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Review article

A Comprehensive Review on Dental Carries

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Abstract

About 25% of the population carries about 80% of the disease burden. Therefore it is a serious problem, for those populations who are very old, young, chronically ill, economically etc. Disease that causes tooth decay, is known as Dental caries it is infectious, and the mutans streptococci bacteria have long been identified as the primary disease-causing agents. It is five times more common in children than asthma and seven times more common than fever. Generally it is caused by the antigen derived from *S. mutans* or *S. sobrinus* to prevent oral colonization by *S. mutans* and subsequent dental caries. It also analysis the spread of dental infections from the teeth and associated oral tissues to vital tissues or organs, as well as prevention and management of this potentially life-threatening complication. In this review article we focus the complete detail of dental carries and its update knowledge of it.

Key words: Tooth decay, Rampant caries, Dental sealants, Mutans streptococci, Laser Caries Detector.

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1. Introduction

Dental caries an infectious disease that damages the structures of teeth. The percentage of persons with >1 decayed, missing, or filled teeth in permanent teeth increases with age, from 26% among persons aged 4-12 years to 67% among persons aged 13-18 years and 94% for dentate adults (with >1 natural teeth) about >18 years.[1] Breakdown of teeth due to activities of bacteria also known as Dental caries is tooth decay, cavities, or caries means number of different colors from yellow to black. Symptoms may include pain and difficulty with eating. Complications may include inflammation of the tissue around the tooth, infection, tooth loss or abscess formation.

What is dental caries?

Today, because of scientific advances and new technologies, dentistry is developing new strategies for managing dental arises stragies emphasize prevention and early intervention.

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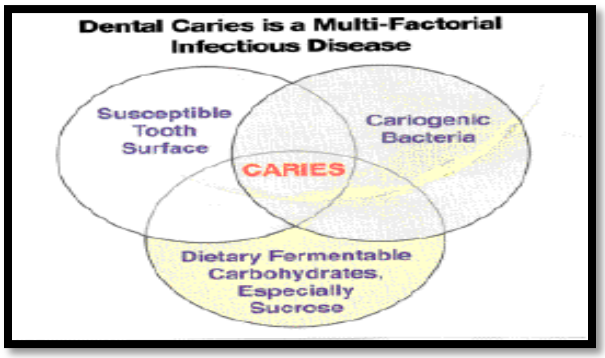


Figure 1. Original model

History of Dental Caries

According to the archaeological evidence it shows that tooth decay is an ancient disease. Skulls dating from a million years ago through the Neolithic period show signs of caries, including those from the Paleolithic and Mesolithic ages [2]. In 1850, another sharp increase in the prevalence of caries occurred and is believed to be a result of widespread diet changes. It is increased availability of sugar cane, bread, refined flour, and sweetened tea corresponded with a greater number of pit and fissure caries [3]. In 1924 in London, Killian Clarke described a spherical bacterium in chains isolated from various lesions which he called *Streptococcus mutants*. Later, in the 1950s in the USA, Keyes and Fitzgerald working with hamsters showed that caries was transmissible and caused by an acid-producing *Streptococcus* [4]. In 1960s that it became generally accepted that the *Streptococcus* isolated from hamster caries was the same as *S. mutans* described by Clarke. The diet of the "newly industrialized English working class" then became centered on bread, jam, and sweetened tea, greatly increasing both sugar consumption and caries.

Signs and Symptoms [5]

- It is dark brown and shiny suggests dental caries were once present but the demineralization process has stopped.
- The earliest sign of a new carious lesion is the appearance of a chalky white spot on the surface of the tooth, indicating an area of demineralization of enamel. This is referred to as a white spot lesion, an incipient carious lesion or a "microcavity".
- Once the decay passes through enamel, the dentinal tubules, which have passages to the nerve of the tooth, become exposed, resulting in pain that can be transient, temporarily worsening with exposure to heat, cold, or sweet foods and drinks.
- Dental caries can also cause bad breath and foul tastes [6].



Figure 2. Affected teeth

Classification of Dental Carries [7]

Classification of dental carries as per the symptoms are as follows.

- Class I - Buccal or lingual pits on molars, Occlusal surfaces of posterior teeth, lingual pit near cingulum of maxillary incisors.
- Class II - proximal surfaces of posterior teeth.
- Class III - Interproximal surfaces of anterior teeth without incisal edge involvement.
- Class IV - Interproximal surfaces of anterior teeth with incisal edge involvement.

