

Tooth Decay: A Review

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Abstract

Review Article

Tooth decay, a chronic ailment that affects only humans, is one of the most common and dangerous oral health problems in the world today. As a result, teeth hard tissues are damaged. Acidic byproducts of bacterial fermentation of dietary carbohydrates, specifically sucrose, harm acellular tissue. Most people have sluggish progression because their tooth minerals and dental biofilms are in balance, but there is an ecological imbalance caused by microbial activity that causes bacterial plaque pH to fluctuate, affecting acid production, saliva's buffering effect, and the tooth's supporting structure. The microbial population of caries is diverse, with a considerable number of facultative and obviobic microorganisms. The major organism associated with it is *S. mutans*. Dental decay can hurt humans by limiting their intake of critical energising foods in a variety of ways, including dental pain, infection, and stomatognathic system failure. Children and adults, as well as their academic performance, interpersonal skills, and recreational activities. Additionally, oral and pharyngeal cancers, as well as oral tissue lesions, are serious health concerns. Ludwig angina and cavernous sinus thrombosis are both potentially deadly. As a result, oral disorders necessitate treatment, which is usually costly and inconvenient for the entire community due to a lack of time, people, and money. Prevention is consequently less expensive. Dietary adjustments and attention to personal hygiene should be recommended.

Keywords: Tooth decay, pathogenesis, fluoride, streptococcus mutans, cavernous sinus thrombosis, etc.

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INTRODUCTION

Dental caries, one of the most common and preventable disorders, are known to be the primary cause of oral pain and tooth decay. It is a significant oral illness that makes it difficult for people of all ages to acquire and maintain good oral health [1]. The WHO stated that, despite great improvements in the general oral health of the population in many different countries, oral sickness remained a serious global health concern. According to the World Health Organisation, many oral illnesses are associated with chronic diseases, and poor oral health can have a major influence on overall health and quality of life [2]. Dental caries are the localised acidic byproducts of bacterial fermentation of dietary carbohydrates that induce the loss of vulnerable dental hard tissues. Most people with it have a chronic illness that progresses slowly [3]. It results from an ecological imbalance in the balance of oral biofilms (plaque) and tooth minerals [4]. Microbial activity in the biofilm alters

the pH of the plaque. This is the result of bacterial acid production, saliva's buffering function, and the tooth's supporting structure. As a result, the tooth surface and its surroundings form a dynamic equilibrium environment. When the pH falls below a certain level, enamel, dentine, and cementum begin to demineralize. While remineralization, or mineral gain, occurs when the pH [5] rises. Throughout the day, processes of demineralization and remineralization occur often. This system eventually causes either caries lesions or the repair and reversal of a lesion [6]. There are several tooth surfaces where primary caries might form. On the lesion originates and progresses at the approximate surface where teeth meet. on the occlusal cavity. Surface is a unique phenomenon that occurs in pits and fissures. Enamel caries is a three-dimensional subsurface demineralization that affects both the occlusal and approximation surfaces of the enamel prisms. A lesion known as secondary caries is found along the edge of a dental restoration.



Fig. 1: Tooth decay

It also indicates that there is a caries lesion on the margin. Wall lesions could indicate demineralization along the cavity walls, which could be caused by microleakage. Nonetheless, clinical and biological research indicate that there is no active demineralization as a result of this leakage because the repair has been accomplished [7]. Caries are differentiated by pain, difficulty eating, chewing, smiling, and communicating due to missing, discoloured, or damaged teeth. Caries are caused by a diverse microbial population that includes numerous anaerobic bacteria from the genera *Actinomyces*, *Bifidobacterium*, *Eubacteria*, *Parvimonas*, *Rothia*, and *Lactobacillus* [8]. It can include a variety of bacteria, such as *Streptococci* from the *mitis*, *anginosus*, and *salivarius* groups, *Scardovi*, *Prevotella*, *Propionibacterium*, *Enterococcus faecalis*, *Leptotrichia*, *Veillonella*, *Atopobium*, *Granulicatella*, *Fusobacterium*, *Dialister*, *Pseudoramibacter*, and *Thiomonas* [9-12]. *Bacteroides*, *Prevotella*, and *Porphyromonas* bacteria are frequently found on mucosal surfaces. Tonsillar crypts, gingival fissures, and dental plaque all contain significant quantities [9]. Currently, the prevalence and severity of dental caries differ both internationally and within a particular country or region. It affects 60–80% of school-aged children and the vast majority of adults. Furthermore, it is one of the most prevalent oral disorders in various Asian and Latin American countries. The prevalence of dental caries varies with age, gender, socioeconomic status, race, region, food, and oral hygiene practices. Because of the high frequency of dental cavities today, the therapy. The need is bigger. However, the cost of treating oral diseases is often high. Annual treatment costs in the United States are estimated to exceed \$ 4.5 billion [13].

