Dr. dr. Wiyarni Pambudi, Sp.A, IBCLC

Riwayat Pendidikan

- Physician, Universitas Airlangga (1997)
- Pediatrician, Universitas Airlangga (2007)
- Doctoral, Universitas Indonesia (2022)
- International Board-Certified Lactation Consultant (2011, recertified 2016 & 2021)
- Course Director & Facilitator of Breastfeeding Counseling + BFHI Training (2011)

Aktivitas & Pekerjaan

- Lecturer at Faculty of Medicine, Universitas Tarumanagara
- Pediatrician at BJ Medical Center, Central Park Jakarta
- Member of Breastfeeding Task Force Indonesian Pediatric Society (IPS)
- Member of Nutrition and Metabolic Diseases Working Group IPS
- Member of WHO Guideline Development Group for Donor Human Milk Banking
- Member of Academy Breastfeeding Medicine (ABM)
- Member of International Lactation Consultant Association (ILCA)

Oral-Lung Axis

UNTAR FAKULTAS KEDOKTERAN

Pengaruh Kesehatan Gigi & Mulut terhadap Gangguan Respiratorik pada Anak

Dr. dr. Wiyarni Pambudi, Sp.A, IBCLC
Departemen Ilmu Kesehatan Anak
Fakultas Kedokteran Universitas Tarumanagara

UNTAR FAKULTAS KEDOKTERAN

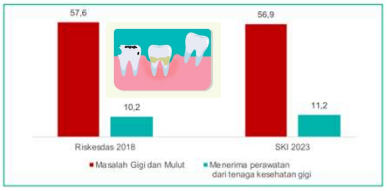
1. Oral Microbiome
2. Oral-Lung-Gut-Brain Axis
3. Oral Care Regimen

Laporan hasil SKI 2023

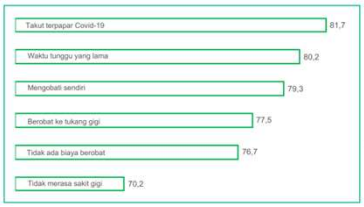
PROBLEMATIKA KESEHATAN GIGI DAN MULUT DI INDONESIA

TEMUAN UTAMA

GAMBAR 7.3. PROPORSI MASYARAKAT YANG MENGELUH MEMPUNYAI MASALAH GIGI & MULUT DIBANDINGKAN DENGAN YANG MENERIMA PERAWATAN DARI TENAGA KESEHATAN GIGI

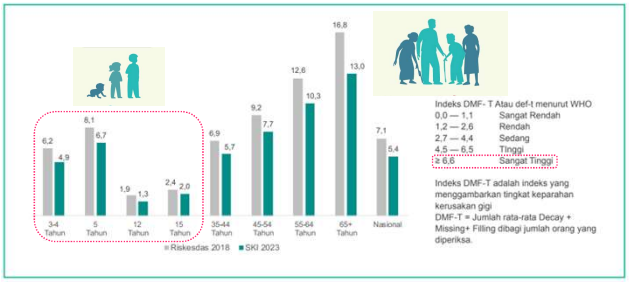


GAMBAR 7.4. ALASAN MASYARAKAT TIDAK MENCARI PENGOBATAN



GAMBAR 7.5. PERILAKU MENJAGA KEBERSIHAN GIGI DAN WAKTU SIKAT GIGI SECARA BENAR

GAMBAR 7.2. PERMASALAHAN GIGI DAN MULUT BERDASARKAN KELOMPOK UMUR



Kesehatan Gigi dan Mulut pada Anak

- **Gingivitis** terjadi pada >50% balita ⇨ meningkat hampir 100% saat pubertas (AAPD)
- **Karies gigi** dan komplikasinya terjadi pada 42% anak usia 2-11 tahun
- Kesehatan gigi yang buruk ⇨ memengaruhi perkembangan dan pertumbuhan anak ≈ kebiasaan makan, pernapasan yang tepat, berbicara, bersosialisasi

Gangguan perkembangan kognitif
Kondisi medis kronis
Malnutrisi dan kondisi lain yang dapat dicegah
Konsekuensi psikososial

Oral health

Oral health is multifaceted and includes the ability to speak, smile, smell, taste, touch, chew, swallow, and convey a range of emotions through facial expressions with confidence and without pain, discomfort, and disease of the craniofacial complex. Further attributes of oral health:

- It is a fundamental component of health and physical and mental well-being. It exists along a continuum influenced by the values and attitudes of people and communities.
- It reflects the physiological, social, and psychological attributes that are essential to the quality of life.
- It is influenced by the person's changing experiences, perceptions, expectations, and ability to adapt to circumstances.

