

# Integrated Approach in Combating Early Childhood Caries

## SUMMARY

*Early childhood caries (ECC), as the most common oral disease occurring in infants and pre-school children, is still very frequent in most Balkan countries. The reason for this is existing old fashion attempt to control it by early diagnosing, preventing its further development by secondary prevention, treatment with expensive curative measures without significant success, what leads to conclusion that ECC is a hopeless dental problem. Identification and elimination of caries risk factors before dental treatment is essential for successful caries management. Caries control measures must be established as a first step towards caries suppression, which will cause long-term changes in the surrounding oral environment, with the aim of altering it from being cariogenic to non-cariogenic. Failing to do so, all restorative works done in cariogenic oral environment will stay for a very short period. In clinical management of caries, the dentist's role consists in seeking the cause, correcting bad habits or deficiency states they may be contributing factors, restoring the teeth, and finally, making use of all available preventive and control measures. Therefore, a successful management of the ECC problem demands integrated approach of preventive and restorative measures, such as carefully completed dental and medical history, the use of currently accepted diagnostic aids, application of sound principles of restorative dentistry, a comprehensive preventive programme, and regular recall appointments for maintenance work and reemphasis of the preventive procedures.*

**Keywords:** Early Childhood Caries; Prevention; Rehabilitation

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## Introduction

Early childhood caries (ECC) is a special form of rampant tooth decay that affects primary dentition in infants, toddlers and pre-school children. This type of caries has an early onset (evident in children  $\leq$  1-year-old) and is initially located on the smooth surfaces of primary teeth, followed by a very fast progression. First signs of ECC are in the form of white-spot lesions on anterior primary teeth, leading quickly to complete tooth destruction, pulp involvement, infections, thus impairing overall child's health (Fig. 1)<sup>15,16</sup>.

In direct relation to age and primary teeth eruption chronology, different patterns of ECC were observed. 2 main categories of caries are recognized in children from birth to age 6: (1) ECC is caries on at least one surface

of any primary tooth; (2) Severe ECC is stratified by age and described for each year to age of 6. Criteria for definition of severe ECC are: (a) for children up to 3 years old - present lesion on any smooth surface; (b) for children from 3 to 6 years old - caries lesions and cavities on upper frontal teeth, extracted or filled teeth,  $dmfs = 4$  for age 3,  $dmfs = 5$  for age 4,  $dmfs = 6$  for age 5, respectively. At the workshop that was organized by National Institute of Dental and Craniofacial Research (NIDCR) in 1999, following 4 different ECC patterns were suggested: (1) caries lesion on any surface of maxillary incisors (Fig. 2a); (2) caries lesion on occlusal surface of the first molars; (3) caries lesions in pits and fissures of the second molars, on maxillary lingual and mandibular vestibular surfaces, respectively (Fig. 2b); (4) caries lesions on smooth surfaces of other primary teeth<sup>1,2</sup>.

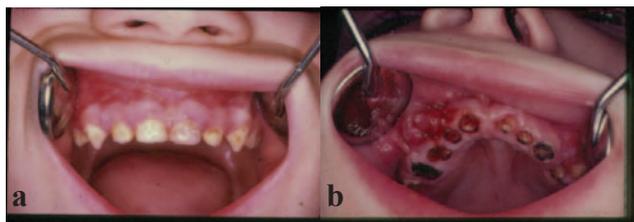


Figure 1. (a) First signs of ECC; (b) Complete teeth destruction by ECC

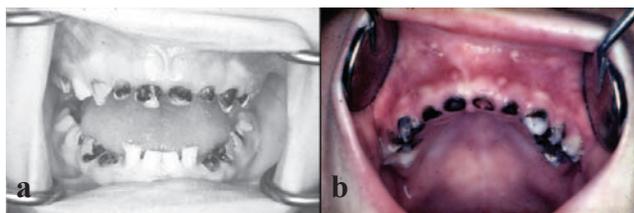


Figure 2. (a). Caries lesions on maxillary incisors; (b) Caries lesions on molar surfaces

Earlier attempts to identify causes of ECC were based on limited number of variables, predominantly on nutritional and biological factors. Such research approach resulted with prediction models high in sensitivity, but low in specificity. It became obvious that it is mandatory to take into account interaction of nutritional, biological, cultural, social and environmental factors for better understanding caries risk and caries development in infants and toddlers<sup>7,17-19</sup>.

ECC is also known as baby bottle tooth decay, nursing bottle caries, milk bottle syndrome, melanodontia, molted teeth and etc. Since ECC is considered as a multifactor infectious disease with behavioural, systemic and social component, the term early childhood caries was adopted lately to emphasize the complexity of etiological factors associated with this disease<sup>12,20,34</sup>.

