precipitating factor in asthma attacks and dental treatment may result in decreased lung function. Patients with asthma who medicated over the long term with systemic corticosteroids may require supplementation for major surgical procedures if their health is poor [2].

### Management of asthmatic attack in dental setting

Discontinue the procedure and allow the patient to believe a secure position. Establish and maintain a patent airway and administer bet two agonist via inhaler or nebulizer. Administer oxygen via a face mask, nasal hood or cannula. If no improvement observed and symptoms are worsening, administer epinephrine subcutaneously (1:100 solution, 0.01 mg/kg of body weight to a maximum dose of 0,3 mg). Alert emergency medical services. Maintain good oxygen level until the patient stops wheezing, and medical assistance arrives [39].

### Conclusion

Anxiety is also a well-known asthma trigger, and the dental environment is a common site for an acute asthmatic attack. Hence it should be ascertained that the patient has taken his or her most recent scheduled dose of antiasthma medication before treatment. Regular professional is and good oral hygiene maintained due to persistent treatment limitations.

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