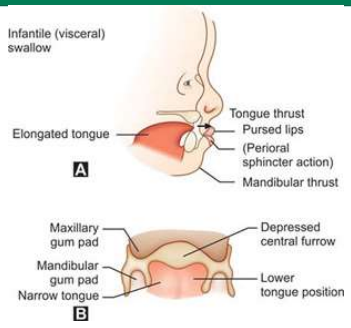
Source: FDI World Dental Federation, 2016.

UNTAR FAKULTAS KEDOKTERAN

1

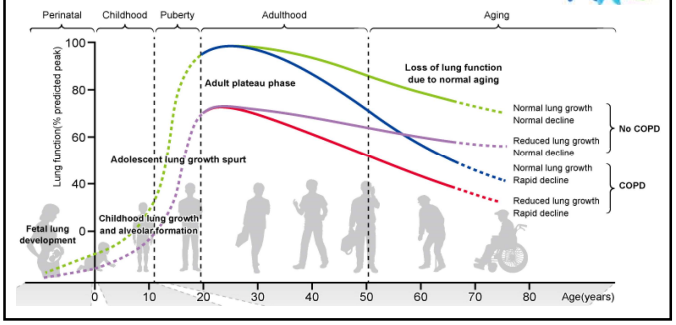
ORAL MICROBIOME

Perkembangan oromotorik

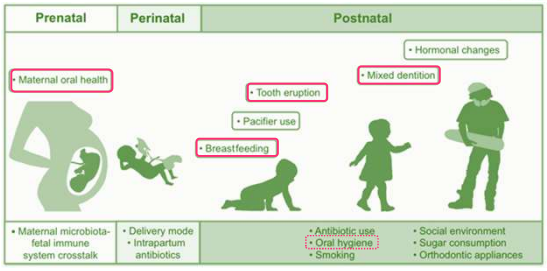


Perkembangan area oromotor, otot daerah sekitar mulut, pipi, rahang dan pencernaan ⇨ berpengaruh pada **perkembangan berbicara** dan **keterampilan makan**

Age-association lung function



Microbiome ≈ journey that shape our life

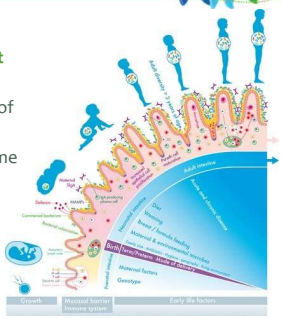


Factors shaping the oral microbiota from fetus through childhood and toward adolescence
Marijee Kaan et al (2021)

Oral microbiome

- After the gut, **mouth has the second largest and most diverse microbiota**
- Different bacteria populate different areas of the oral cavity
- Every individual has a unique oral microbiome
- Mouth microbes tend to work in teams

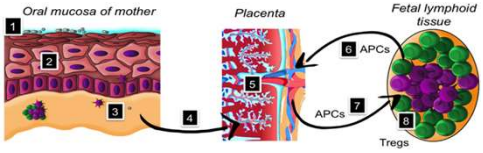
Launched in 2010, **The Human Oral Microbiome Database** offers a repository of oral bacterial genome sequences, featuring 772 prokaryotic species



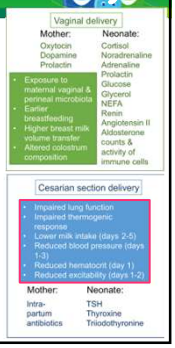
Microbiom tolerance during pregnancy & delivery

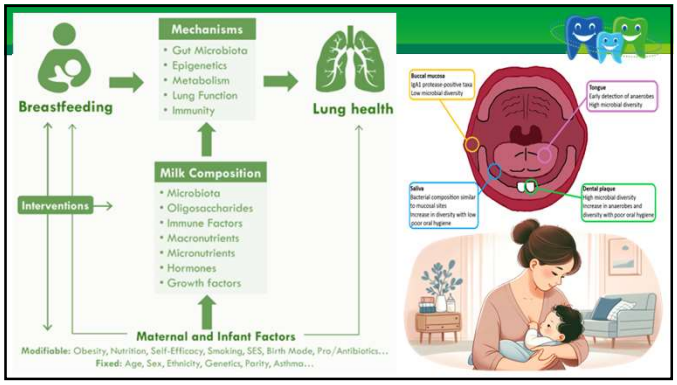
Hypothesis on the role of the placental microbiome in the development of **fetal tolerance** toward maternal (oral) microbiome