Etiological factors contributing to the occurrence of ECC are found to be parental lack of information regarding the disease, forwarding poor habits to the child, inappropriate feeding practices, poor oral hygiene, inadequate fluoride intake, maternal caries status, socioeconomic status and genetics<sup>7,4,18,21-24</sup>.

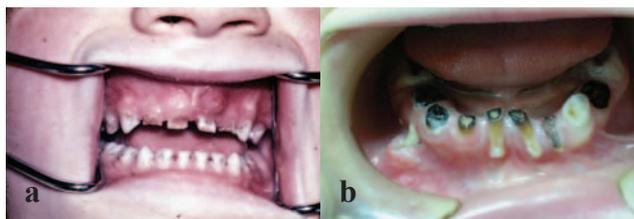


Figure 3. ECC can cause serious problems

ECC can cause serious problems concerning oral and general health (Fig. 3), such as infections, abscesses, pain, fear, sleeplessness, chewing and eating difficulty, malnutrition, gastrointestinal disorders and other, which can lead to failure to thrive, delay in proper development, malocclusion, poor aesthetics and speech articulation, caries in the permanent dentition, thus affecting child's quality of life<sup>12-14,34</sup>.

Despite the recent improvements in the oral health of children, ECC remains to be the most common oral disease in toddlers and pre-school children, presenting a serious challenge to child's wellbeing. Estimated prevalence in developed countries ranges from 18-25% of children 2-6 year olds, while in some ethnic groups prevalence is as high as 40-45%. (California Department of Health Services, 1995). However, in developing countries and in disadvantaged groups within developed countries, the prevalence could be as high as 70%<sup>1,10</sup>. The reason for this is the existing approach to control the disease by early diagnosing (absence of widely accepted standards), preventing its progression by secondary prevention, treatment with expensive curative measures which may lead to the conclusion that ECC is a never ending dental problem<sup>12,25,26,34</sup>.

For many centuries dental decay has been the number one problem in dentistry because dentists have been treating just the consequences of the disease. The tendency has been ever since to treat these patients as one's that have mechanical dental problems. They therefore had a false belief that restored teeth are equal to good dental health<sup>12,27</sup>.

Dental caries today is considered to be the result of a disturbance in the ecologic balance of the oral cavity. This balance is resembled by aggressive (demineralization) factors and defensive (re-mineralizing) factors. If and when factors that promote demineralization prevail, the balance will shift in favour of enamel demineralization and the formation of caries lesion<sup>12,15,29</sup>.

Therefore successful management of ECC must be accomplished by integrated (joint) approach and implementation of the following procedures:

1. Conditioning (re-modification) of oral environment (primary prevention);
2. Caries treatment (secondary prevention);
3. Rehabilitation (tertiary prevention);
4. Maintenance of achieved oral health.

### Conditioning of Oral Environment (Primary Prevention)

Caries control measures must be established as a first step towards caries reduction, which will cause long-term changes in the oral environment, with the aim

of transforming it from cariogenic to non-cariogenic. Failing to achieve this, the restorative work done in cariogenic oral environment will have a short-term effect. Collectively, identification and elimination of all (risk) factors prior to dental treatment is essential for successful caries management.

### Identification of factors that caused the disease

Taking into consideration that etiological factors of oral diseases are relatively well known today, identification of factors that can cause the disease must be made and actions has to be taken in order to neutralize risk that can cause problems in future.

Caries risk for dental caries can be diagnosed and effective measures offered to prevent or reduce the prevalence. At this point, we are able of identifying patient's level of risk for cavities and utilize specific treatment options to prevent caries from occurring and progressing. To accomplish this task information that we need can be obtained by:

- a. Case history;
- b. Clinical investigation;
- c. "Caries risk tests".

#### A. Case History

By interviewing the patient, we are trying to find out factors that may influence the disease. Such factors usually belong to one or more of the following groups:

- General information about diseases (beside general information about the present oral disease, attention must be focused on existence of general diseases as well. Several diseases may directly or indirectly influence oral diseases, ether through affecting saliva properties, dietary patterns or by use of various medicines);

- Oral hygiene (good or bad);
- Use of fluorides (yes or no);
- Dietary habits (it is well known that in making up the "risk profile" of the patient, diet and dietary habits are of great importance. Information about the diet of the patient can bi obtained by the "interview method", the "three-day record" and by presence of bad feeding/eating habits);

- Drug use (frequent use of sweet medication against certain diseases in early childhood could contribute ECC formation);

- Socio-economic background (the common finding is that families from a lower socio-economic background may experience lack of understanding regarding oral hygiene, increased consumption of high cariogenic diet, vertical transmission of cariogenic bacteria to their children and difficulties in getting proper dental health services).

