Republic of Iraq
Ministry of Higher Education
and Scientific Research
University of Baghdad
College of Dentistry

Caries Classification Systems

A project submitted to

The College of Dentistry, University of Baghdad, Department of Pediatric and Preventive Dentistry in Partial Fulfillment for the Bachelor of Dental Surgery

By

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2023 A.D **1444 A.H**

Certification of the Supervisor

I certify that this project entitled "Caries Classification System" was prepared by the fifth- year student Rafah Abd Al- Abbaa Salman under my supervision at the college of Dentistry/University of Baghdad in partial fulfillment of the graduation requirements for the Bachelor Degree in Dentistry.

Supervisor name

Lec. Muna Abdullah Saleem

Signature

Date: /

Dedication

To... *My father..*

To... *My support in this life..*

To... *You who planted in an ambition that is pushing me forward to successful future..*

I love you father..

To... *My Mother,*

To... *The candle that lit my way who taught me to go on despite every things I love you mother.*

To... *My sister, Thank you for love& support.*

Rafah

Acknowledgment

First and foremost, praise and thanks to Allah Almighty for helping me fulfill my dream, for His blessings throughout my work to complete it successfully.

My deep appreciation to Prof. Raghad Abdulrazzaq Al- Hashimi, the dean of College of Dentistry/ University of Baghdad, for granting me the opportunity to perfume my study. Deep thanks to prof. Ali Al- Bustani, the associate dean for scientific affairs.

I would like to convey appreciation and thanks to Assist. Prof. Aseel Haidar, the head of department of pediatric and preventive Dentistry.

I would like to extend my deepest respect and gratefulness to Lec. Muna Abdullah Saleem for her encourgement, parience, meaningful and valuable instructions, advice and kindness inside and throughout working this project.

My great appreciation& thanks to all teaching staff in Department of pediatric & Preventive Dentistry.

To all those whom I forgot to mention their names for kind efforts helping me to composr this review of literature.

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INTRODUCTION

In the modern times, Dental caries is one of the most prevalent diseases of the teeth in the whole world. Almost 90% of the people get affected by cavity. Dental caries is the cavity which occurs due to the remnant food and bacteria. Dental Caries are curable and preventable diseases when it is identified at earlier stage. Dentist uses the radiographic examination in addition with visual tactile inspection to identify the caries. Dentist finds difficult to identify the occlusal, pit and fissure caries. It may lead to sever problem if the cavity left untreated and not identified at the earliest stage (Megalan, et al, 2020).

Dental caries is a preventable, infectious disease that forms a significant portion of daily dental practice. Caries occurs due to an imbalance in demineralization and remineralization process resulting in mineral loss over a period of time. Detecting and recording carious lesions is an essential component of the dental hygiene process. Dental caries present with a wide range of clinical features affecting all age groups and all surfaces of teeth. The first attempt in classifying dental caries was by GV Black. With the advancements in preventive strategies, various classification systems have been proposed to classify dental caries by limiting the cavity size and retaining a maximum natural tooth structure. All classification systems must be simple, reliable, comprehensive, and validated. It is important to classify to aid communication, outcome, diagnosis, and treatment plan (Shruthi, et al, 2022).

Review of the Literature

Review of Literature

Definition of Dental Caries:

Dental caries is a microbial disease of the calcified tissues of the teeth, characterized by demineralization of the inorganic portion and destruction of the organic substance of the tooth.

The World Health Organization defines caries as a localized post-eruptive, pathological process of external origin involving softening of the hard tooth tissue and proceeding to the formation of a cavity Machiulskiene, et al, 2020).

Dental caries is derived from the Latin word *caries* which means decay or rotten (Selwitz, et al, 2007).

Etiology of Dental Caries

Dental caries is a multi – factorial disease. Three primary factors are the Host, The microbial flora and the substrate. In addition fourth factor that is the time must be considered in any discussion of the etiology of dental caries (Kutsch, et al, 2011).

1. Host factor: This involved tooth susceptibility and saliva.

A: Tooth: Several factor affecting tooth susceptibility.

- ❖ Morphology of teeth.
- ❖ Position of teeth.
- ❖ Composition of teeth.

B. Saliva: Through its secretion and composition affect dental caries development. It can be affected the number of microorganisms through cleansing action (Stookey, 2008). While buffer system in saliva affect the integrety of teeth as well as calcium a phosphate (Hicks, et al, 2004).