Zaura et al (2014), Marijee Kaan et al (2021)

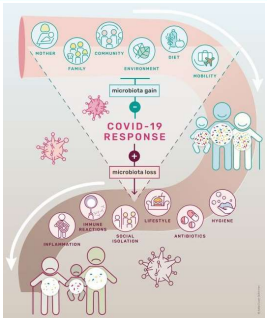


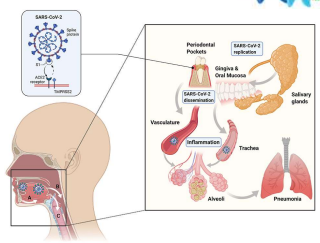
1 – Oral microbiome of mother; microbial cells attach to the oral epithelium
2 – Loosening of epithelial cell contacts due to pregnancy hormones; oral bacterial penetration
3 – Bacterial cells reach lamina propria and vascular tissues of the oral mucosa
4 – Transfer of bacterial cells to the placenta via blood stream
5 – Oral bacteria of mother are trapped in placental tissue
6 – Fetal antigen-presenting cells (APCs) acquire the alloantigen information in placenta
7 – Fetal APCs return to fetal peripheral lymphoid organs
8 – Fetal regulatory T cells (Tregs) that recognize mother's microbiome as "safe" are generated in fetal lymphoid tissue





Periodontal-COVID-19 connections

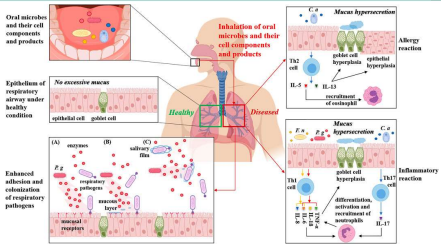




The oral cavity can represent a SARS-CoV-2 replication and **dissemination reservoir**, leading to acute respiratory and lower digestive tract infection

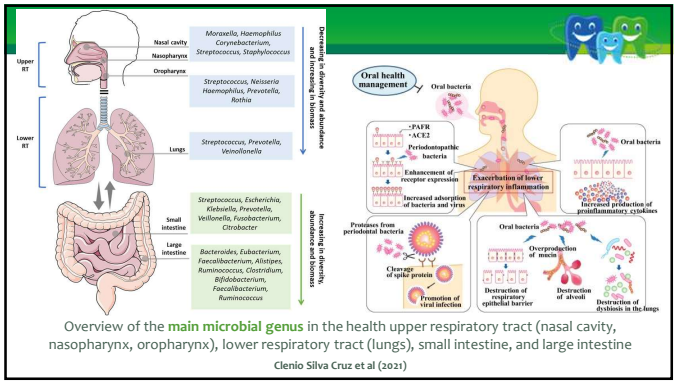
Mikaela Brock et al (2022)

Oral microbiome & respiratory diseases



Potential mechanisms on aspiration of indigenous oral microorganisms (including lipopolysaccharide, peptidoglycans, enzymes and toxins) in saliva ⇨ inhaled into the lower respiratory tract to **modulate immunoreaction and facilitate adherence and colonization** of respiratory pathogens

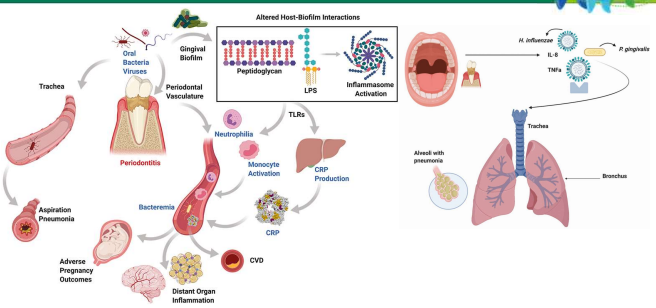
Kenichi Imai et al (2021), Jiajia Dong et al (2022)



Overview of the **main microbial genus** in the health upper respiratory tract (nasal cavity, nasopharynx, oropharynx), lower respiratory tract (lungs), small intestine, and large intestine

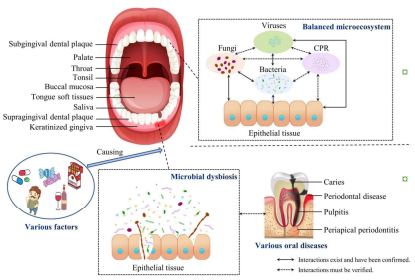
Clenio Silva Cruz et al (2021)

