

## Aetiology, pathogenesis and epidemiological trends of oral and dental diseases

### Application to patient management



1

## Objectives

- Understand the aetiology of oral and dental disease
- Explain the impact of oral and dental disease on provision of orthodontic treatment

2

The epidemiological trends of oral and dental diseases have been changing globally due to factors like urbanization, aging populations, dietary habits, and public health policies.

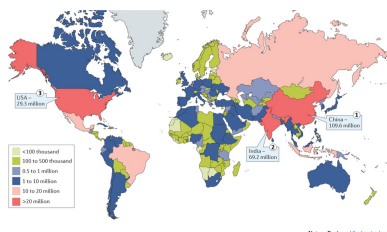
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## Global Prevalence

- Dental caries (tooth decay) remains the most common non-communicable disease (NCD) worldwide.
  - Affects 60–90% of schoolchildren and nearly 100% of adults.
  - Untreated dental caries in permanent teeth is the most prevalent condition in the Global Burden of Disease (GBD) studies.
- Periodontal disease affects about 20–50% of the global population.
- Tooth loss is often a consequence of both caries and periodontal disease; it increases with age.
- Oral cancer is among the top 15 most common cancers globally, with rising trends in some regions.

4

## Global Prevalence of Type 2 Diabetes



5

## Regional Variations for Dental Disease

- Low- and middle-income countries (LMICs) face rising prevalence due to:
  - Increased sugar consumption
  - Poor access to dental care
  - Lack of preventive programs
- High-income countries (HICs) show:
  - Lower caries rates due to fluoridation, education, and dental insurance
  - A shift towards gingival and periodontal problems in aging populations

6



### Urbanization and Lifestyle Factors

Increased urbanization is linked with:

- Higher intake of processed foods and sugary beverages
- Sedentary lifestyle and tobacco/alcohol use, increasing risks for periodontal disease and oral cancers

### Aging Population

Aging populations, especially in HICs, are retaining more of their natural teeth but face:

- Root caries
- Xerostomia (dry mouth) due to medications
- Higher need for prosthodontic and periodontal care

7

## Risk Factors

Common risk factors shared with other NCDs:

- Tobacco and alcohol (linked to oral cancer, periodontitis)
- Unhealthy diet, particularly high sugar intake
- Poor oral hygiene
- Systemic diseases like diabetes and cardiovascular conditions



8

## Public Health and Preventive Measures

- Fluoridation (water, salt, toothpaste) is a major success in caries prevention in many countries.
- School-based oral health programs and sealant use are increasing.
- WHO and FDI (World Dental Federation) emphasize integration of oral health into general health policies.

### Impact of COVID-19

- Decreased access to routine dental services during lockdowns.
- Worsening of untreated conditions and increased demand for urgent care.
- Accelerated adoption of teledentistry in some regions.

9

## Dental Caries

- Caused by acidogenic bacteria (e.g., *Streptococcus mutans*, *Lactobacillus* spp.)
- These bacteria ferment dietary sugars, producing acid that demineralizes enamel.
- Risk factors: poor oral hygiene, high sugar intake, low fluoride exposure, dry mouth (xerostomia).



10

## Orthodontics Implications

- Active caries must be treated before braces or other appliances are placed.
- Orthodontic appliances make oral hygiene more difficult, increasing caries risk.
- Extensive decay or tooth loss may complicate treatment planning due to altered anchorage or tooth alignment.

11

## Periodontal Disease (Gingivitis and Periodontitis)

### Aetiology:

- Caused by plaque-induced inflammation from bacteria in dental biofilm.
- Risk factors: poor hygiene, smoking, diabetes, genetic susceptibility.



12

### Impact on Orthodontic Treatment:

- Healthy periodontium is essential for tooth movement.
- Orthodontic forces on compromised periodontium can accelerate bone loss.
- Periodontal disease must be stabilized before treatment; close monitoring is needed during orthodontics.
- Adults with periodontitis may require lighter forces and interdisciplinary care.

13

### Dental Trauma

#### Aetiology:

- Falls, sports injuries, accidents, or assaults.
- Common in children and young adults.

#### Risks Factors:

- Increased OJ
- Incompetent lips
- Age



14

### Impact on Orthodontic Treatment:

- Traumatized teeth may have root resorption, ankylosis, or pulpal necrosis.
- These complications can limit or prevent tooth movement.
- Endodontic treatment may be required before orthodontic intervention.
- Ankylosed teeth may require surgical intervention or prosthetic replacement.

15

### Developmental Anomalies

#### Aetiology:

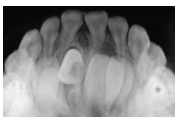
- Genetic and environmental factors during tooth formation.
- Examples: hypodontia, supernumerary teeth, enamel hypoplasia, amelogenesis imperfecta.



16

### Impact on Orthodontic Treatment:

- Hypodontia may lead to space issues requiring prosthetic planning.
- Supernumerary teeth can block eruption and need extraction.
- Structural anomalies like enamel defects can increase caries risk during treatment.



17

### Malocclusion

- Genetic: skeletal discrepancies, inherited tooth size-arch length discrepancies.
- Environmental: habits (thumb sucking, mouth breathing), early loss of primary teeth.



18

### Impact on Orthodontic Treatment:

- Malocclusion is often the primary reason for seeking orthodontic care.
- Early intervention may prevent more severe problems later.
- Some malocclusions can be secondary to other diseases (e.g., periodontal disease leading to drifting).