- Class V - Cervical third of facial or lingual surface of tooth.
- Class VI - Incisal or occlusal edge worn away due to abrasion.

Rampant caries

"Baby bottle caries," or "Bottle Rot" is a pattern of decay found in young children with their deciduous teeth. The teeth most likely affected are the maxillary anterior teeth, but all teeth can be affected [8]. The name for this type of caries comes from the fact that the decay usually is a result of allowing children to fall asleep with sweetened liquids in their bottles or feeding children sweetened liquids multiple times during the day [9]. It is due to large sugar intake which result problems can also be caused by the self-destruction of roots and whole tooth resorption when new teeth erupt or later from unknown causes shown in figure no 3.



Figure 3. Early childhood caries

Rate of progression



Figure 4. Calcium Tablets

Fluoride treatment can help recalcification of tooth enamel as well as use of Amorphous calcium phosphate.

Prevention and Control

Oral hygiene

It consists of proper brushing and flossing daily. The purpose of oral hygiene is to minimize any etiologic agents of disease in the mouth.



Figure 5. Dental tooth brush

Dietary modification

Chewy, substances sticky foods tend to adhere to teeth longer, and, as a consequence, are best eaten as part of a meal. Chewing and stimulation of flavor receptors on the tongue are also known to increase the production and release of saliva [10].

Dental sealants

The use of dental sealants is a means of prevention [10]. A sealant is a thin plastic-like coating applied to the chewing surfaces of the molars to prevent food from being trapped inside pits and fissures. Fluoride helps prevent decay of a tooth by binding to the hydroxyapatite crystals in enamel [11]. The incorporated calcium makes enamel more resistant to demineralization and, thus, resistant to decay. Calcium, as found in food such as milk and green vegetables, is often recommended to protect against dental caries.



Figure 6. Socket

Dental Caries: A Bacterial Infection [12]

1. There are two specific groups of bacteria found in the mouth which is responsible for dental caries
a. Mutans streptococci (*Streptococcus mutans*)
b. Lactobacilli
2. It is found in relatively large number in the dental plaque.
3. The presence of lactobacilli in the mouth indicates a high percentage of sugar intake.



Figure 7. Bacterial Infection

Transmission of Caries Causing Bacteria [13]

1. Mutans streptococci are transmitted through saliva, most frequently the mother's, to the infant.
2. When mothers have high counts of mutans streptococci in their mouths, similarilly the babies also have high counts of the same bacteria in their mouth.
3. Women should be certain their own mouths are healthy [12].
4. When the number of caries causing bacteria in the mouth increases, the risk for developing dental caries also increases.

Dental Plaque

1. Dental plaque is a colorless, soft, sticky coating that adheres to the teeth.
2. Plaque remains attached to the tooth despite movements of the tongue, water rinsing, water spray, or less than thorough brushing [14].
3. Formation of plaque on a tooth concentrates millions of microorganisms on that tooth.



Figure 8. Dental plaque made visible with disclosing agent

Structure of Enamel

1. Enamel is stronger than bone. Enamel is the most highly mineralized tissue in the body
2. It consists of microscopic crystals of hydroxapatite arranged in structural layers or rods, also known as prisms and sourended by water.[15]
3. Both water and protein components in the tooth are important because that is how the acids travel into the tooth and the minerals travel out and the tooth structure dissolves.

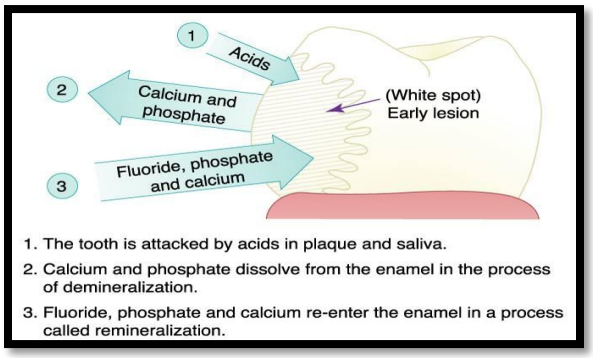


Figure 9. Dental caries

The Caries Process [16]

1. For caries to develop, three factors must occur at the same time:

a. A susceptible tooth
b. Diet rich in fermentable carbohydrates
c. Specific bacteria