Symptoms of Tooth Decay

Depending on the size and location of the cavity, there are different signs and symptoms. You might not have any symptoms at all while a cavity is just getting started. As the degradation spreads, it may result in the following signs and symptoms:

- Toothache, spontaneous pain, or discomfort that appears to have no apparent cause;
- Pain that ranges from mild to severe while consuming sweet, hot, or cold foods or beverages;
- Pain when you bite down;
- Visible stains on any surface of a tooth;
- Visible holes or pits in your teeth.

Risk Factors

Everyone who has teeth is at risk of getting cavities, but the following factors can increase risk:

Location of the Tooth

Your rear teeth, or molars and premolars, are where decay most frequently occurs. These teeth feature several roots, pits, and crannies as well as numerous grooves that can catch food debris. They are therefore more difficult to maintain than your front teeth, which are smoother and easier to access.

Specific Foods and Beverages

Those that stick to your teeth for a long period, such dry cereal, chips, milk, ice cream, honey, sugar, soda, dried fruit, hard candies, and mints, are more likely to rot your teeth than those that are quickly removed by saliva.

Constant Nibbling or Drinking

You give oral bacteria more fuel to make acids that damage and wear down your teeth when you consistently munch or consume sugary beverages. Additionally, drinking soda or other acidic beverages regularly throughout the day contributes to a constant acid bath on your teeth.

Feeding Infants before Bed

When babies are given bottles containing milk, formula, juice, or other liquids containing sugar at bedtime, these drinks stay on their teeth for hours while they sleep, feeding bacteria that causes tooth rot. Baby bottle tooth rot is a common name for this injury. When

children roam the house sipping from a sippy cup loaded with these drinks, similar harm may result.

Mouth ache

Saliva helps prevent dental decay by washing away food and plaque from your teeth, which is why dry mouth is brought on by a lack of it. Salivary substances also work to neutralize the acid that bacteria create. By lowering saliva production, some prescription treatments, medical conditions, radiation to the head or neck, and chemotherapy therapies can raise your risk of cavities.

Broken or Worn Dental Appliances

Dental fillings may become brittle, start to degrade, or form jagged edges over time. Plaque might accumulate more readily as a result, which makes it more challenging to remove. Dental appliances that no longer fit properly can start to deteriorate.

Acid Reflux

Stomach acid can reflux into your mouth as a result of heartburn or gastroesophageal reflux disease (GERD), eroding away your teeth's enamel and seriously harming your teeth. By exposing more of the dentin to bacterial attack, this increases the risk of tooth decay. Your dentist could advise you to see a doctor to determine whether your enamel loss is being caused by stomach reflux.

Eating Problem

Significant teeth erosion and cavities can result from anorexia and bulimia. Purging causes stomach acid to repeatedly wash over the teeth, eroding the enamel. Saliva production might also be hampered by eating problems.

Types of Tooth Decay

There are two types of tooth decay-

Early Childhood Caries

A pattern of deterioration called early childhood caries (ECC) is seen in young children's deciduous teeth. teeth are most the maxillary anterior teeth are most likely affected, but any tooth may be impacted. Children who are repeatedly fed sweetened drinks or who are allowed to fall asleep with them in their bottles develop this type of caries in the daytime. Pre-existing enamel hypoplasia, a developmental abnormality, may potentially influence the risk for ECC. Teeth with hypoplasia are more vulnerable to malnutrition and early Streptococcus mutans infection. When eating, ECC displays a distinctive pattern in the emerging order of the teeth and the placement of the tongue. The upper incisors are the first to erupt and are most vulnerable to ECC. The upper first primary molars are frequently affected, followed by the upper second molars and canines, and in severe cases, the lower teeth. This depends on how long the caries process has been active.

Rampant Caries

Severe deterioration on numerous tooth surfaces is referred to as rampant caries. It can occur in those who have xerostomia, poor oral hygiene, use stimulants because of drug-induced dry mouth, or who consume a lot of sugar. Radiation-induced caries is the term used to describe cavities that have become epidemic as a result of prior radiation to the head and neck. When new teeth sprout, the self-destruction of roots and total tooth resorption can also result in issues.

Dental Caries' Pathogenesis

Three factors—host, bacteria, and diet—are included in the traditional explanation of what causes dental caries. Dental decay happens when a dietary source of sucrose or refined sugar is present and a vulnerable tooth surface is colonized with cariogenic bacteria. Lactic acid was generated by bacterial pathogens from Caries is brought on by the fermentation of carbohydrates and the resulting acid, which destroys the hydroxyapatite crystal structure of the tooth.

