



Review Article

Early Childhood Caries - Cause, Diagnosis & Management

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ABSTRACT

Early Childhood caries has been a major challenge facing health care professionals' with a very high prevalence world wide. Early childhood caries is characterized by early onset and very rapid progression of caries in primary teeth of infants and pre-school children. Untreated ECC is associated with poor oral and general health, high treatment cost, psychomotor problems and diminished growth. In addition to typical causative factors of caries a multitude of other factors like socioeconomic factors, oral hygiene of mother, presence of diseases and consumption of infant food and medication are also involved. A definite diagnosis is established on questions to parents regarding risk factors and a clinical oral examination, and radiological examination. Management of Early Childhood caries involves a prevention strategy during and after pregnancy with a multi-disciplinary approach in coordination with pediatricians and public health workers for early detection of ECC. The expectant mother should be monitored for dental problems during pregnancy and given the appropriate prevention recommendations before the birth of her baby. This is required to control the bacteria and eliminate the sources of infection, in view of the risk of bacterial transmission to the child. The Baby's first dental visit should be during the first year of life, preferably during the first six months following the eruption of his first teeth, but no later than his first birthday. During the first visit, the dentist will examine the baby's mouth and give specific oral care advice for preventing ECC. Other preventive methods include use of fluorides, chlorhexidine varnish, pit and fissure sealants and dietary advice. Clinical management of ECC may be complicated and is based on the stage of caries and involves an immediate, stabilization and restorative phase followed by routine monitoring of the child. ECC prevention is therefore an essential part in any dental health promotion program which will provide a base for the healthy upbringing of a child.

Key Words: Children, Caries, cause, diagnosis, management

INTRODUCTION

Worldwide Early Childhood Caries (ECC) is one of the highly prevalent disease affecting children under the age of 6 years. In most developed, developing and under-developed countries the disease mostly remains untreated under the age of three years.

The problems associated with ECC include:

- Poor oral health with subsequent problems in general health of the child.
- Frequent dental clinic visits and possible hospitalization.
- High cost of treatment and time.
- Loss of school days and increased days with restricted activity
- Diminished ability to learn due to psychosomatic and behavioral problems.
- Children with ECC usually weigh less and are shorter than average. ⁽¹³⁾
- Growth is affected because of difficulty in sleeping and eating due to infection and pain.

Untreated Early Childhood Caries:

- High risk of new carious lesions in both the primary and permanent dentitions
- Subsequent to pulpal necrosis, infection spreads characterized by cellulites, lymphadenopathy and mobility of the affected teeth.
- In the chronic form, it is characterized by abscesses and interdental septum syndrome. ⁽¹⁸⁾

- Severe infection can spread to developing permanent teeth buds causing irreversible lesions.
- Complications from subsequent infections can occur in children already in a weakened state of health
- Early loss of primary can cause orthodontic, esthetic and speech related problems.

ECC is defined as “the presence of 1 or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces” in any primary tooth in a child 71 months of age or younger. ⁽¹⁾

Other commonly used terms to describe early caries in children.

- Baby bottle tooth decay
- Nursing bottle caries
- Baby Bottle Syndrome
- Early childhood dental decay
- Early childhood tooth decay
- Comforter caries
- Maxillary anterior caries
- Rampant caries

However, the term *Early Childhood Caries (ECC)* that reflects the multi-factorial nature of the disease is now universally accepted to describe caries in children between the ages of 0 to 6 years. **Severe Early Childhood Caries (S-ECC)**. This has replaced the term *rampant caries*. In children younger than 3 years of age, any sign of smooth-surface caries is indicative of severe early childhood caries (S-ECC). From ages 3 through 5, 1 or more cavitated, missing (due to caries), or filled smooth surfaces in primary maxillary anterior teeth or a decayed, missing, or filled score of > 4 (age 3), >5 (age 4), or > 6 (age 5) surfaces constitutes S-ECC.4. ⁽¹⁾

In clinical terms, Severe Early Childhood Caries (SECC) describes dental caries in the primary dentition of young children that is of sudden onset, rapidly progressing, widespread, burrowing in nature and affecting those surfaces of teeth that are otherwise immune to caries resulting in early involvement of the dental pulp. ⁽¹⁶⁾

More specifically, some experts recommend using the term Severe Early Childhood Caries (SECC) to designate all caries considered atypical, progressive, acute or rampant.