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#### B. Clinical Findings

The aim of clinical findings is to get a proper information about severity of the caries problem. It can

also give us information about motivation and behavioural habits of the child and family to follow recommendations for oral health care.

Caries prevalence can be estimated by noticing: number of teeth missing, number of fillings, and number of cavities, incipient lesions or deep tissue lesions.

Aggravating factors can be checked by noticing: crowded teeth, deep fissures, overhangs, enamel or dentin disturbances (hypocalcification - local, systemic or hereditary disturbance), and acquired tooth defects (abrasion, erosions).

Assessing presence of factors ultimately involved in the caries process

- Oral hygiene
- Saliva factors

#### C. Caries "Chair Side Tests" for Some Selected Factors

Available "chair side tests" for identification of caries risk factors are: plaque accumulation rate test, salivary flow rate test, salivary buffer capacity test, Mutans streptococci level test, and Lactobacilli level test.

Plaque accumulation rate test (Fig. 4) is based on the amount of plaque which deposits within 24 hours after professional tooth cleaning. For estimation of plaque accumulation rate, the simplified "OHI debris index" according to Green and Vermillion can be used.



Figure 4. Plaque accumulation

Salivary flow rate test is a natural first step in obtaining a general information of saliva factors. It can be disturbed by: medication, radiation therapy, salivary stone or other local factors, anorexia nervosa, diabetes mellitus etc.

Salivary buffer capacity test is giving us a general idea about the quality or ability of saliva to control pH of the oral environment in physiological borders. It can be measured by "Dentobuff" kit (Fig. 5).

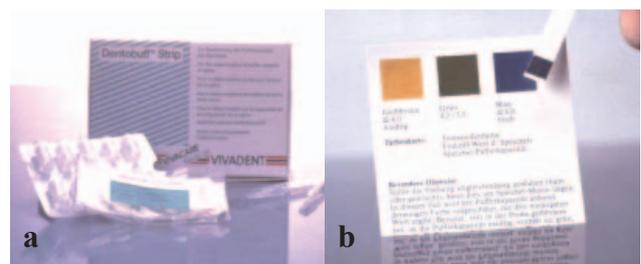


Figure 5. Salivary buffer capacity test - "Dentobuff"

High count of Mutans streptococci in saliva indicates high risk for caries formation. This levels can be recorded by Mutans streptococci level test

High frequency of sucrose consumption and dietary carbohydrates intake causes higher salivary concentrations of Lactobacilli colonies which are most responsible for dental caries formation. the amount of salivary lactobacilli can be measured by Lactobacilli level test using “Dentocult LB” kit (Fig. 6).

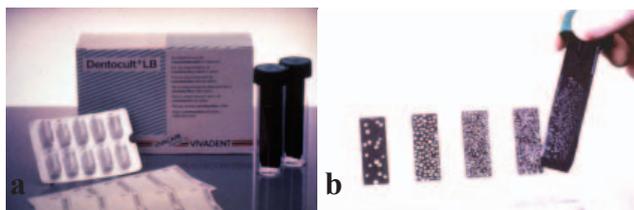


Figure 6. Lactobacilli level test - “Dentocult LB”

### **Risk factors control (elimination of factors that caused the disease)**

Risk factors control, or elimination of factors that caused the disease, can be accomplish by applying professionally instructed *home-preventive measures* and *chair-side prevention programme* in order to suppress caries promotion factors and modify oral environment from being high to low risk for ECC occurrence.

#### **A. Professional basis of home-applied preventive measures**

Home-applied preventive measures comprise: dietary guidance, oral hygiene counselling and fluoride application on regular basis.

The basic connections between caries and nutrition are well known. The most important basics of practical recommendation on dietary guidance are as follow: correction of bad feeding/eating habits; avoidance of sugar-containing food; the use of sucrose alternatives; and decreasing the frequency of snacks between meals.

First objective of proper oral hygiene counselling is to prevent plaque formation, or to remove it completely as early as possible, which can be seen as a basic caries home-preventive measure.

Use of fluoride-containing preparations in caries prevention is of great importance for improvement of oral health. It can be accomplished by: fluoride-containing dentifrices, fluoride tablets; and home fluorides mouth rinses.

#### **B. Chair side prevention programme**

Beside home-applied preventive measures to maintain achieved oral health, “chair side preventive programme” is recommended as well to keep oral environment at low risk for caries disease for longer time period.