2. Dental plaque: The cariogenic bacteria in plaque consist of mutans streptococci, Lactobacilli. Bacteria ferment carbohydrate causing release of acid lead to demineralization if tooth surface. Plaque accumulation may show individual variation and affected by many factors such as age and practice of oral hygiene (Marsh, 2010).
3. Diet: It may exert an affect on caries locally in the mouth by reacting with the enamel surface and by serving as substrate for cariogenic microorganisms. Frequent consumption of sweets between meals lead to continuous drop of pH, thus demineralization will occur (Gupta, et al, 2013).
4. Time: The fermentation of sugars by cariogenic bacteria, the increase in plaque bulk and the demineraliztion of tooth tissue all require a minimum length of time for the net demineralization flexto become greater than net remineralising flux.

   In addition genetic is also believed to play a role affecting the susceptibility and resistance to dental caries as show in this figure (Yildiz, et al, 2016).

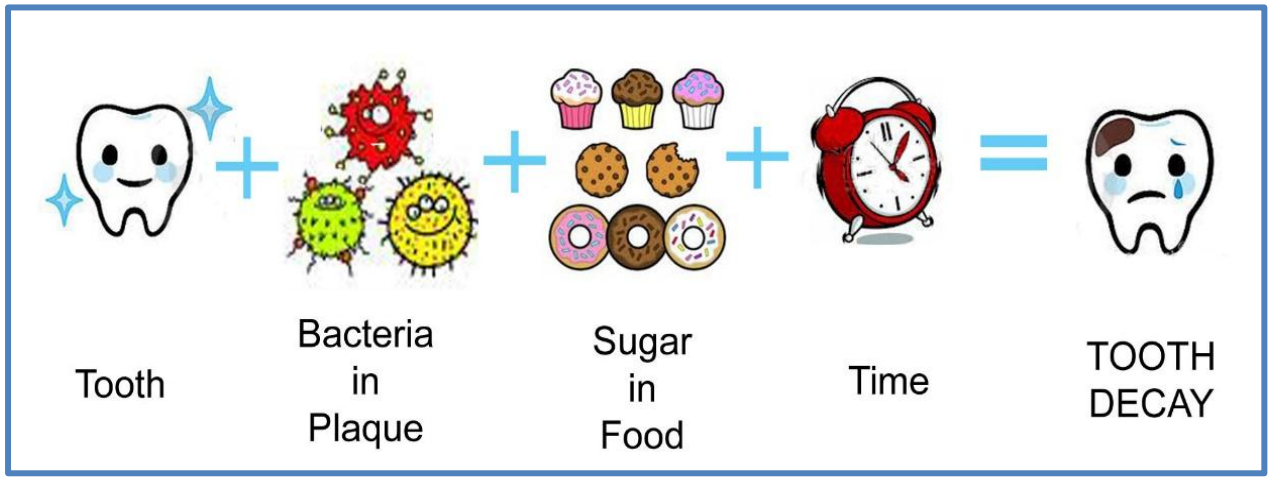

Figure (1): Etiology of Dental caries.

Factors affecting caries prevalence

1. Race: People livening same geographical area but belonging to different race have differing caries incidence. Generally Chinese, blacks, Indians have lesser caries incidence than caucasian whites (Matsuo, et al, 2015).

2. Age: Dental caries more prevalence in children up to 12 years incidence decreases somewhat in younger and middle age group. Incidence increase again by the older age (Kunin, et al, 2015).

3. Gender: Incidence of caries significantly higher in females than males. This may be due to the fact that teeth in females erupt earlier compared to male (Lukacs, 2011).

4. Familial: Appears to be heredity involved. Children of parents with low caries experience also show lesser caries incidence and vise versa (Foxman, et al, 2016).

Caries Classification Systems

There are many classification of the dental caries but the most common caries classification according to:

1) G. V BLACK Classification

The most widely used method to classify carious lesions is using G.V. Black's classification, which was developed by G.V. Black in the early 1900s. It describes caries based on the anatomical location on the tooth. It is one of the easiest ways to describe carious lesions as show in this figure (Parameswaren, 2016).