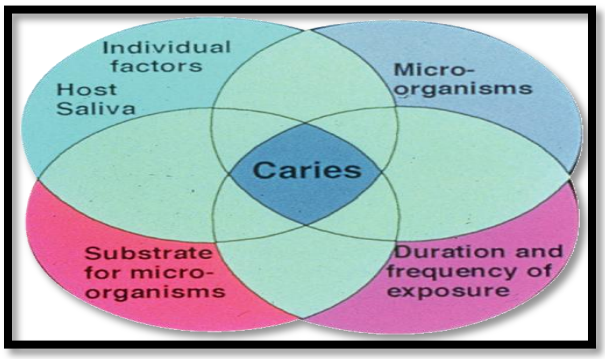


Figure 10. Dental caries

Areas for Development of Caries

1. Pit and fissure caries occurs primarily on the occlusal surfaces and buccal and lingual grooves of posterior teeth, as well as in lingual pits of the maxillary incisors [17].
2. Smooth surface caries occur on the intact enamel other than pits and fissures
3. Root surface caries occur on any surface of the root.

Stages of Caries Development

1. It is an ongoing process, characterized by alternating periods of demineralization and remineralizatio.

a. Demineralization is the dissolving of the calcium and phosphate from the hydroxyapatite crystals [18].
b. Remineralization is the calcium and phosphate being redeposited in previously demineralized areas.

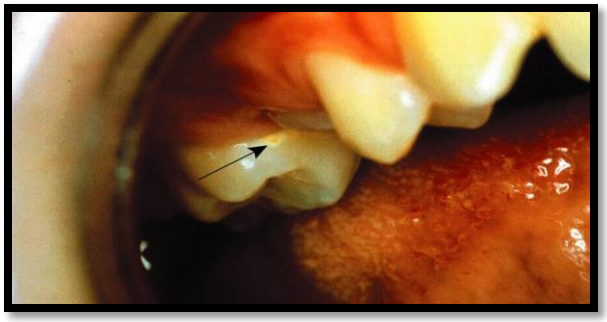


Figure 11. Sign of decay is decalcification



Figure 12. Dental caries

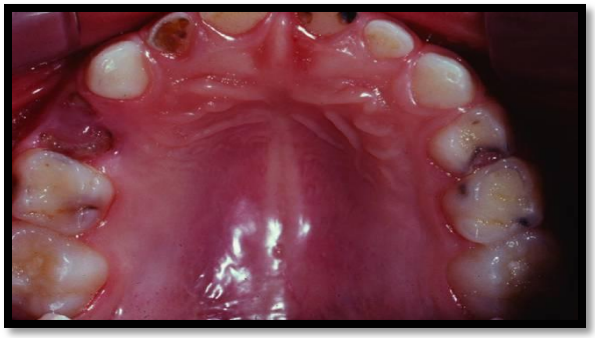


Figure 13. Decayed molar



Figure 14. Decay on the lateral incisor

2. It is possible to have the processes of demineralization and remineralization occur without any loss of tooth structure.
3. Incipient lesion develops in the earliest stages when caries begins to demineralize the enamel [19].
4. Overt, or frank, lesion is characterized by cavitation.
5. Rampant: The time between the onset of the incipient lesion and the development of the cavity is rapid and there are multiple lesions throughout the mouth.

Root Caries [20]

1. Root caries is becoming more prevalent and is a concern for the elderly population who often has gingival recession exposing the root surfaces.
2. People are living longer and keeping their teeth longer. Older people are often taking medications known to reduce salivary flow.[21]
3. Carious lesions form more quickly on root surfaces than coronal caries because the cementum on the root surface is softer than enamel and dentin. [20]
4. Like coronal caries, root caries has periods of demineralization and demineralization.



Figure 15. Root caries

Secondary, or Recurrent, Caries [22]

1. Bacteria are able to thrive in these areas.
2. When dental restorations need to be replaced, it is because there is recurrent caries under the existing restoration. New restorative materials that are bonded to the tooth structure eliminate the gap between tooth and filling where micro leakage can occur. Restorative materials that slowly release fluoride help to prevent secondary caries.