Factors responsible for Early Childhood Caries

The typical causative factors for caries are:

- Cariogenic bacteria
- Fermentable carbohydrates
- Susceptible host

In ECC development a multitude of other factors are also involved. In addition to prolonged on-demand breast-feeding and improper use of nursing bottle ECC has been associated with:

- Socioeconomic status and parental education.
- Nutrition and oral hygiene of the mother, social issues and parenting practices followed.
- Possibility of Cariogenic bacteria transmitted from mother and caregivers to child during feeding due to sharing of spoons, utensils or toothbrush.
- Consumption of cariogenic infant food preparations and milk-based formulas for infant feeding.
- Several diseases are associated with ECC, among them, malnutrition,

asthma, recurrent infections and some other chronic diseases.

- Premature babies, Low birth-weight, lead to high levels of streptococcal colonization in addition to risk of development of enamel hypoplasia and salivary disorders increasing the susceptibility to ECC.
- Insufficient fluoride intake
- Medications that cause decrease in the oral salivary flow and use flavored Pediatric syrups are a causative factor for ECC.

Role of Bacteria: ^(14, 15)

Scientific evidence suggests that *Streptococcus mutans* is a major etiologic agent in the development of S-ECC however, it is not known whether S-ECC is caused by a single or specific grouping of bacteria. However, it has been reported that the microbial diversity and the complexity of the microbial biota in plaque is less in children with S-ECC than in Caries Free children. The severity of ECC is directly related to the early establishment of mutans streptococci in the infant. These bacteria need non-desquamative surfaces to colonize because their oral benefits with the number of erupted teeth and with age. In the period known as *window of infectivity* which corresponds to the eruption of lower incisors (6 months) and upper molars (24months), the acquisition of streptococci increases. Other microorganisms include lactobacilli, which were associated with the progression of an established lesion and not with the development of caries itself.

Diagnosis:

Early childhood caries is characterized by early onset and very rapid progression of caries in primary teeth of infants and pre-

school children. The caries pattern is dependent on three factors

- ❖ Sequence & timing of the tooth eruption.
- ❖ Presence & duration of the harmful oral habits.
- ❖ Sucking pattern of the child.

Based on these factors the teeth affected are:

- Maxillary primary incisors followed by the first primary molars are most affected.

- Mandibular incisors are usually spared but may be involved in case of inappropriate pacifier use or in severe early childhood caries.
- Primary canines and second primary molars are least affected in ECC.
- Evidently, the attack pattern of ECC changes at age three, when it begins to affect the first and second primary molars. ⁽¹⁶⁾

Diagnosis of ECC & S- ECC based on stage ⁽¹⁷⁾

STAGE	AGE	CLINICAL FINDINGS	SIGNS & SYMPTOMS
One	10-20 months or younger	Appearance of chalky, opaque demineralization lesions on the smooth surfaces of the maxillary primary incisors. A distinctive whitish line can be distinguished in the cervical region of the vestibular and palatal surfaces of the maxillary incisors	Non-symptomatic Usually not recognized by parents or in first clinical examination The lesions can be diagnosed only after the affected teeth have been thoroughly dried
Two	16-24 months	The dentin is affected when the white lesions on the incisors develop rapidly, causing the enamel to collapse. The dentin is exposed and appears soft and yellow. The maxillary primary molars present initial lesions in the cervical, proximal and occlusal regions	The child begins to complain of great sensitivity to cold. The parents sometimes notice the change of color on their own and become concerned.
Three	20–36 months	Large, deep lesions on the maxillary incisors, and pulpal irritation	The child complains of pain when chewing or getting his teeth brushed, and of spontaneous pain during the night. At this point, the maxillary primary molars are at stage 2, while stage 1 can be diagnosed on the mandibular primary molars and the maxillary canines.
Four	30 – 48 months	Characterized by coronal fractures of the anterior maxillaries as a result of amelodentinal destruction At this stage, the maxillary incisors are usually necrotized, and the maxillary primary molars are at stage 3. The secondary molars and maxillary canines and the first mandibular molars are at stage 2.	Some young children suffer but are unable to express their toothache complaints. They experience sleep deprivation and refuse to eat.

A definite diagnosis is established on questions to parents regarding risk factors and a clinical oral examination, and radiological examination.



Early Childhood Caries Stage I to IV

Criterion for Severe Early Childhood Caries (S- ECC).⁽¹⁾

- Any sign of caries on a smooth surface in children younger than three years.
- Any smooth surface of an antero-posterior deciduous tooth that is decayed, missing (due to caries) or filled, in children between three and five years old.
- decayed, missing, and filled teeth index (DMFT) equal to or greater than 4 at the age of 3, 5 at the age of 4 and 6 at the age of 5 years.

