# Recent Advancements in Pediatric Dental Caries Prevention

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## Abstract

In childhood dental caries is commonly affecting diseases. According to the World Health Organization 60% to 90% of school children and adults are affected by this disease. It is a disease that can be prevented and if diagnosed in early-stage tooth decay can be stopped by applying various preventive materials. The primary prevention of dental caries mainly focused on young children. Fluoride has been widely used as a preventive measure against caries development. Fluoride is found in topical and systemic form, the topical form is good, has a high life span. Recent advancements suggest that asymptomatic regimen of caries lesion has the inherent of re-mineralization. In the field of dentistry, nanotechnology has been introduced which has developed substances ranging from 100nm or smaller in size. Nanotechnology replicates the natural dental enamel by the process of bio-mineralization. Leading an integral part of bone and teeth is the hydroxyapatite. Since, nano-hydroxyapatite can provide preventive and therapeutic loom to caries in children worldwide, therefore various researches are performed to improve its capacity in clinics.

***Keywords:*** *Dental Caries; Children, Dental Management, Host-defense system.*

## Introduction

Oral health is an integral part of general health and well being. It is important to know about the factors which have a bearing on oral health on oral health so that preventive measures can be taken. In childhood dental caries is commonly affecting diseases. According to the World Health Organization 60% to 90% of school children and adults are affected by this disease. It is a disease that can be prevented and if diagnosed in early-stage tooth decay can be stopped by applying various preventive materials. The primary prevention of dental caries mainly focused on young children.[1,2]

**Etiology:** Numerous factors are associated with caries formation i.e; environmental, biological factor, and socioeconomic status and behavioral. It is dependent on the complex interrelationships between the five critical parameters such as: 1- Biofilm, 2- Tooth habitat, 3- Diet, 4- salvia, 5- Oral hygiene. If the person has higher risk factors, then the caries experience chances also increase. Dental caries is a condition that takes position when pathogens, primarily streptococcus mutans, overrun the tooth aspect and anabolism digestible carbohydrate to fabricate lactic and other acetous, prompting in demineralization of teeth. In children age 12 to 30 months, caries consistently begin with influence the maxillary primary cuspids and first primary bicuspids, through back the ornamentation of emission. Dental caries first noticeable as colorless fleck contusion, which are small-scale domain of demineralization underneath the enamel aspect.[3] At this phase, the caries contusion is conventionally unpredictable. If oral state forgoes ameliorate, demineralization advancement and in due course termination in irreparable cavities, with a deprivation of the accustomed tooth configuration and appearance. Uninterrupted continuance of the caries procedure guide to pulpitis and tooth dropping, and could be correlated along with impediment for instance facial fervouring and congenital inflammation.[4]

**Streptococcus Mutans:** Most of the organisms present in the human body consists near about $10^{14}$ cells and the majority are resident of microflora, and the progression to the growth of s.mutans instigate the dental caries. The ability of the s.mutans to bind to the tooth structure is highly assembled through dental plaque, and the set of bacteria are specially ordered and metabolically desegregated. Complex form of matrix and glucan isthe

main configuration of plaque accumulation.[5] *S.mutans* can survive at high ph and is the originator of enamel demineralization. Sucrose which is a sweetening agent naturally materialize carbohydrate and boosts critically with *S.mutans*, other acidolysis agents and acid indulging species. It can begin and maintain microbial growth and to carry on with acid production at low ph values. When there is a decrease in saliva flow, the ph of the plaque drops, allowing the acid-tolerant bacteria like s.mutans to proliferate. It forms dextran and causes a sticky plaque, trapping bacteria, calcium and phosphate ions.[6]

