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Review Article

Role of paediatricians in oral disease prevention

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ABSTRACT

Oral diseases pose a major health burden, especially in children, causing pain, discomfort, disfigurement and also affecting the quality of life. Most of the oral diseases are preventable by early diagnosis, thereby achieving standard oral and dental healthcare in children. The paediatricians due to the unique position, they occupy in child care, are invaluable in diagnosing the early changes in dental and facial structures. Oral health awareness among paediatricians and implementation of their oral health-related knowledge in their practice can have a significant impact on prevention of oral disease in children. This review discusses the common oral conditions in children such as early childhood caries, childhood oral habits and dentofacial abnormalities in children and the role of the paediatrician.

Keywords: Dental caries, ECC, Dentofacial orthopaedics, Oral habits

INTRODUCTION

Paediatricians are considered as curators of health in children.[1] A child is examined from birth to adulthood by them and continue seeing them as family physicians throughout their lifetime. A study[2] shows that, before 1st birthday, a child is examined at least 8 times and 13 times before 3rd birthday by a paediatrician. This specialty deals with child's psychosocial, physical, developmental and mental health needs apart from disease-based treatment and also gives required guidance regarding nutrition, prevention of diseases and cognitive development to the parent.

Even though paediatricians have a great role in child's oral health, the scope of paediatricians as oral health provider is not clearly defined. During childcare visits, their involvement in oral health might play an important role in diagnosis and prevention of dental and facial diseases of their patients.[3] Usually, a child is taken to the dentist only if there is problem with the teeth, most of the teeth are affected by caries due to poor oral hygiene by this time. Contribution to oral health can be done by a paediatrician who is familiar with science of dental condition, capable of assessing oral disease risk and knowledgeable about preventive strategies to his or her patients.

The American Academy of Paediatrics recommends that paediatric healthcare professional should be trained to carry out an oral health risk assessment in children over 6 months of age.[4] Various studies show that paediatricians knowledge about preventive oral health therein and to the assessment of oral health and diseases is unsatisfactory.[5]

Oral health is a major neglected global population health challenge according to the Global Burden of Disease study.[6] In the developing countries, dental caries is a public health problem.

It has 60–90% incidence in children.[7,8] About 30% of children suffer from misaligned teeth and jaws affecting the dentofacial apparatus.[9] This can be prevented if diagnosed early. Paediatricians play a great role in identifying these conditions so that early interventions can be done. This review article provides insights into common oral health diseases such as dental caries, malocclusion and role of oral habits in dental diseases. This article also discusses various methods and strategies which can be employed in paediatric practice and help in diagnosis and referring appropriately.

DENTAL CARIES IN CHILDREN

Dental caries in children is considered as one of the most common diseases worldwide. In a list of 291 diseases of children below 5 years, it is placed in 12th position and in children below 12 years, it is placed in 5th position. Early childhood caries is an age-related caries where the presence of one or more decayed, missing or filled tooth surfaces in a child under 6 years of age.[10,11] Global prevalence of ECC is ranged from 0.3% to 69.6% in children of 0–2 years old (means prevalence = 23.8%) and 6.3–98.1% in children 3–5 years old (mean prevalence = 57.3%). A systematic review of ECC prevalence in India shows the overall prevalence at 49.6% with none of the states reporting below 40%.[12]

There is a multifactorial aetiology [Figure 1] related to ECC which is mainly time-specific interaction of microorganisms with sugar on a tooth surface in acidic saliva.[13] A review by Harris *et al.*[14] reveals out of 104 risk factors identified for ECC, dietary and feeding-related factors constituted about 44 risk factors in young children.