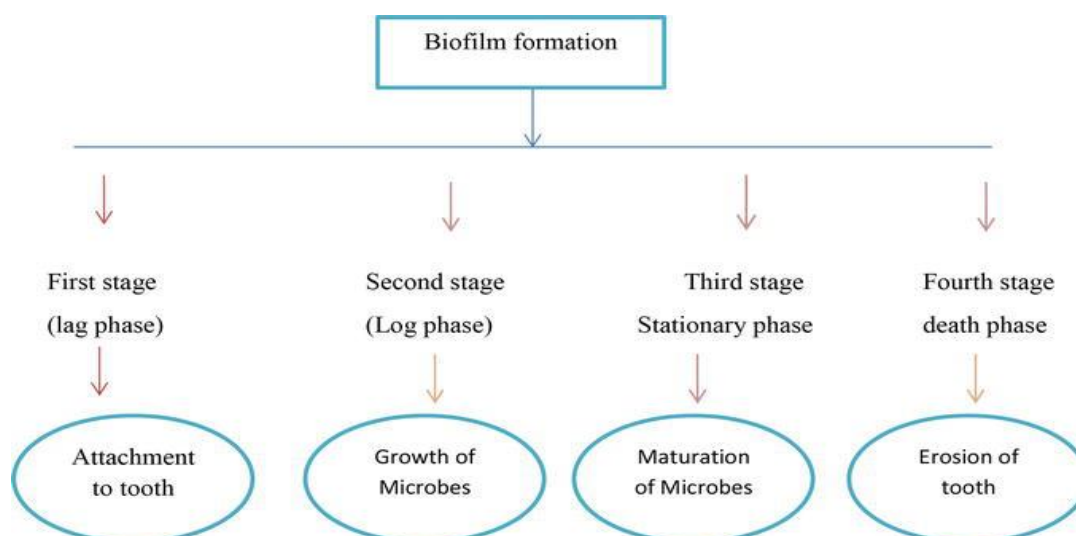


Fig. 2: Dental Caries Stages

Stage of White Spots

- The tooth plaque's bacterial and yeast-produced acid,
- Dissolve the tooth's mineral matrix. When it first begins,
- A patch of chalky white color on the teeth indicates dental caries.
- The surface is still intact at this point, and the subsurface lesion is changeable. White spots brought on by developing caries can be challenging to differentiate from developmental hypocalcification.
- Additionally, the white spot transforms into a black staining stage.
- If the acid challenge results in further mineral loss,
- The surface eventually breaks down or becomes "cavitated," and the damage is irreversible. Large areas of teeth may be lost if the condition gets worse. Typically, active cavitated lesions are brown in color. Long-standing lesions are often darker, almost black. Because stopped decay is a better indicator of the severity of the lesions than color depth typically the darkest.

Enamel

The direction of the enamel rods and the various triangular patterns are followed by caries in the demineralization of the enamel. In the enamel, caries

appear between pit and fissure and smooth-surface caries. The enamel creates numerous unique zones as it loses minerals, including a translucent zone, a dark zone, the lesion's body, and the surface zone. The translucent zone corresponds to a mineral loss of 5%. Dark zone is enamel's very modest remineralization. The lesion's body has undergone the most severe demineralization and disintegration. Up until a cavitation is caused by the loss of tooth structure, the surface zone is still largely mineralized.

Dentine and the Lucent Zone Coincide

The distinct areas affected by caries in dentine from the deepest layer to the enamel are the advancing front, the both the bacterial penetration zone and the destruction zone. With no bacteria present, the advancing front is a zone of acid-induced demineralization of dentine. The locations of invasive germs and ultimately the breakdown of dentin are the zones of bacterial penetration and destruction. Where proteolytic enzymes have degraded the organic matrix, the zone of damage contains a more diverse bacterial community.

Cementum

Cemental caries is more common in older persons. As a result of trauma or periodontitis, gingival droop might develop. malady tal. It is a persistent disease that creates a sizlow lesion steadily infiltrates the cementum of the root initially, and then dentin to develop a persistent pulp infection.