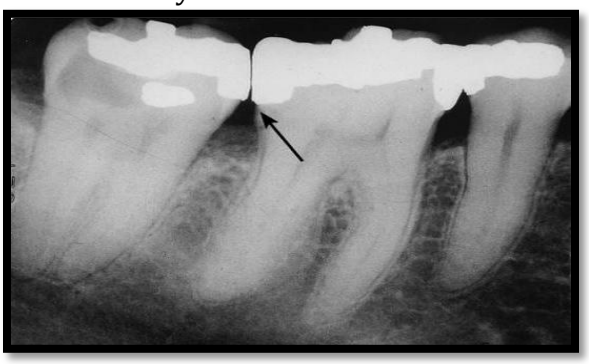


Figure 16. Amalgam restoration

Saliva and its importance [23]

1. Physical protection provides a cleansing effect. Thick, or viscous, saliva is less effective than more watery saliva in clearing carbohydrates.
2. Chemical protection contains calcium, phosphate, and fluoride. It keeps calcium there ready to be used during remineralization. It includes buffers, bicarbonate, phosphate, and small proteins that neutralize the acids after we ingest fermentable carbohydrates.
3. Antibacterial substances in saliva work against the bacteria [23].
4. If salivary function is *reduced* for any reason, such as from illness or medications or due to radiation therapy, the teeth are at increased risk for decay.

Diagnosis of Dental Caries [24]

1. Detectable explorer "stick"
2. Radiographs
3. Visual
4. Laser caries detector

Laser Caries Detector [25]

1. The laser caries detector is used to diagnose caries and reveal bacterial activity under the enamel surface.
2. Carious tooth structure is less dense and gives off a higher reading than non- carious tooth structure.



Figure 17. Visual and radiographic appearance of seemingly intact molar

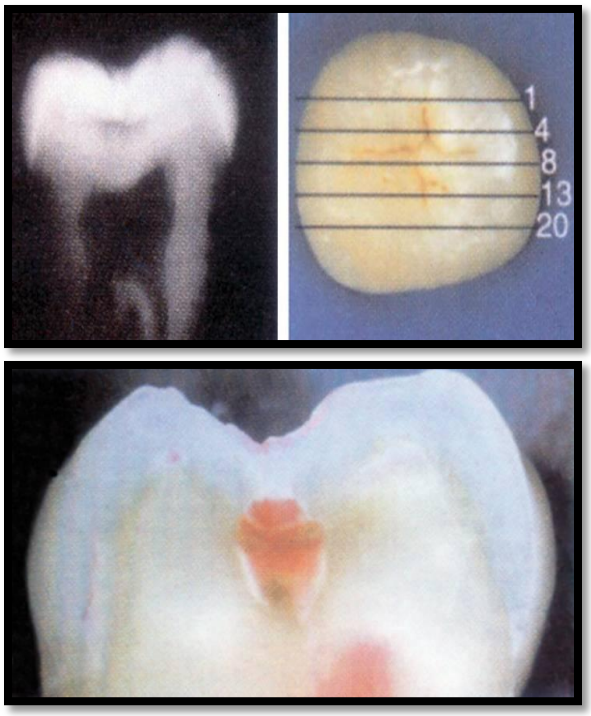


Figure 18. Cross section of molar showing decay

Methods of Caries Intervention [26]

1. Fluoride: A variety of types are available to strengthen the tooth against solubility to acid.
2. Antibacterial therapy: Products such as chlorhexidine rinses are effective [24].
3. Fermentable carbohydrates: Reduce the amount and frequency of ingestion.
4. Salivary flow can be increased by chewing sugarless gum, for example, those with a non-sugar sweetener such as *xylitol* [25].



Figure 19. Medicine used for tooth decay problem A] Fluoride rinse. B] Chlorhexidine rinse. C] Xylitol gum



Figure 20. Sensodyne toothpast

Risk Assessment for Dental Caries [27]

1. If the patient's risk for developing dental caries can be determined, it is possible to prevent the caries from developing by beginning appropriate preventive treatment [28].
2. Caries risk assessment tests are based on the amount of mutans streptococci

and lactobacilli present in the saliva [26].

3. High bacterial counts indicate a high caries risk, low counts indicate a low risk for caries. If the preventive measures are not provided, carious lesions are likely to develop [27].

Conclusion

Tooth decay can be controlled by medical ramifications, including death. As the health care practitioner (Dentist) most familiar with patients' regular check up could be done time to time oral health, the dental hygienist must be knowledgeable of the appearances, causes, and symptoms of dental infection lesions.

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