Periodontal-systemic connections



Mikaela Brock et al (2022)

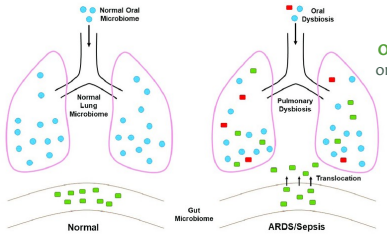
Oral microbiota: balans vs dysbiosis



- The composition of the **oral microbiota** and the structure of the **oral biofilm** adapt specifically to nine different microecological environments
- **Dysbiosis** ⇨ contributes to oral and systemic diseases

Xinyi Li et al (2022)

Oral-Lung Axis



Poor oral health

⬇

Oropharyngeal microbial dysbiosis
oral inflammatory cells and proteins

⬇

Micro and/or macro aspiration

⬇

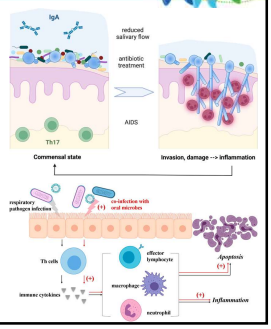
Lung microbiome dysbiosis
and lung inflammation

⬇

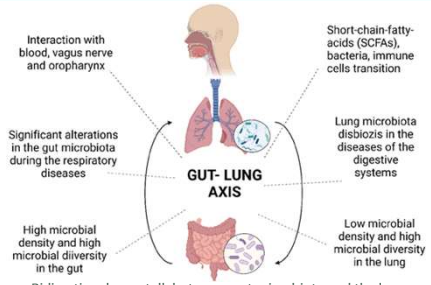
Lung disease

Pathogenesis

- By **aspiration of oral pathogen** in the lungs
- By action of **periodontal disease-associated enzyme in saliva** on the mucosal surfaces to promote adhesion and colonization by respiratory pathogens
- By periodontal disease associated enzymes, which may **destroy protective salivary pellicles**
- By **cytokines** originating from periodontal tissues, which may alter epithelium to promote infection by respiratory pathogens



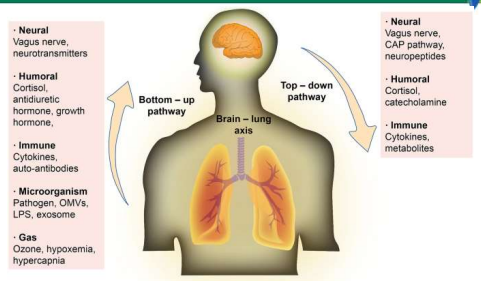
Gut-Lung Axis



Bidirectional crosstalk between gut microbiota and the lungs

Nilufer Yuksel et al (2023)

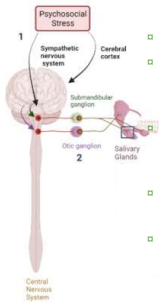
Lung-Brain Axis



Functional two-way crosstalk between brain and lung

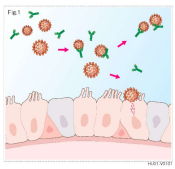
Chunyi Li et al (2023)

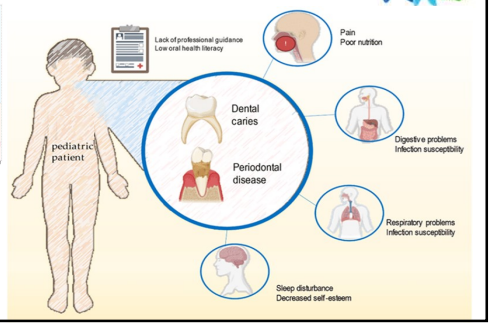
Psychological stress during 1st stages of early life