*Professional tooth-cleaning* means removal of all supragingival and clinically visible hard and soft coatings by dentally educated professional personnel.

*Topical application of high and low concentrated fluorides* is effective for remineralization of early lesion (Fig. 7). The presence of fluorides in oral cavity strongly prejudices the remineralization/demineralization equation towards remineralization. Beside the crystals containing fluoride are more resistant to acid dissolution, it is a highly effective antimicrobial that is specific to acid-producing organisms. Fluoride toothpaste should be used daily at home and fluoride varnish or foam can be applied by the dentist periodically.

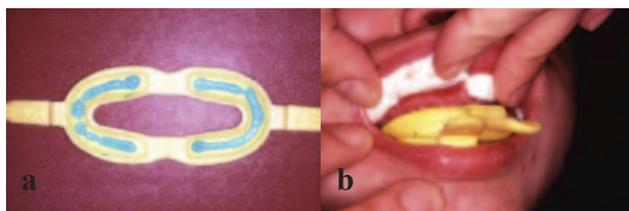


Figure 7. Fluoride topical application

*Fissure sealing* should be applied as a primary preventive measure to non-carious and the patients judged to be at some risk to caries formation<sup>12,28,32,33</sup>.

## **Caries Treatment (Secondary Prevention)**

Following the clinical findings, on the basis of child’s medical history and the treatment needs, a thorough treatment plan must be designed. The most important objective is to get the disease under control as soon as possible.

A clinical protocol for treating ECC includes proper diagnosis and effective disease control. The main objectives for the placement of dental restorations (Fig. 8) are: reconstruction of the lost tooth surfaces, prevention of further complications, regaining basic functions (feeding, speech, phonetic articulation), maintaining space and, finally, aesthetic and communication rehabilitation.

Caries removal and temporization are designed to eliminate the presence of bacteria as quickly as possible. Once the caries lesion is completely removed, restorations



Figure 8. Caries treatment

of lost tooth surfaces are recommended with the use of fluoride-release restorative materials (glass ionomer restorations). Endodontic therapy is performed only if the tooth is restorable. Any tooth that cannot be restored has to be extracted.

The basic idea of radical EEC treatment (tooth extractions) is to: (1) eliminate sources of infections; (2) prevent further infection progression (bacteraemia); and (3) improve child health and the quality of life<sup>12,29,34</sup>.

## Rehabilitation (Tertiary Prevention)

Beside having basic functional problems in terms of chewing and eating, which can cause disturbances in growth and development, the consequences of early tooth loss have shown that social isolation can have a detrimental effect upon a young person general health as well. Obviously, social support plays an important role in enhancing general health-related behaviours, as well as

providing emotional support and enhancing child's sense of self-worth (in itself important for health).

Similarly to eating problem, speech is also affected. Ability to speak "normally" is one of the primary ways in which one makes contact with others in the surroundings. If ability to speak is affected, clearly, this could have a detrimental effect upon basic social interaction. Such children may increasingly begin to dread occasions when they have to socialize and interact (communicate) with their friends and playmates. This could, in the worst-case scenario, result in withdrawal, social isolation and a negative spiral in which the individual loses confidence in himself and draw further away from the social world.

Therefore, the rationale solution for the rehabilitation of lost oral structures (Fig. 9) in this early life period must provide: proper food consumption, aesthetic and communication rehabilitation, and maintaining space. This can be accomplished with removable space retainers which can serve as small partial prosthetic appliance that can satisfied all the mentioned demands as well<sup>29,30,34</sup>.



Figure 9. Oral rehabilitation

## Maintenance of Achieved Oral Health

Maintenance of the achieved oral health is to be kept further on by regular recalls or check-up visits, performing caries control-preventing programmes, which will consider: (1) evaluation of the effect of casual treatment and rehabilitation; (2) caries risk factors control with comprehensive preventive programs; and (3) prediction and suppression regarding further development or continuation of the disease. Frequency of regular recalls or check-up visits should be organised on individual basis, regarding patients potential risk susceptibility and the already achieved level of oral health rehabilitation<sup>30,31</sup>.

## Conclusion

Combating ECC consists of addressing the cause, correcting bad habits or deficiency that may act as

contributing factors and restoring the function by using all available preventive and control measures. Therefore successful management of early childhood caries demands integrated approach of preventive and restorative measures. These measures include carefully completed dental and medical history, use of currently accepted diagnostic aids, application of comprehensive preventive programs, use of sound principles of restorative dentistry, as well as regular recall appointments in order to maintain health and reemphasize preventive measures.

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