Differential Diagnosis for ECC⁽¹⁸⁾

- Congenital tooth anomalies like infantile melanodontia which primarily affects the maxillary incisors.

- Amelogenesis imperfecta, which affects the enamel of every tooth, and is a hereditary disease of the dentin, characterized by an opalescent, brownish tooth color, and typical short roots.
- Enamel hypoplasia caused by malnutrition during the perinatal period
- Vitamin A deficiency which promotes high caries susceptibility.

Management of Early Childhood Caries:

Prevention of Early Childhood Caries:

Role of Dentist:

- Work together with individuals and the community to acquire skills and tools that aid in prevention of ECC

- Organize dental health promotion programs among expectant parents, parents of very small children and other high-risk communities to increase awareness about ECC.
- Multi-disciplinary approach in coordination with pediatricians and public health workers for early detection of ECC.
- Provide treatment to the child depending on the stage of Early childhood Caries.

Preventive strategy during Pregnancy:

The expectant mother should be monitored for dental problems during pregnancy and given the appropriate prevention recommendations before the birth of her baby. This is required to control the bacteria and eliminate the sources of infection, in view of the risk of bacterial transmission to the child.

- Oral hygiene status of the expectant mother
- The presence of active carious lesions and the degree of caries activity.
- Detection and evaluation of dental plaque and calculus.
- Evaluation of the salivary consistency and flow of the mother.
- Daily Diet analysis of the mother with emphasis on cariogenic food intake.
- Oral examination for morphological structure of the teeth, the presence of initial carious lesions, and past fluoride use to assess the individual resistance to caries.

Preventive Procedures to be employed before birth:

- In case of high plaque content topical application of fluorides and use of Chlorhexidine mouth washes.

- Excavation of active carious lesions and placing temporary fillings or by ART technique.
- In case of high risk, the expectant mother and other family members are advised to use substitutes like Xylitol chewing gums during and after pregnancy. This advice should be accompanied by routine maintenance and reinforcement programs.(19)
- Given the hormonal changes that occur during pregnancy and regardless of the risk level for caries, it is important to periodically monitor the dental health of expectant mothers. However, fluoride supplements are not recommended before the baby is born.

Preventive Strategy after Birth:

- Once the baby's first tooth erupts, the child's mouth must be cleaned with a wet cloth or with a child's toothbrush and a small amount of fluoride toothpaste (about the size of a grain of rice).
- Parents should be taught how to brush their baby's teeth, either by resting the baby against them, or laying the baby on their lap with his head between their legs.
- When the baby reaches the age of one, his teeth should be brushed twice a day with a small toothbrush and water and fluoride toothpaste (about the size of a pea)
- Between the ages of 18 and 24 months, the child can learn to brush his teeth under adult supervision.
- In addition, parents should not try to soothe a crying or agitated baby with candy, a pacifier dipped in sugar, or a bottle containing a sweet drink

- Lastly, it is important to talk to expectant parents about the importance of the first dentist's visit.

First Dental visit

AAPD recommends that the Baby's first dental visit should be during the first year of life, preferably during the first six months following the eruption of his first teeth, but no later than his first birthday.⁽¹⁾ During the first visit, the dentist will examine the baby's mouth and give specific oral care advice for preventing ECC.

It is important to talk with parents about the following points:

- Verifying and reinforcing the information and advice given during pregnancy.
- Reinforcing that the child should not be given cariogenic substances in his bottle at bedtime.
- Encouraging healthy eating and limiting sugary foods by suggesting other types of sweeteners.
- Cleaning the child's teeth as soon as they begin to erupt.
- Encouraging the child to drink out of a cup around his first birthday, and then progressively limiting the use of the bottle between the ages of 12 and 16 months.
- Observing the baby's early habits such as thumb sucking, so that the caregiver can receive timely instructions in correcting it, even if that means giving the child a pacifier.

No connection has been noted between pacifier use (*as long as it has not been dipped in a sweetener*) and ECC. If the provider notices ECC once the primary teeth have erupted, he must evaluate the child's

risk for caries just as he did with the expectant mother. He must also prepare a personalized prevention program.