Improper feeding practice can expose teeth to fermentable carbohydrates for a long time which will aggravate the chances of ECC.[15] Night feeding results in pooling of milk in the mouth between the palate and tongue. This acts as a medium for caries forming bacteria to colonise the tooth followed by initiation of caries. Moreover, the saliva production is reduced during night which will enhance the caries process.[16]

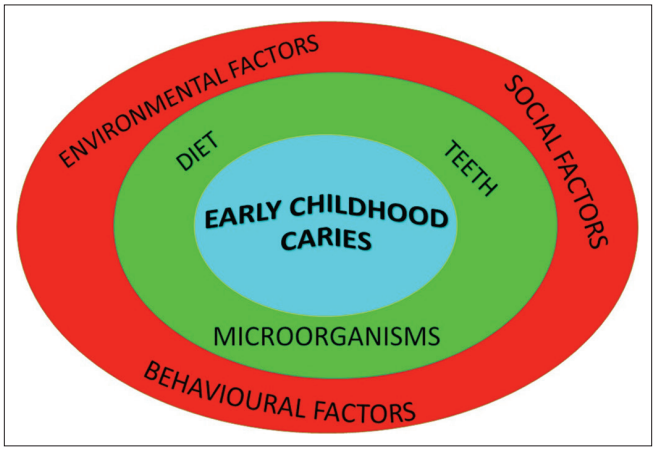

Figure 1: Etiological factors of ECC.

Initiation and weaning of breastfeeding should be timed appropriately. In children of 2–5 year,[17] breastfeeding and it's duration were independently associated with increasing risk for ECC. Lactose which is a potential carbohydrates food source for the caries causing bacteria is the main content of human milk. Even though immune boosting properties such as secretory Ig A, lactoferrin, Lewis factor X, SLTI, alpha defensins, complements, mucin and prostaglandins may override this, increased periods of breastfeeding are always risk for dental caries.[18]

High age of weaning, increased number of between meal sugar intake and increased frequency of sugar intake are a potential risk factor in the development of caries. Smaller the size of sugar molecules, it is easier for the salivary amylase to split the molecules into products which can be easily metabolised by plaque bacteria. Thus formed, acidic end products lead to subsequent demineralisation and increased risk of caries on susceptible teeth.[19] Other factors contributing to caries[20,21] are high carbohydrates diet, retentiveness of food and the presence or absence of productive factors in food.

A new born is exposed to millions of microorganisms immediately after birth which turns into infants' normal flora. Epithelial surfaces of the oral cavity of infants are colonised by various bacterial species[22] soon after birth.

Streptococcus epidermidis, *Streptococcus salivarius*, *Staphylococcus* spp. and Fusobacterium are the most frequently detected oral bacterial community. One of the most dominant bacterial groups found in human breast milk are the *Streptococcus*. Hence, they are abundantly seen in early oral cavity.[23]

Streptococcus mutans are the main microorganisms seen in early childhood caries. Dietary sucrose is effectively used to rapidly synthesise insoluble glutens and produce acids by *S. mutans*. They adapt to environmental stress and acidic pH, some of the strains are capable of genetic transformation and bacteriocin production. Thus, they compete with other oral bacteria and initiate development of cariogenic biofilm. High genetic and phenotypic activity of *S. mutans* can impact these virulence factors, which may influence its cariogenic activity of ECC.[24] Possible routes of spread of *S. mutans*[25] are vertical transmission from mother to children and horizontal transmission from peers.

Several clinical studies surprisingly reveal that the fungus *Candida albicans* is frequently detected in plaque biofilms from toddlers with ECC.[26] *Lactobacilli* also participate in the development of caries and play an important role in its progression but not it's initiation. *Actinomyces gerencseriae* were also associated with initiation of caries; on the other hand, *Bifidobacterium* was associated with the deep caries

lesion. *Scardovia wiggsiae* is also recently associated with ECC.[27]

Salivary buffering capacity, pH and flow are important factors for ECC but the role of salivary proteins such as acidic and basic proline-rich glycoproteins, mucins, immunoglobulin, agglutinins, lactoferrin, cystatin and lysozyme is thought to be important modulators of oral health but their exact role and significance in caries development or in ECC have not been easy to demonstrate.[16]

The upper central incisors are the most commonly affected by ECC followed by maxillary lateral incisor, maxillary molars and maxillary canines. Mandibular anterior teeth remain immune to ECC due to the protection of tongue and salivary clearance,[19] whereas lower molars are affected at a later stage.