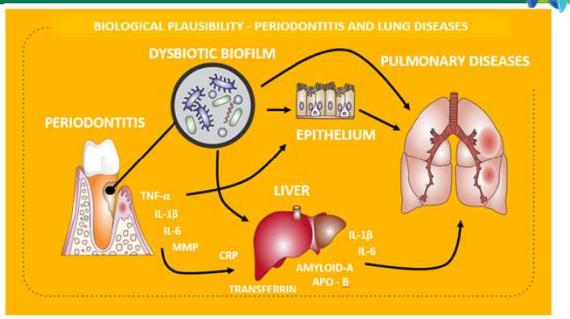


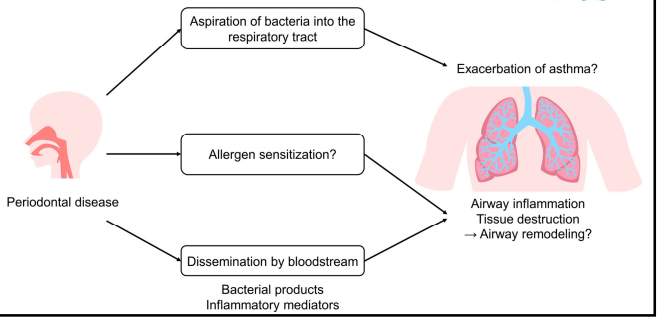
- Psychosocial stress activates **sympathetic nervous system**
- Preganglionic nerves of the thoracic segment of the spinal cord are activated, which synapse with postganglionic nervous in both submandibular and otic ganglions
- Consequently, neurotransmitter norepinephrine in salivary glands that started **salivary immune response** in Peyer's patches, aggregated lymphoid nodules, by activating unspecific lymphocyte B
- Along with signals elicited by specific proteins binding, then released as secretory component bound to dimeric IgA to yield **secretory IgA**
- s-IgA secreted into the mucus layer **prevents the direct adhesion to the epithelium of pathogenic agents**

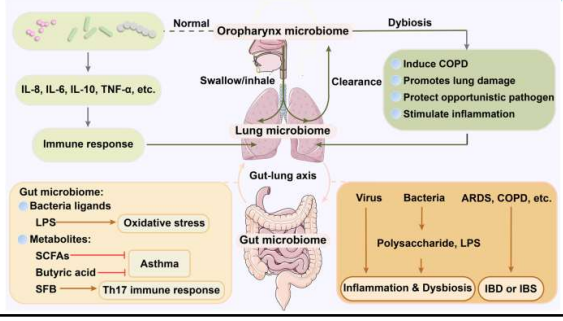
Águeda Castro-Quintas et al (2023)