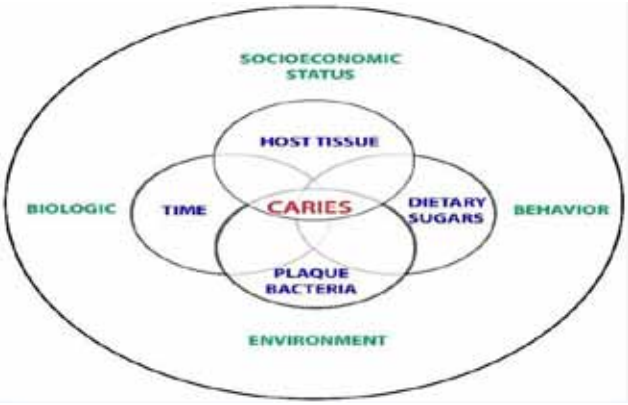


**Figure 1**

**Host Factors:**

**Saliva:** It consists of approximately 99% water along with 1% solid, the viscosity nature of saliva is due to electrolytes and proteins. It is the main defense against caries protection, and it also buffers the acid formed by Streptococcus mutans which is formed by oversaturation with calcium and phosphate ions. It configured a protecting mucoid coating on the mucous integument which reacts as a barricade to plague and intercept desiccation. Its flowaid to clear-out mouth of food and cancellated and bacterial detritus and accordingly slow down plaque establishment. The film with glycoprotein formed over the tooth surface by saliva also protects the tooth by wear due to erosion and abrasion.[7,8]

**Remineralizing Agent:** Minerals that are delivered onto carious lesion predominantly calcium and phosphate apprehend caries evolution. If the alignment of tooth and vulnerability to acidulated ambush then it is slighter to demineralization. Since the demineralization procedure persists, the ph of the mouth flatters further acidulated which encourages the evolution of cavities. Disintegrated deposits then dispense out of the tooth configuration and into the saliva abutting the tooth.[9] The shielding amplitude of saliva considerably smashes the ph of plaque neighboring the enamel, thereby restricting caries development. Plaque extent and the integer of bacteria attending regulate the efficacy of salivary shields. The elevated salivary centralization of calcium and phosphate which are retained by salivary proteins may register for the evolution and demineralization of enamel. The occupancy of fluoride in saliva pips up crystal drizzles establishing a fluorapatite–like plating which will be more impenetrable to caries.[8-11]

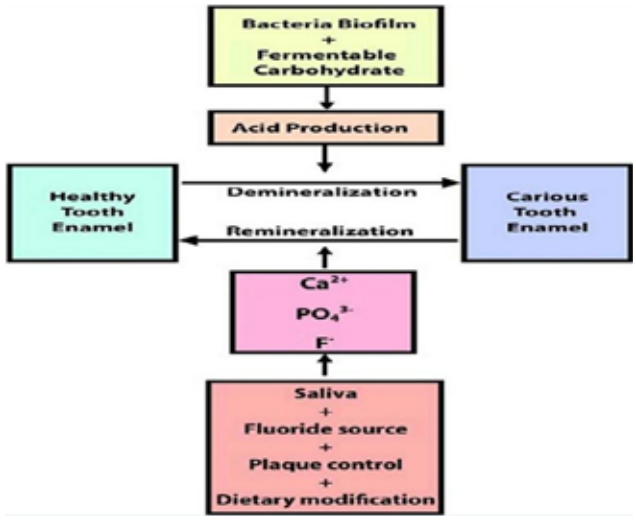


**Figure 2**

**Fluoride:** To reverse the tooth structure in early lesion, fluoride is the chief aspect of remineralization. It can minimize caries by counteract demineralization and developing remineralization of tooth surface and can impede plaque, acid fabrication. Considerable engrossment of fluoride liberate from the deliquesce enamel or previously available on the plaque, the more will remineralization be advocated and carious action is slowed down. Utilization of topical fluoride elevates the fluoride extent of tooth surface and fundamental tissues to anextent anticipated to defend in opposition to caries.[12]

**CPP-ACP:** It is Anti cariogenic potential and enhances remineralization. It is mainly used in the biomedical field because of extremely good bioactivity, adaptable biodegradable rate, High cell adhesion, and great osteoconductivity. For the treatment of tooth sensitivity it is the most recognizable abrasive cement. CPP-ACP holds together to plaque and it imparts immense calcium reservoir and diffuse unbound calcium steadily.

