

Theories Of Cariology -A Complete Review

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Abstract

Dental caries is a biofilm mediated multifactorial disease, which results in the demineralization and remineralisation of dental hard tissues.

The disease occurs throughout the life both in dentitions (primary and permanent dentition). The initiation and progression of caries is influenced by pathological and protective factors

Key words: Dental caries, Theories of dental caries, Postulates, Risk Assessment, Prevention

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I. Introduction:

Dental caries is the oldest and the most common disease found in human. It occurs due to tooth adherent cariogenic bacteria.

Dental caries causes pain, suffering and the depressed mode of life. (1, 2,3)

History:

Many evidences show that the fossils from Australopithecus species reveal some earliest dental caries from 1.1 million to 4.4 million years ago itself.

Long back people who lived in around 8000 BC itself shows the signs of cavities. Dental fillings also done by this age itself. (4)

Classification

Based on location

- Pits and fissure caries
- Smooth surface caries
- Root surface caries

Based on rapidity of caries

- Acute dental caries
- Chronic dental caries
- Arrested dental caries (5, 6)

Based on extent of caries

- Incipient caries
- Cavitated caries

Based on carious lesion

- Primary caries
- Secondary caries (7, 8)

Based on number of surfaces involved

- Simple caries
- Compound caries
- Complex caries

Based on the age of patient

- Nursing bottle caries
- Adolescent caries
- Root caries (9)

Based on treatment

- Class 1
- Class 2
- Class 3 Class 4
- Class 5
- Class 6

Based on clinical scoring of proximal lesion

- Score 1&2
- Score 3
- Score 4&5
- Score 6 (10, 11)

According to WHO

- D1, D2, D3, D4

Based on visual Examination

- Grade 1,2,3,4,5

Sturdevant classification

a) Location

- Primary caries
- Back ward caries
- Forward caries
- Residual caries
- Root surface caries
- Secondary caries

b) Extent

- Incipient
- Cavitated

c) Rate

- Acute
- Chronic (12, 13)

According to Dental clinic

- a) Tooth type
- b) Hard tissue type
- c) Anatomic site
- d) Others

Classification by GJ mount

- Site 1,2,3

Classification by Dr Sikri

- Class 1,2,3,4,5,6

ADA caries

- Initial
- Moderate
- Severe
- Pit fissure
- Proximal
- Cervical
- Root surface (14, 15)

Theories of Dental Caries:

- Many factor involve aetiology of dental caries. Original opinion of dental caries is not known. Many theories describe reason for dentalcaries.

- Caries occur in any age and difference progress. Caries investigatesince paleolithic age

- 1.Humoral theory.
- 2.worm theory.
- 3.Vital theory.
- 4.Putrefaction theory.
- 5.parasitic theory
- 6.surfatase theory
- 7..Theory of inflammation8.chemical theory
9. septic theory
10. Acidogenic theory
11. 11.Diet detergent theory
- 12.Environment and Nutritional theory
- 13.Osmotic theory
- 14.Chelatin theory
- 15.Proteolytic theory
- 16.Protolysis chelation theory
- 17.Genetic theory
- 18.Autoimmune theory
- 19.Sucros Chelation theory
- 20.Bioelectric phenomenon
- 21.Levine's theory
22. Bandlish theory 23.Caries balance theory24.systemic theory

Humoral theory:

Hippocrates(400BC) and Galen(130AD) observed specific diseases Humor, blood, phlegm, yellow bile, blackbile. They describe stagnant of juices in tooth.

Galen stated when the head become disordered in nature, it produces many extremes from lesion of lower organ occurs. (16)

Worm theory :

Gay de chalice described this Anton Von Leuwenhoek (father of microscopy) observed three different wormsfrom caries tooth Caries tooth has holes was result worm being into the tooth.(16)

Vital theory:

Tooth decay within tooth itself gangrene, area on the top of tooth.