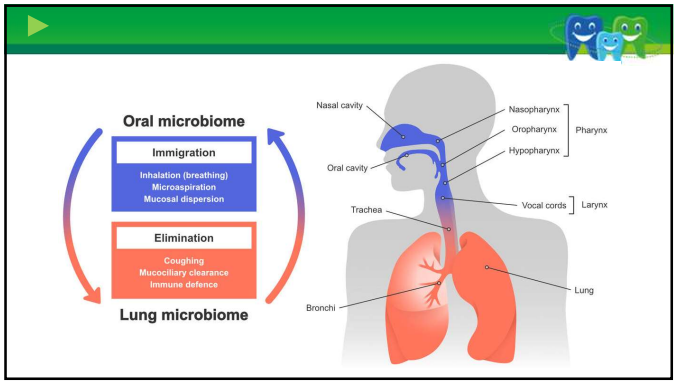


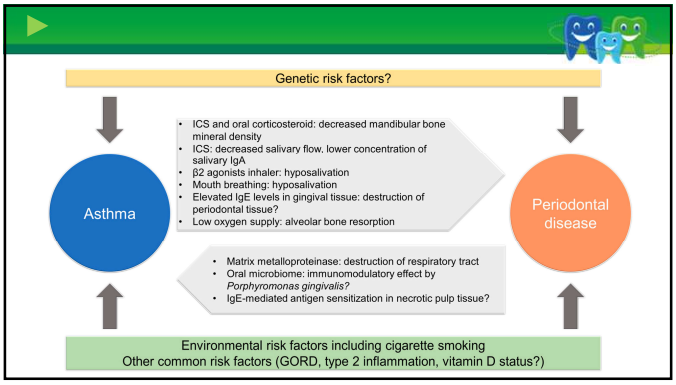


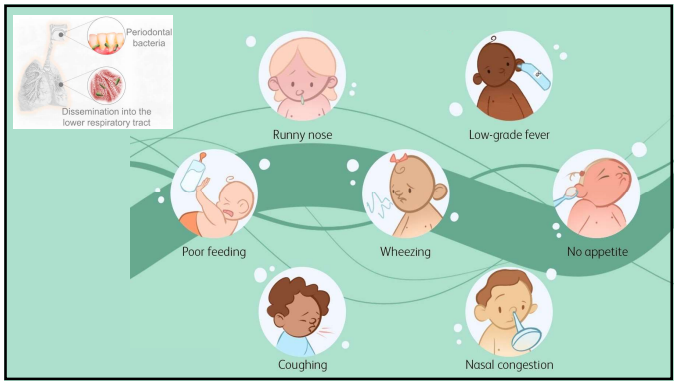


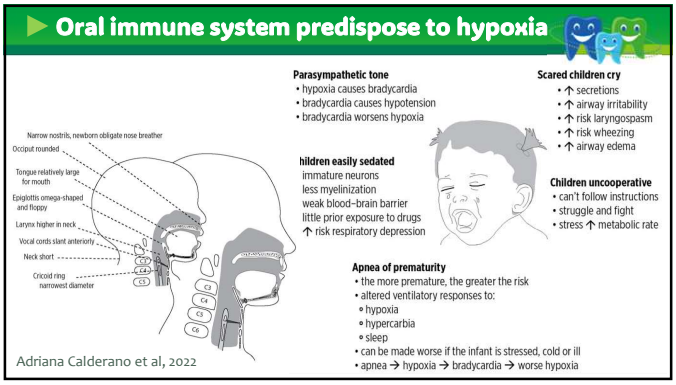




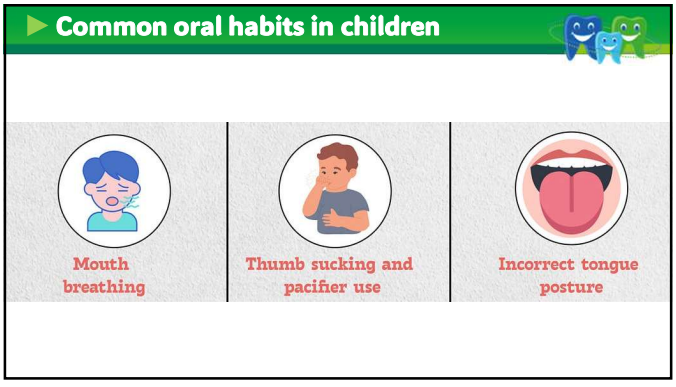

Oral microbiome
Immigration
Inhalation (breathing)
Microaspiration
Mucosal dispersion
Elimination
Coughing
Mucociliary clearance
Immune defence
Lung microbiome
Nasal cavity
Oral cavity
Trachea
Bronchi
Nasopharynx
Oropharynx
Hypopharynx
Pharynx
Vocal cords
Larynx
Lung


Genetic risk factors?
Asthma
ICS and oral corticosteroid: decreased mandibular bone mineral density
ICS: decreased salivary flow, lower concentration of salivary IgA
β2 agonists inhaler: hyposalivation
Mouth breathing: hyposalivation
Elevated IgE levels in gingival tissue: destruction of periodontal tissue?
Low oxygen supply: alveolar bone resorption
Periodontal disease
Matrix metalloproteinase: destruction of respiratory tract
Oral microbiome: immunomodulatory effect by Porphyromonas gingivalis?
IgE-mediated antigen sensitization in necrotic pulp tissue?
Environmental risk factors including cigarette smoking
Other common risk factors (GORD, type 2 inflammation, vitamin D status?)


Periodontal bacteria
Dissemination into the lower respiratory tract
Runny nose
Low-grade fever
Poor feeding
Wheezing
No appetite
Coughing
Nasal congestion


Oral immune system predispose to hypoxia
Parasympathetic tone
• hypoxia causes bradycardia
• bradycardia causes hypotension
• bradycardia worsens hypoxia
Scared children cry
• ↑ secretions
• ↑ airway irritability
• ↑ risk laryngospasm
• ↑ risk wheezing
• ↑ airway edema
hildren easily sedated
immature neurons
less myelinization
weak blood-brain barrier
little prior exposure to drugs
↑ risk respiratory depression
Children uncooperative
• can't follow instructions
• struggle and fight
• stress ↑ metabolic rate
Narrow nostrils, newborn obligate nose breather
Occiput rounded
Tongue relatively large for mouth
Epiglottis omega-shaped and floppy
Larynx higher in neck
Vocal cords slant anteriorly
Neck short
Cricoid ring narrowest diameter
Apnea of prematurity
• the more premature, the greater the risk
• altered ventilatory responses to:
hypoxia
hypercarbia
sleep
• can be made worse if the infant is stressed, cold or ill
• apnea → hypoxia → bradycardia → worse hypoxia
Adriana Calderano et al, 2022