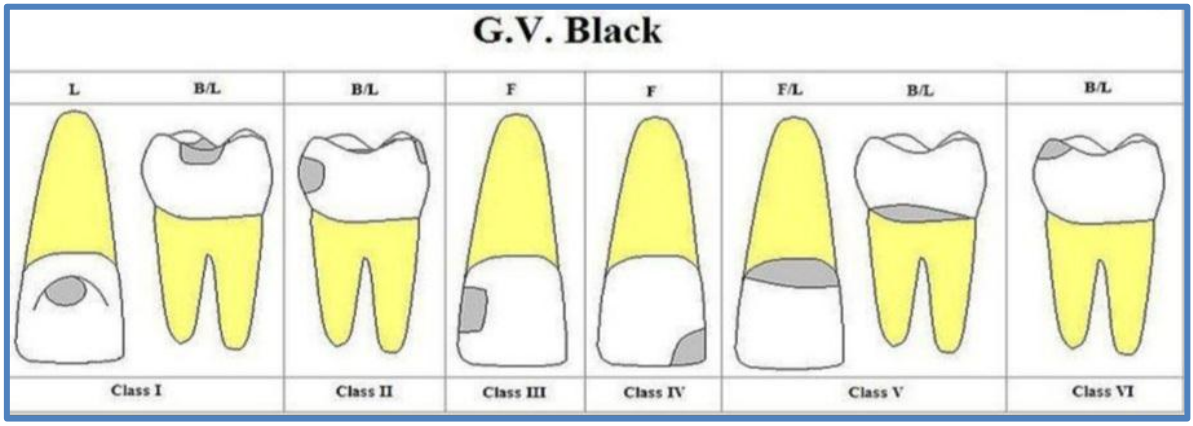

Figure (2): G. V BLACK Classification.

Class I	**Caries affecting pits and fissures on occlusal third of molars and premolars, occlusal two- third of molars and premolars and lingual part of anterior teeth.**
Class II	Caries affecting proximal surfaces of molars and premolars.
Class III	Caries affecting proximal surfaces of central incisors, lateral incisors and cuspids without involving the incisal angles.
Class IV	Caries affecting proximal surface including incisal angles of anterior teeth.
Class V	Caries affecting gingival one third of facial or lingual surfaces of anterior or posterior teeth.
Class VI	Caries affecting cusp tips of molars, premolars and cuspids.

2) Tooth surface involved

Simple: Caries involving only one tooth surface.

Compound: Caries involving two tooth surfaces.

Complex: Caries involving more than two surfaces as show in this figure (Parameswaren, 2016).

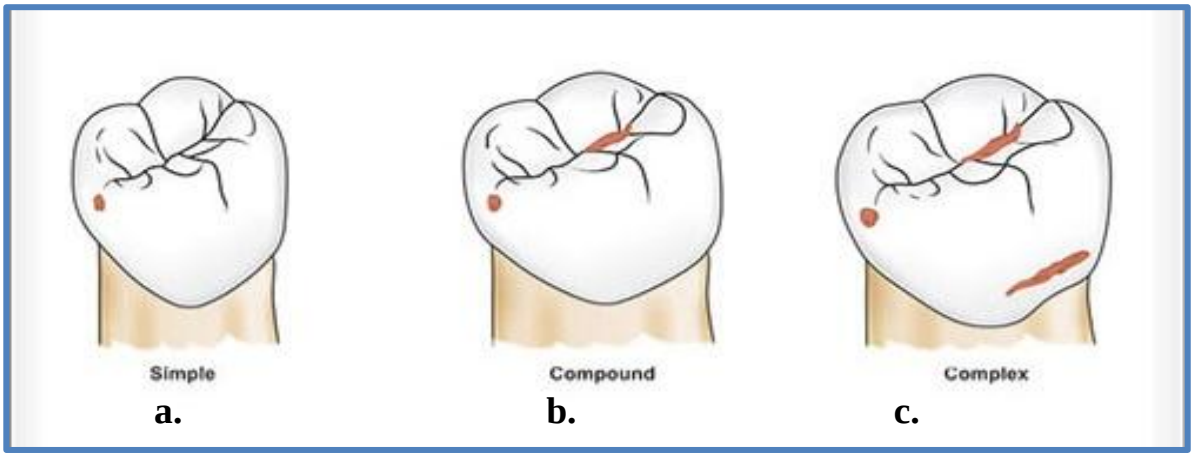

Figure (3): a. Simple, b. Compound, c. Complex Caries.