Putrefaction theory:

This is the putrefaction as the cause of dental decay. This one dispelledidea(17)

Parasitic theory:

Erdl(1843) described filamentous parasites causes dental caries filamentous parasites have infiltrated into the

tooth(17)

Sulfatase theory:

Bacterial toxin hydrolyse the sulfate of enamel and chondritic sulfate of dentin producing sulphuric acid that in turn cause decalcification of dental tissue. (17)

Theory of inflammation:

John hunter(1778) and Thomas bull(1832) suggested internal inflammation causes dental caries. W. D Miller demonstrated that it was not possible to protect an inflammatory process in the hard structures of teeth. (17)

Chemical theory:

Robert so (1835) proposed they the acid was formed by fermentation of foodparticles around teeth. Filnus(1847) attributed dental caries as “Denticle”, the generic term for decayrelated to micro organism(18)

Septic theory:

Under wood and Miller (1880) said that acid is capable of causingdecalcification produced by bacteria(18)

Acidogenic theory:

According to this theory caries is caused by acids produced by micro organismof oral cavity Miller found with saliva at body temperature produced enough acid ofdecaying enamel and dentin..(19)

Diet Detergent theory:

Wallace(1910) hypothesised that the fibrous part of diet act as detergent which lead to physical removal of substrate required for initiation of caries. (19)

Environmental and Nutritional theory:

The Continuous availability of these vitamins and minerals affects disintegrationand dissolution of enamel(19)

Sucrose chelation theory:

Egglers-Lyra(1967) proposed that sucrose itself and not the acid so produced cancause dissolution of enamel(20)

Bioelectric phenomena

The electric forces causes dental decay(20)

Levin’s theory:

Levin hypothesised that caries may be considered as a Demineralizing process with the passage of mineral ions from enamelmodified by the presence of plaquewhich acts as diffusion barriers(21)

Bandlish theory:

Bandlish (1982) hypothesised that oral fluids protect the enamel by providing a protecting covering on the enamel surface(21)

Caries Balance concept:

Featherstone(1999) proposed caries balance concept and hyper that the caries outcome of disturbance in balance between pathological and protective factors the caries progress if the pathological factors overweigh the protective factors(21)

Systemic theory:

The body organ constantly move between States of health and disease based on oxidative stresses and the inflammatory response(22)

Osmotic theory:

Eckerman in 1920 hypothesised two kinds of caries-primary (physio pathological process within the tooth)-secondary (breakdown of tissues by microorganisms)

Osmotic membrane are formed by the Nasmyth’s membrane leads to the development of caries canal. Caries canal is a cone shaped area in dentin exhibiting different colour. Colour is due to blood plasma . Eckerman’s concept could not explain the extension of caries. (22, 23)

Chelation theory:

The two most important pigments are chelate complexes. Haemoglobin are an iron chelate. Chlorophyll is a magnesium chelate.

Due to the demineralization by chelating agents which dissolve enamel minerals by forming complexes results in the formation of tooth decay.(23)

Proteolytic theory:

Gottlieb in 1944 and others proposed this theory .The proteolytic enzymes liberated by oral bacteria destroy the organic matrix of the enamel results in the loosening of apatite crystals with loss of minerals. When the enamel is destroyed forms the cavity. The microorganisms enters the deeper dentinal tissues. The initial process in caries formation was due to the proteolytic breakdown of dental cuticle. (23)

Proteolysis Chelation theory:

This theory was proposed by Schatz-et-al in 1956 . He implies a simultaneous microbial degradation of organic compounds and dissolution of minerals of a tooth by a process known as Chelation. It involves the complexing of a metallic ion to substance through coordinate covalent bond results in highly stable ionized compound.

Calcium exerts a vitamin sparing action on some bacilli. Fluorapatite is formed in some case. No evidence for the clinical role of cavities whether Chelation account for localization. (23, 24)

Genetic theory:

Caries has been established as a multifactorial disease affected by the action of genetic, environmental and behavioural factors

The genetic/hereditary involvement of preferences of carbohydrates intake taste of individuals have been reported.

Heritability in ratio of genetic component of variance to total variance the trait expressed in proportion or percentage. (25)

Autoimmune theory:

Burnet in 1959 hypothesised forbidden clone concept, describes that "caries as a Autoimmune disease" He proposed that the normal state of immunological self tolerance might be induced by genetic mutations in mesenchymal(25).

Bioelectric phenomena:

The electric forces might be the causative agents in dental decay. (26)

Levin's theory:

Levin hypothesised that caries may be considered as a Demineralizing process with the passage of mineral ions from enamel modified by the presence of plaque which acts as diffusion barriers. (26, 27)

Bandlish's theory:

Bandlish(1982) hypothesised that oral fluids protect the enamel by providing a protecting and covering on enamel surface.(27, 28)

Caries Balance concept:

Featherstone(1999) proposed caries balance concept and hypothesised that the caries the outcome of disturbance in balance between pathological and protective factors the caries progress if the pathological factors overweigh the protective factors. (29, 30)

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