Growth failure
Article published online: 2021-10-01
32 Review Article
THIEME OPEN ACCESS
Does Growth Stunting Correlate with Oral Health in Children?: A Systematic Review
Zayyana Jasmine Sadida[1] Ratna Indriyanti[2] Arlette Suzy Setiawan[2]
[1]Faculty of Dentistry, Universitas Padjadjaran, Jl. Sekeloa Selatan 1, Bandung, Indonesia
[2]Department of Pediatric Dentistry, Faculty of Dentistry, Universitas Padjadjaran, Jl. Sekeloa Selatan 1, Bandung, Indonesia
Address for correspondence Arlette Suzy Setiawan, Department of Pediatric Dentistry, Faculty of Dentistry, Universitas Padjadjaran, Jl. Sekeloa Selatan 1, Bandung 40132, Indonesia (e-mail: arlette.puspa@fkg.unpad.ac.id).
Eur J Dent 2022;16:32–40.
A high plaque index and a decrease in saliva composition in stunting children ⇨ showed a relationship between growth stunting and salivary flow rate and the incidence of dental caries

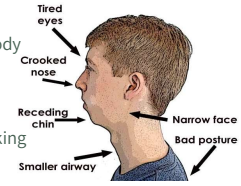

Common oral habits in children
Mouth breathing
Thumb sucking and pacifier use
Incorrect tongue posture

Mouth breathing due to nasal obstructions

- **Anatomic deformities**
  ① Deviated septum
  ② Turbinate hypertrophy
  ③ Concha bullosa
- **Atopy**
- **Nasal Mass or Polyp**
- **Enlarged Adenoids**
- **Vasomotor Rhinitis**

Common issues caused by mouth breathing

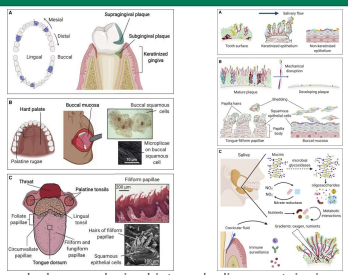
- **Improper Facial Development**
- **Bad Posture** ⇨ misalignment of neck—spine—body and muscle tension
- **Sleep Disordered Breathing** ⇨ restless sleep, restless leg syndrome, snoring, trouble falling or staying asleep, frequent night wakings, sleepwalking
- **Obstructive Sleep Apnea**
- **Teeth Grinding And Clenching**
- **ADHD and ADD** ≈ about 40% of kids who have **sleep disordered breathing issues** also develop ADHD, ADD, or a learning disability



Nose breating is better than mouth breathing

- Keeps child's face in a **natural position ⇨ optimal for proper development** of face structurally, functionally, and aesthetically
- Breathing through the nose means your child gets the **nitric acid** ≈ chemical that only produced in the nasal passage
- Nasal breathing takes in **more oxygen** vs mouth breathing ⇨ improves sleeping and brain activity ≈ especially important for rapidly-developing brains
- Nose breathing promotes **deeper breathing** ⇨ child who mouth breath are more prone to shallow breathing and **respiratory problems**
- Since 50% of what's in the mouth goes to the gut, mouth breathing can lead to **digestive issues**

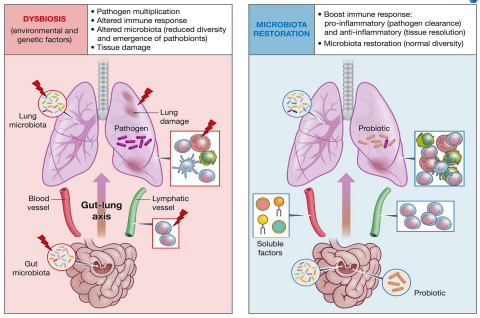
Oral habitat of mouth-breathing child

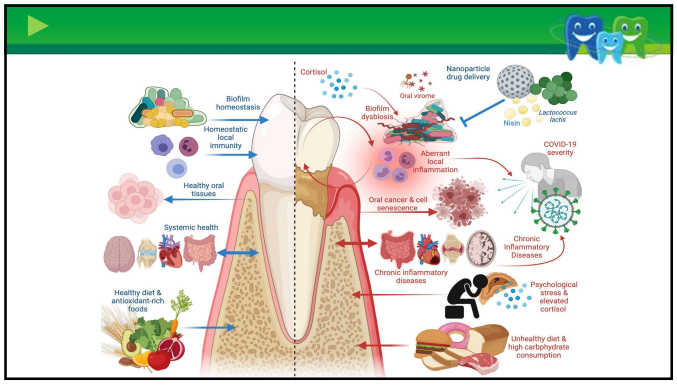


Alterations in oral–nasal–pharyngeal microbiota and salivary proteins in mouth-breathing children
⇨ micron-scale habitat and niche oral microbiome