19

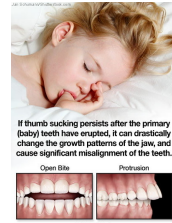
### Oral Habits and Systemic Conditions

#### Common Habits:

- Thumb sucking, tongue thrusting, nail biting, bruxism.

#### Systemic Conditions:

- Diabetes, osteoporosis, hormonal imbalances, immunodeficiencies.



20

### Principles of preventative care Primary Prevention

Prevent the onset of disease.

#### Oral hygiene education:

- Teach proper brushing/flossing techniques, especially around brackets and wires.
- Recommend interdental brushes, water flossers, fluoride rinses.

#### Dietary advice:

- Educate on reducing sugary snacks and drinks to prevent caries.

#### Topical fluoride application:

- Prescribe fluoride toothpaste/mouthwash.
- Apply fluoride varnish before or during orthodontic treatment to reduce demineralization.

#### Sealants on posterior teeth:

- In high-risk patients to prevent occlusal caries.

21

### Secondary Prevention

Early detection and prompt management of disease.

#### • Routine screening for caries and gingivitis:

- Monitor for white spot lesions (early caries), bleeding gums, plaque accumulation.
- Use disclosing agents for plaque visualization.

#### • Collaboration with general dentist:

- Refer for restorative work or periodontal care as soon as problems are identified.

#### • Adjustment of appliances:

- Modify or remove appliances that are causing hygiene challenges or tissue trauma.

22

### Tertiary Prevention Limit the impact of established disease

Manage consequences of dental disease:

- Coordinate with general dentists or periodontists to manage periodontitis before orthodontic treatment resumes.
- In cases of root resorption or trauma, adapt force levels or avoid movement altogether.

Retention phase care:

- Educate on long-term hygiene with retainers (especially fixed types which can trap plaque).
- Continue reinforcement of oral care practices to prevent relapse and disease.

23

### Special Considerations

- High-risk patients (e.g. with special needs, diabetes, or poor hygiene) need individualized preventive protocols.
- Use of self-ligating brackets or removable aligners may reduce plaque retention in some cases.
- Educating parents of young patients on preventive measures is essential for compliance.

24

### Multiple-Choice Question

Which of the following is the most effective strategy for preventing white spot lesions in a patient with fixed orthodontic appliances?

- A. Brushing twice a day with non-fluoridated toothpaste
- B. Advising the patient to rinse with water only after meals
- C. Applying fluoride varnish at regular intervals during treatment
- D. Encouraging the patient to avoid all dairy products

25

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• Correct Answer:

- ☒ C. Applying fluoride varnish at regular intervals during treatment

26

### Clinical Scenario-Based Question

A 14-year-old patient is undergoing fixed appliance therapy. At a routine review, you notice plaque accumulation around the brackets and early signs of decalcification on the upper lateral incisors.

**Question:**

As the orthodontic therapist, describe your approach to managing this situation and preventing further disease progression.

27

### Answer

- Re-educating the patient on effective brushing techniques around brackets
- Demonstrating use of interdental brushes and orthodontic-specific oral hygiene aids
- Reinforcing dietary advice to limit sugar intake
- Application of fluoride varnish to high-risk areas
- Use of disclosing tablets to highlight plaque
- Referral to a hygienist or dentist if periodontal health is at risk
- Scheduling more frequent review appointments to monitor compliance

28

### Oral questions

How can you provide patients with a comprehensive and accurate prevention education and instruction in a manner which encourages self care and motivation?

29

### Sample Answer

**Educate Clearly and Simply**

- Use plain, non-technical language to explain:
  - Why oral hygiene is critical with braces or appliances
  - How plaque buildup is more likely around brackets and wires
  - Risks like decalcification, gingivitis, and bad breath
- Provide visual aids, such as:
  - Diagrams, videos, and before/after photos of poor hygiene
  - Models showing plaque around orthodontic appliances

30

## Demonstrate Proper Techniques

### Show and tell how to:

- Brush around brackets and under wires (e.g., 45-degree angle technique)
- Use interdental brushes, orthodontic floss threaders, and mouth rinses
- Clean removable appliances
- Allow hands-on practice in the chair, and give immediate feedback

### Personalize the Advice

- Tailor hygiene instructions to the patient's:
  - Age
  - Appliance type (fixed, removable, aligners)
  - Dexterity and lifestyle
- Recommend specific tools:
  - Electric toothbrushes
  - Water flossers for patients with difficulty flossing manually

31

## Reinforce Regularly and Motivate with Goals and Positive Reinforcement

### Review hygiene at every appointment:

- Use a disclosing agent to show missed areas
- Praise improvement and gently correct poor technique
- Use short reminders that are encouraging, not judgmental

### Emphasize benefits of good hygiene:

- "Clean teeth = faster treatment = better smile!"
- Avoiding white spots and swollen gums
- Use motivational techniques:
  - Progress charts or hygiene score cards
  - Small rewards or recognition for consistent effort
  - Involve parents for younger patients

32

## Use Technology

- Recommend apps or videos that support daily habits
- Send reminder texts or emails with hygiene tips
- Offer QR codes linked to tutorial videos

### Encourage Two-Way Communication

- Invite questions and concerns at every visit
- Ask open-ended questions to understand challenges:
  - "What's the hardest part about brushing with your braces?"
  - "How confident do you feel about using the floss threader?"
- Build trust so the patient feels supported, not judged

33