3) World health organization System

In this classification the shape and depth of the caries lesion scored on a four point scale (Taqi, et al. 2019).

D1. Clinically detectable enamel lesion with intact (non cavitated surface).

D2. Clinically detectable cavities limited to enamel.

D3. Clinically detectable cavities in dentin.

D4. Lesion extending into the pulp.

4) Anatomical site

a- Pits and Fissure caries

Pit and fissure caries (also called type-1 caries): Caries occurring on anatomical pits and fissures of all the teeth. The specific areas or surfaces involved include occlusal surfaces of molars and premolars, buccal and lingual surfaces of molars and lingual surfaces of maxillary (Carvalho, et al, 2016).

Clinically these lesions appear brown or black, with little softening and opaqueness of the surface. When the lesion is examined by a fine explorer tip, a 'catch point' is often felt, where the explorer teeth catches the area (Ekstrand, et al, 2001).

When the lesion reaches the dentinoenamel junction, they spread laterally to cause undermining of the enamel as show in this figure (Ekstrand, et al, 2001).

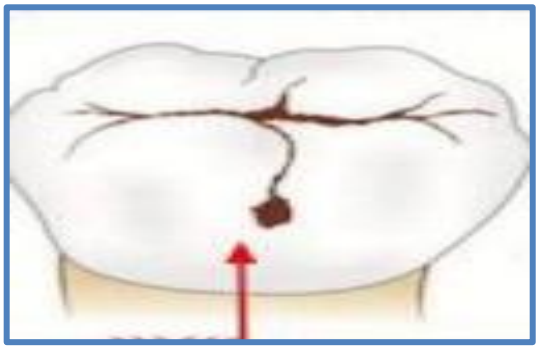

Figure (4): Pits and Fissure caries.

b- Smooth surface caries

Smooth surface caries (also known as type-2 caries): These carious lesions occur on the smooth surfaces of the teeth (e.g. proximal surfaces or gingival areas of the buccal and lingual aspect of tooth) (Aljehani, et al, 2007).

Proximal caries usually begins just below the contact point, and appears in the early stage as a well demarcated faint white opacity of the enamel without apparent loss of continuity of enamel (Bignozzi, et al, 2014).

The white spot lesion becomes pigmented yellow or brown and it often extends buccally and lingually.

The surrounding enamel becomes bluish white as the lesion continues to progress).

The surface of the affected enamel becomes rough and later on, there is formation of a cavity as show in this figure (Bignozzi, et al, 2014).

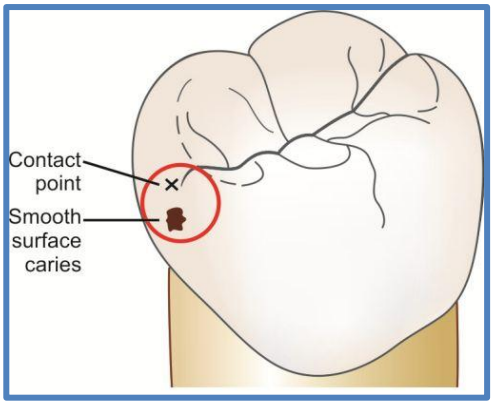

Figure (5): Smooth surface caries.

c- Root caries

Root caries: Caries occurring at the cementoenamel junction or cementum. This occurs predominantly in the older age when there is gingival recession as show in this figure (Griffin, et al, 2004).

Figure (6): Root caries.

d- Linear enamel caries

Linear enamel caries: Caries occurring on the labial surfaces of anterior teeth. This is also known as ‘odontoclasia’. The caries occurs at neonatal zone because of trauma at birth or metabolic disturbances (Griffin, et al, 2004).

5) Speed of progression

a- Acute Denal caries:

It is a form of caries which runs a rapid clinical course and results in early pulp involvement by carious process.

It occurs most frequently in children and young adults, presumably because the dentinal tubules are large and open and show no sclerosis (Stoleriu, et al, 2019).

The process is usually so rapid that there is little time for the deposition of secondary dentin (Stoleriu, et al, 2019).

b- Chronic caries:

Slowly progressing in nature and tends to involve the pulp much later than the acute caries most common in adults (Paglia, 2018).