Quality of life in children is affected by ECC as it spreads rapidly to multiple teeth with early involvement of the pulp. The child will have difficulty to eat hard food and will be sensitive to both thermal and physical stimuli. Poor intake of food will result in poor general health in children. Sleep disturbances are also seen due to pulpitis. The permanent teeth are also susceptible to new caries lesion if not treated early in children. As the infection spreads, the parents will have to bear high treatment cost and hospitalisation. Diminished oral health affects quality of life, loss of school days and diminished ability to learn.[28]

Control of bacterial infection, reduction of risk levels by identification of caries risk, remineralisation of teeth and long-term follow-up[29] are the medical management of ECC. The American Association of Paediatric Dentistry motivates preventive measures both professional and at home that include elimination of frequent intake of liquid and/or solid food-containing sugar, especially sugar sweet and beverages and *ad libitum* breastfeeding soon after the primary tooth eruption is initiated and introduction of other dietary carbohydrates.[11]

Implementation of oral hygiene practices should be before eruption of the first primary tooth, the child should be encouraged to brush twice daily by the parent using a soft toothbrush appropriate to the child's age. In children under the age of 3, a smear or rice sized amount, and in children between age 3 and 6, a pea sized amount of fluoridated toothpaste is recommended. For children diagnosed of ECC[11] provisionally applied fluoride varnish, the treatment is also suggested. Working with medical professionals is advised to make sure all newborns and toddlers should have access to dental counselling, screening and preventive procedures. To reduce incidence of ECC, promotion of healthy feeding practice is an important component because is establishment of such eating practices which may help encourage suitable choices.[30-32]

To identify white lines or spots on the tooth, brown spots at the gum line, broken teeth cavities and bad breadth the paediatrician can go for 'lift the lip.'[33] By consistently performing a simple, quick screening will help healthcare practitioner to identify any disease and will be able to inform the parent so that it can be treated before it becomes serious.[34] Caries is one of the side effect in chronically ill children as they are exposed to a greater sugar load from oral medication. If medication is administered at bed time,[35] an association with the sugar base syrups and dental caries has been reported. The paediatrician can recommend the patient to maintain good oral hygiene and advise them to have water after medications so that clearance of sugary oral environment is reduced.

ORAL HABITS

Oral habits in children can have harmful effects in the developmental stages of orofacial complex.[36] The most common habits are digit sucking, mouth breathing, tongue thrusting, bruxism, lip or cheek biting, nail biting, pencil biting, masochistic habits, etc. In age group of 3–6 years, digit sucking, pencil biting and tongue thrust are highly prevalent. Assessment of immediate and long-term effects on the teeth and orofacial development is made as early as possible, if such habits are identified earlier. In primary and mixed dentition increased, the prevalence of malocclusion and upper front permanent teeth[37] and increased risk of trauma are associated with this habits.

Sucking is a natural reflex which is present *in utero* and is generally given up by 3 years of age but if it persistent beyond 4 years of age, it may result in malocclusion.[38] On examination, clean and chapped fingers are the identification marks of children with digit sucking, along with thumb exhibiting dish pan appearance with fibrous roughened callus on superior aspect of finger nail. Lower lip is hyper active, whereas the upper lip appears to be short and hypertonic passive or incompetent during swallowing. Protrusion of maxilla and profound mentalis muscle activity is noted on the early identification therapies which are non-invasive such as placing hot flavoured or bitter tasted liquid preparation on finger that are sucked, use of chemicals, thumb guard, bandage on finger and long sleeved night dresses with ends stitched can be tried to break the habits [Table 1]. If the habits continue into the mixed dentition period, appliance therapy with reminder appliance is eventually needed.[39,40]

Mouth breathing is an abnormal respiration through the oral cavity instead of nose. Anatomical deviation in nasal passage, nasal obstruction due to some pathologies or learned habits cause mouth breathing.[41,42] During the early mixed dentition period, it can cause lot of abnormal changes to the orofacial complex. Facial appearance of child with mouth breathing[43] habit is termed as adenoid facies with long narrow expressionless face, flattened nose and short lower

Table 1: Non-invasive therapy for thumb-sucking habit.