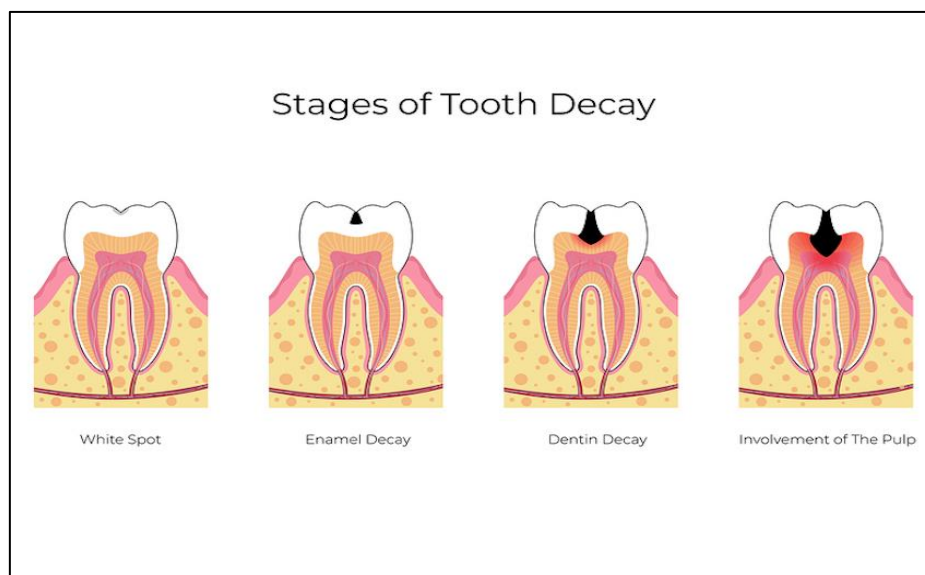


Fig. 3: Stages of Tooth Decay

Diagnosis

Typically, our dentist can identify tooth decay by:

- Enquiring about teeth sensitivity and pain,
- Inspecting our teeth and mouth,
- Using dental tools to look for soft spots on our teeth,

- Examining dental X-rays, which can demonstrate the degree of deterioration and cavities.

Our dentist will also be able to tell you whether you have a root, pit and fissure, or smooth surface cavity.

Treatments

Cavities and other oral abnormalities can be found during routine examinations before they create bothersome symptoms or more serious issues. Your chances of stopping tooth decay in its tracks and reversing its early stages are stronger the earlier you seek treatment. You usually won't need significant treatment if you address a cavity before it starts to hurt.

The severity of your cavities and your unique situation will determine how they should be treated. Options for treatment include:

Fluoridation processes

A fluoride treatment may help rebuild the enamel on your tooth if your cavity has just begun, and it occasionally works to stop a cavity in its earliest stages. Fluoride levels in professional fluoride treatments are higher than those in tap water, toothpaste, and mouthwash. Fluoride treatments can be applied to your teeth as a liquid, gel, foam, or varnish with a brush or in a little tray that fits over your teeth.

Filling

When decay has advanced past the initial stage, fillings, sometimes referred to as restorations, are the primary therapeutic choice. Dental amalgam, which is a mixture of numerous materials, tooth-colored composite resins, porcelain, and other materials are used to make fillings.

Crowns

Your dentist will remove all of the decayed area and enough of the remaining tooth to ensure a good fit for a crown, which can be made of gold, high strength porcelain, resin, porcelain fused to metal, or other materials. Crowns are custom-fitted coverings that replace the entire natural crown of your tooth and are sometimes necessary for people with extensive decay or weak teeth.

The root canal

You might require a root canal if decay has spread to the tooth's pulp. Instead of extracting a severely decayed or broken tooth, this procedure repairs and saves it. The infected pulp of the tooth is removed. To eliminate any infection, medication may occasionally be injected into the root canal. The filler is then used to replace the pulp.

Extractions of teeth

Some teeth develop severe decay to the point where they cannot be repaired and must be removed. A gap left by a tooth extraction could encourage your other teeth to move. If a bridge or dental implant are options, think about getting one to replace the missing tooth.

CONCLUSION

The current analysis identifies a number of dental caries risk factors that have undergone various preventative strategies. Severe caries damage can

drastically reduce a person's functional and cosmetic quality of life. It can help them enhance their knowledge and skills in delivering oral health care by increasing awareness and information regarding dental caries in general. Knowing how to identify potential health risk factors, such as lifestyle, Health care practitioners can evaluate the risk associated with oral health status using criteria such as ethnicity, health, and social determinants. Participate actively in health screening to identify any requirements. can detect health problems and be utilised for clinical preventive care, such as dental screenings. With appropriate training, health care workers can play an important role in the oral health education of people and groups by serving as role models and displaying knowledge of oral health behaviour to clients, friends, family, and the general public. Good dental health is an essential component of overall health. As a result, preventing dental caries is critical to sustaining public health efforts. Personal hygiene activities (using fluoride toothpaste to brush teeth properly and flossing daily) and dietary adjustments (limited snacking, drinking milk, and eating green vegetables) should be recommended. Raising public knowledge about dental checkups may aid in early diagnosis.

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