**Tricalcium Phosphate (TCP):** Fluoride and TCP are the attribute consigned to the tooth during brushing

and dispense intensify remineralization and put on preservation in opposition to demineralization. Calcium complex gets triggered when TCP extends to the tooth surface, and it is shifted by TCP and is guarded by fluoride ion. And remineralization gets boost up when the calcium and fluoride ion level gets down to lesion when delivered tooth surface.[7] Since the configuration of TCP is indistinguishable to hydroxyapatite, once the functionalized calcium ions are liberated, they voluntarily interrelate with the tooth surface and below the grounded structure. Since added calcium phosphate accompaniment may need an acidic ph, which credible restricts the prerequisite to the tooth, functionalized TCP can provide the most favorable advantage when distributed in a neutral ph environment.[13,14]

**Silver Dynamin fluoride (SDF):** is used in young children to restore carious teeth by conventional method. The excessive application of SDF Stains the tooth surface black, which results in the formation of an impermeable layer over the tooth structure.

Recently it was established that SDF does not inimically influence the bond strength of resin composite to non-carious dentin, contradictory to this an additional in vitro study from Japan establish that SDF intensifies the bond strength of GIC to bovine dentin. [3]

SDF can be applied to proximal caries lesion using spongy floss. A small section next to the contact is then saturated with SDF and pulled under the contact area. Secure the area by brushing fluoride varnish or petroleum jelly over SDF treated Surfaces. The application of varnish will not 'seal in' the SDF; in this protocol, the varnish is used to create a minuscule barricade in the middle of the treated surface and saliva.[4-7]

**Nano - Hydroxyapatite:** Enamel is considered as the main inorganic component of hydroxyapatite. Enamel is generally made up of HA of size 20 o 40nm particle. S. mutans which produces glucan is absorbed by hydroxyapatite along with salivary proteins which inhibit plaque formation. HA is an organically appropriate medium, and is appraised as ananalytical amalgamation replacement for the natural mineral component of dentin. Its appositeness in biomaterials by the introduction of HA powders to restorative dental materials for remineralization results and enhancement of mechanical belongings has been explored due to its magnificent biocompatibility and bioactivity nature.[5-8]

**Mechanism of Action:** HA perhaps reconstruct and intercept commencing contusion in enamel due to its immensity and high-level possibility of calcium and phosphate anion particles that take part in a lead character in demineralization and remineralization procedure. The absorption of calcium is perceived to have appreciable termination than the phosphate absorption in obstructing demineralization. The stunted portion of calcium in plaque is established to be a characteristic of caries prevalence while not a bit for the phosphate anion. The ph intensity transforms the absorption of calcium and phosphate in nano- HA ph cramming where high-rise degradation of remineralization is perceived at ph 4.0 apart from at ph 7.0, and as ph the practically diminishes,the absorption of calcium and phosphate intensifies.[7,8,14]

## Conclusions

Although current research and technologies have enabled early detection of caries, no current diagnostic method fulfill all the criteria for optimal caries diagnosis. Recent advances have great potential to improve oral health, in the field of pediatric dentistry advancement can be carried out by the application of nanotechnology, by providing effective preventive, diagnostic and therapeutic measures. So, it is indispensable that we, as dentists should be distinct on managing not only those who are afflicted, but also handle those who are further probable to get sick.. we have a diversification of latest negotiator which can be handed-down to intercept dental caries but solicitation of this representative in clinical inquiry is stock-still restricted in the evolving countries. Furthermore dental caries are complex and all preventative estimates should be assessed appropriately in human litigation so that they can be established at the grading strength for the anticipation of dental caries.

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