Fluoride therapy (systemic and topical)

- Evaluate the risk for caries
- Ensure that the child is not drinking fluoridated water or taking fluoride supplements.
- Consult the attending pediatrician.
- Fluoride therapy should be advised according to the caries risk and the patient's age
- Fluoride supplements (0.25 mg) are not recommended for low-risk children under the age of three. For high-risk children fluoride tablets (0.25 mg) are recommended beginning at the age of 6 months, i.e. when the child first visits the dentist.
- Evaluate systemic ingestion sources (total daily ingestion must not exceed 0.05-0.07 mg F-/ kg)⁽²⁰⁾
- Brushing the teeth with fluoridated or non-fluoridated toothpaste (*as required*) must immediately be added to the child's daily oral health regimen as soon as his first primary tooth erupts.
- The use of topical fluoride in the form of a varnish or gel is beneficial but not recommended before the child turns one.

Other Preventive measures

- Chlorhexidine varnish can be used topically in children between the ages of 3 and 4 with a high risk for caries, in order to reduce the quantity of streptococci within the dental plaque and as a tool for the bacterial control phase.⁽²¹⁾
- Pit & fissure sealants are strongly indicated to prevent occlusal caries

of the primary molars and should be used beginning at age 3 after considerations of the caries risk and clinical recommendations.

- Substituting sugar with Xylitol or other artificial sweeteners can help in preventing EEC in the future.⁽¹⁹⁾

- Lastly, it would be important to schedule children at risk for regular three-month check-ups and to stay in touch with parents in order to provide proper follow-up.

Summary of recommendations for prevention of Early Childhood Caries

Age		During pregnancy	6-12 months	12-24 months	2-6 months
Dental Examination		Periodic			
Radiographic examination					
Evaluation for bad habits (thumb Sucking)					
Meeting the Pediatrician					
Prevention of childhood dental trauma					
Caries risk assessment	High risk				
	Low Risk				
Treatment of active carious lesions	High Risk				
	Low risk				
Topical Fluorides	High Risk				
	Low Risk				
Oral Hygiene instructions	Baby				
	Mother & other family members				
Use of artificial sweeteners (high Risk)					
Pit & fissure sealants					

Dietary Recommendations to parents to avoid early Childhood caries.^(1,18)

- Breastfeed the child, even on demand, during the first six months of life.

- If the child is bottle-fed, he should be taken into the caregiver's arms for the feeding, and then put to bed once he falls asleep, without a bottle or sweetened pacifier.
- Infants should not be put to sleep with a bottle. On demand nocturnal

breast-feeding should be avoided after the first primary tooth begins to erupt

- Outside of breastfeeding or bottle-feeding times, give a child water to drink without added sugar.
- Parents should be encouraged to have infants drink from a cup as they approach their first birthday. Infants should be weaned from the bottle at 12 to 14 months of age.
- Limit the use of fruit juice to the amount required to balance the child's diet. A few ounces a day are enough for a young child. Additional amounts should be in the form of fresh fruit. Do not give teething biscuits or other sugar coated teethers? They provide no real benefit and are a food of choice for bacteria.
- When the child begins to have a varied diet, do not give him cookies, candy, pastries, fruit juices, or sweet drinks during the day. Pieces of fruit, cheese, some vegetables, and small sandwiches are better for his health.
- An oral health consultation visit within 6 months of eruption of the first tooth and no later than 12 months of age is recommended to educate parents and provide anticipatory guidance for prevention of dental disease.
- An attempt should be made to assess and decrease the mother's/primary caregiver's mutans streptococci levels to decrease the transmission of cariogenic bacteria and lessen the infant's or child's risk of developing ECC.

Clinical Management of Early Childhood Caries.

A. Treatment of Stage I & II. Early Childhood Caries.

Conservative Phase:

In stage I ECC, the child may be symptomless and the carious is reversible. In such cases, no curative treatment is required. However, routine preventive measures like Diet counseling, topical fluoride application, professional application of fluoride varnishes, sugar free chewing gum, and oral health education are employed. The caries should be monitored to ascertain that it remains in the non- progressive stage until exfoliation.

Restorative Phase:

In stage II ECC the principal role of restorative treatment is to eliminate active caries lesions to inhibit caries extension. Restorative treatment should always be used in conjunction with preventive therapy, based on the child's risk factors and age.

The choices of restorative materials depend on:

- Site and extent of caries
- Level of child's cooperation
- Whether permanent or temporary restoration.
- type of anesthesia to be used

Stabilization: Materials of Choice for restoration & stabilization:

- Zinc-oxide Eugenol cements as temporary filling.
- Glassionomer cement in ART procedure

Final Treatment

- Restoration of teeth using Glassionomer cement or composite resins
- Pulpal therapy if indicated

- Stainless steel crowns for extensively damaged teeth. In young children with high risk of caries, stainless steel crowns have been shown to function better than multi-surface intra-oral restorations. ⁽²²⁾
- Routine preventive Strategy.