Chemical	Bitter and sour materials applied over thumb to terminate practice for example, quinine, asafoetida, pepper and castor oil
Thumb guard	A thermoplastic thumb post is placed on offending digit.
Ace bandage	Elastic bandage wrapped across the elbow. Pressure exerted by the bandage removes the digit from the mouth as the child tires and falls asleep
Long sleeve night gown	Long sleeves of the gown interfere with contact of thumb and oral cavity thus reminding the child constantly.

lip and receding chin. Habit correction should be done only after ruling out of nasal obstruction, deviations or pathology in a patient. The best advised correction for habitual mouth breathing is the oral screen.

Other habits such as tongue thrusting can occur isolated or in combination with mouth breathing. The patients will also have lisping problem in articulation of s/n/t/d/l/th/z/v sounds.[44,45] Some exercises [Table 2] help in the correction of tongue thrusting at the early stage in the age group of 6–8 years,[46] growth period shows abnormal face and jaw development. Protruding maxilla and mandible, retruded maxilla and mandible or in different combination are the abnormal growth patterns. Retrognathic or short mandible with normal or prognathic maxilla is characteristic features of Class 2 malocclusions. In Class 3 malocclusions, concave profile or face with midfacial deficiencies results in sunken appearance and relative mandibular prognathism and prominent chin.[47]

Genetics or prolonged oral habits may be the cause of these craniofacial growth changes. To avoid extensive management in the future, these deformations require orthopaedic correction at appropriate age that is, 7–9 years during the secondary growth period is considered as optimal age for growth modification. Functional appliances can be used to alter the growth pattern so that jaw alignment is achieved before the secondary growth period ends.[48] Early diagnosis aids in complete correction rather than orthognathic surgery which is indicated after complete growth of dentofacial complex.

Recommendations for the primary paediatric practitioners: [49]

1. Administrator periodic oral health risk assessment to all children.
2. For medical practitioners who are in training programs and those who currently treat children are recommended to be trained for oral health risk assessment.
3. Dietary counselling for optimal oral health should be an intrinsic component of general health counselling.
4. Anticipatory guidance for oral health should be an integral part of comprehensive patient counselling.

Table 2: Myofunctional exercises for tongue thrusting.

1. The child is asked to place the tip of the tongue min the rugae area for 5 min and is asked to swallow
2. Sucking the tongue upward against the roof of the mouth and press the entire tongue against it and hold this position for 10 s and repeated for 5 time
3. The tongue tip against the palate can hold small orthodontic rubber band during swallowing. Repeat it for few times
4. Instead of the elastic, a lemon candy is put on the tongue tip. The patient is asked to hold the candy against the palate by the tongue tip and then asking the child to swallow. Repeat it for few times
5. 4S Exercise#: This includes identifying the spot by tongue, salivating, squeezing the spot and swallowing.

#The four steps are as follows: (i) Spotting exercise (1S) – Spot should be the rest position of the tongue. (ii) Salivation exercise (2S) – The tongue is placed on the spot, which results in salivation. (iii) Squeezing exercise (3S) – The tongue is squeezed vigorously with the teeth closed against the spot followed by relaxing. (iv) Swallowing exercise (4S) – After squeezing, the next step is to swallow the spot. This new swallowing pattern should be practiced at least 40 times a day.

CONCLUSION

Oral health is an integral part of the overall health and well-being of children. Most oral health conditions are largely preventable and can be treated in their early stages. Paediatricians are well positioned to begin this process as they see their patients at infancy itself and thereafter. Paediatricians are also in a good position to see that every child is provided practical, targeted and effective advice to parents about preventing dental disease. A paediatrician who is familiar with the science of dental diseases, oral habits and capable of assessing growth and development can apply various strategies of prevention and can refer the child for further intervention by the dentist.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Conflicts of interest

There are no conflicts of interest.

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