These caries lesions exhibit a large cavity with brownish pigmentation.

Pain is not a common feature of chronic caries because of the protection afforded by secondary dentin.

The slow progression of the lesion allows sufficient time for both sclerosis of the dentinal tubules and deposition of secondary dentin in response to the adverse irritation (Paglia, 2018).

c- Arrested caries:

Caries which becomes stationary or static and not show any tendency for further progression, both deciduous and permanent teeth affected with the shift in the oral conditions, even advanced lesions may become arrested (Sharma, et al, 2015).

Arrested caries involving dentin show a marked brown pigmentation and induration of the lesion

Sclerosis of dentinal tubules and secondary dentin formation commonly occur.

Exclusively seen in caries of occlusal surface with large open cavity in which there is lack of food retention (Keyes, et al, 2016).

Also on the proximal surfaces of tooth in cases on which the adjacent approximating tooth has been extracted as show in this figure (Keyes, et al, 2016).

Figure (7): Arrested Caries.

6) Age of the patient

a- Early chilhood caries

Early chilhood caries would include, two varients: Nusing caries and rampant caries.

The difference primarily exist in involvement of the teeth (mandibular incisor) in the carious process in rampant caries as opposed to nursing caries (Serow, 2018).

Classification of Early chilhood caries:

Type I (Mild)

- Involves molars & incisors.
- Seen in 2-5 years.
- Cause/cariogenic semisolid food + lack of oral hygiene.

Type II (Moderate)

- Unaffected mandibular incisors.
- Soon after first tooth erupts.
- Cause/ inappropriate feeding + lack of oral hygiene.

Type III (sever)

- All teeth including mandibular incisors.
- Cause/multitudes of factors.

SYNONYMS

Nursing caries, Nursing bottle mouth, Nursing bottle syndrome, Bottle-propping caries, caries as show in this figure (Kawashita, et al, 2011).

Figure (8): Early chilhood caries.

Difference between Nursing caries and rampant caries

Nursing caries	Rampant caries
Seen in infant and Toddler	Seen in all ages including adoloscen
Affect primary dentition mandibular incisors are not involved Etiology Improper bottle feeding Pacifier dipped in honey/other sweetener	Affect primary and permanent dentition mandibular incisors are also affected Etiology Multifactorial • Frequent snacks • Decreased salivary flow • Genetic background

b- Adolescent Caries

Is type of caries is a variant of rampant caries where the teeth generally considered immune to decay are involved.

The caries is also described to be of a rapidly burrowing type, with small enamel opening, the presence of a large pulp champer add to the woes, causing early pulp involvement (Singh, 2019).

c- Adult caries

With the recession if the gingiva and sometimes decreased salivary function due to atrophy, at the age of 55-60 years, the third peak of caries is observed.

Root caries and cervical caries are more commonly found in this group. Sometimes they are also associated with a partial denture clasp (Singh, 2019).

7) Radiation caries

Radiotherapy is frequently associated with xerostomia due to decreased salivary secretion, an increase in viscosity and low PH.

This and other causes of decreased salivary secretion may lead to a rampant form of caries, including the significance of saliva in preventing caries (Moore et al, 2020).

Three type of defects due to irradiation

- ☒ Lesion usually encircling the neck of teeth amputation of crowns may occur.
- ☒ Begins as brown to black discolouration of tooth occlusal surface and incisal edge wear away.
- ☒ Spot depression which spreads from any surface as show in this figure (Moore. et al, 2020).

Figure (10): Radiation caries.

Conclusion:

Dental caries is perhaps the most prevalent chronic disease. The outcome of the disease is dental decay. Risk for caries includes factors such as high numbers of cariogenic bacteria, high frequency sugar consumption, inadequate salivary flow, insufficient fluoride exposure, poor oral hygiene, and poverty.

The disease is the result of a complex interaction between acid producing tooth-adherent bacteria and fermentable carbohydrates. Over time, the acids in the dental plaque may demineralize enamel and dentin in the fissures and the smooth surfaces of the tooth. The earliest visual sign of dental caries is the so-called white spot lesion. If demineralization continues, the surfaces of the white spot will cavitate, resulting in a cavity. However, if the demineralization environment is reduced or eliminated, white spot lesions may remineralize and not progress.

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