Follow up: Every 6 months

B. Treatment of Stage III & IV. Severe ECC:

Immediate treatment

Children with acute S-ECC in stage III & IV often present with pain, discomfort and infection, and may require medication including use of antibiotics and analgesics.

- Systemic infection resulting from a local focus of dental infection should be treated with antibiotics.
- Very Severe cases may require hospitalization prior to definitive treatment.

Stabilization Phase

Caries progresses rapidly through the thin dentine of primary and young permanent teeth and may rapidly endanger the pulp.

- Identification and extraction without delay of teeth that are not indicated for restoration or pulpal therapy.
- Palliative treatment of teeth that are to be preserved by endodontic therapy to avoid further progress of the carious process

Treatment Phase:

Extraction of primary teeth and/or complete/partial pulpectomy and restoration with stainless-steel crown are the treatment

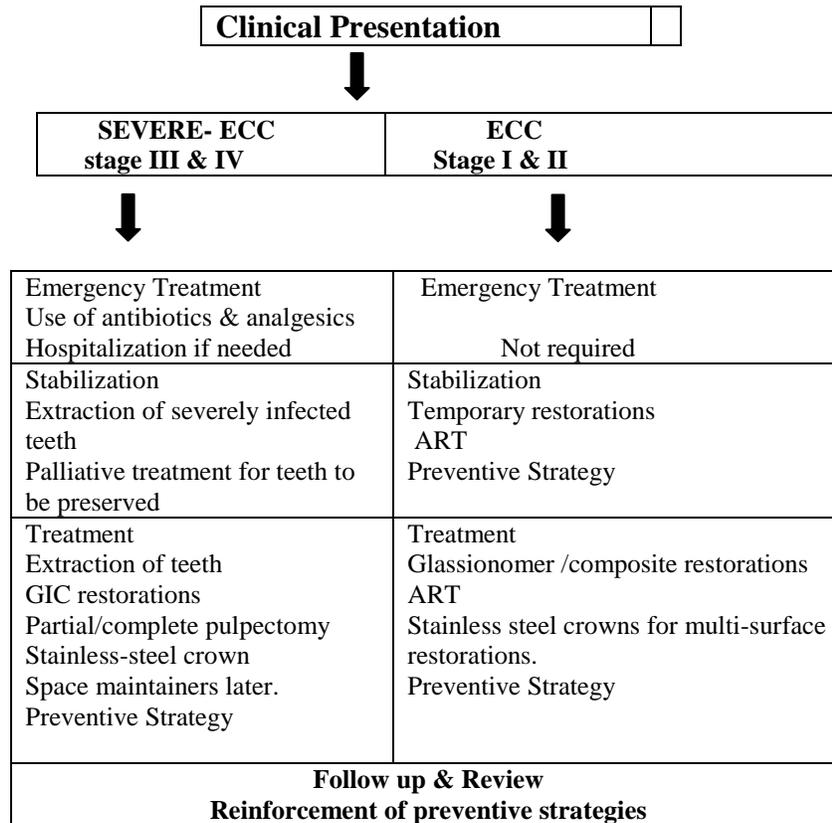
options in managing children with stage III & IV S-ECC. Clinical procedures in case of non-cooperative or medically compromised patients may require the use of general anesthetics. The decision to extract or to preserve should only be made after considering: ⁽⁸⁾

- Patient's cooperation
- Medical condition
- Extent of dental infection
- Immuno-compromised condition
- Bleeding disorder
- Restorability
- Extent of caries which may involve the pulp and roots
- Potential for malocclusion or disturbances in development of the dentition. (Use of space maintainers may be considered later.)

Follow-up

- Routine preventive strategy.
- Children with S-ECC must be reviewed to detect any changes children with obvious signs of active oral disease or its predisposing factors should be reviewed at 4-monthly intervals until well controlled
- Medically Compromised and other high-risk children should be reviewed depending on the severity of their medical condition and oral findings.
- Reinforcement of appropriate preventive strategies for remineralization and arrest of carious lesions should be carried out review should be carried out by the same clinician, where possible.

Summary of Management of ECC & S-ECC.



CONCLUSION

We know the etiological factors and the process of EEC. There is a definite preventive and curative protocol available to help the dental practitioner and the parents to prevent and control EEC. EEC prevention is an essential part in any dental health promotion program which will provide a base for the healthy upbringing of a child.

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