Jessica L Mark Weich et al (2020), Cancan Fan et al (2021)

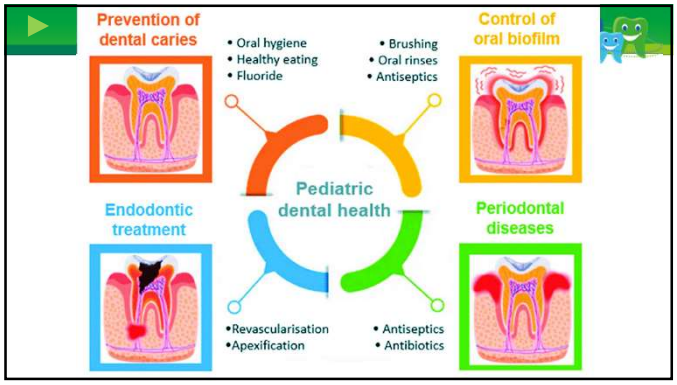
Possible microbiome restoration





Oral care regimen

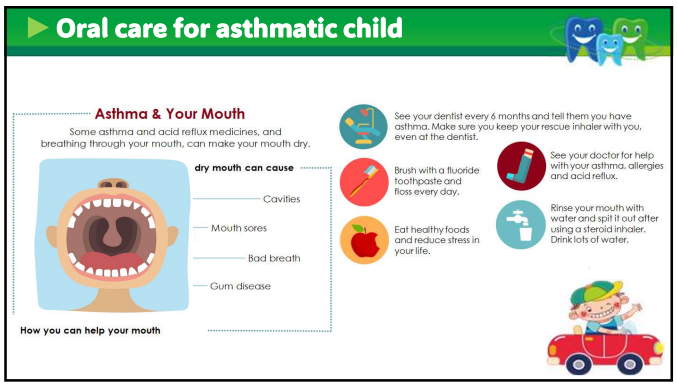
- **Breastfeeding** provides the best nutrition for babies
- From 6 months of age infants should be introduced to **drinking from a free-flow cup**
- From age 1 year feeding from a **bottle should be discouraged**
- Sugar should not be added to weaning foods or drinks
- Limit intake of **free sugar** and or any medication
- Eat a healthy diet high in of fruits and vegetables ⇨ **more fiber** means more saliva
- **Rinse mouth** with water after every meal

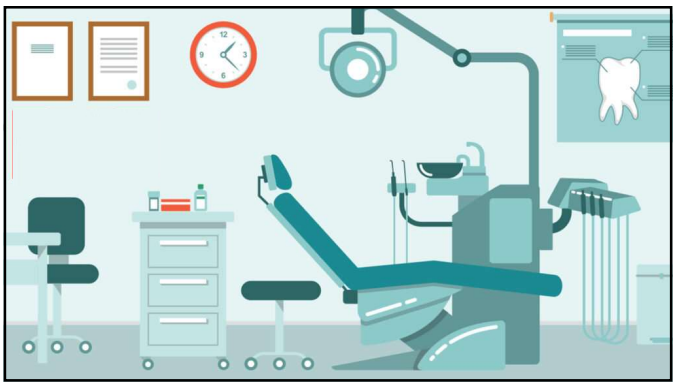


Oral care regimen

- **As soon as teeth erupt** in the mouth, brush them twice daily with fluoridated toothpaste – a flat smear of toothpaste up to 3 years of age, a pea-sized amount of toothpaste thereafter
- From 3 years onwards, at least **twice a day, brush** with a soft-bristle brush and toothpaste for a full two minutes ⇨ make sure to clean along gumlines and tongue ≈ to maintain fluoride concentration levels, spit out after brushing, do not rinse mouth
- Parents or carers should brush or **supervise toothbrushing** until the age of 7 years
- **Floss regularly** to remove plaque and leftover food
- On a regular basis, **visit the dentist** for a checkup and cleaning

Oral care for asthmatic child





Take home messages ☺

- **Dental caries, periodontitis and gingivitis, dental malocclusion, dental trauma, and some oral soft tissue lesions** are among the most common oral disorders in children ⇨ if these problems remain untreated, they can have **long-term effects on the orofacial system, chewing and speaking abilities, oral health-related quality of life, and overall health status** ⇨ **early diagnosis and management** of these conditions necessitate being aware of the clinical manifestations of each disease at every age.
- Implementing **preventive intervention, accurate diagnosis, proper treatment, and performing regular follow-ups** are among the key factors for eliminating harmful long-life consequences of poor oral and dental health status in children and adolescents.