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Periodontitis and Cognitive Decline

Impact of periodontitis on cognitive function

What is periodontal disease?

Periodontal disease, a common chronic oral condition, is characterised by inflammation and destruction of the structures that support our teeth and gums, due to infection by microbes

6th
most prevalent
non-communicable disease

Severe periodontitis affects about
750 million people
across the world

Signs and symptoms of periodontitis

Red, swollen, tender, and bleeding gums

Persistent foul taste and halitosis

Pain on chewing

Increasing spaces between teeth

Teeth that appear elongated

Loose or mobile teeth

If ignored, periodontal disease could lead to tooth loss as well

What is cognitive decline?

Cognitive decline, or dementia in less mild forms, is a loss or reduction of one or more cognitive abilities

50 million people worldwide live with dementia

This number is projected to increase to 152 million by 2050

Modifiable risk factors include less education, hypertension, hearing impairment, smoking, obesity, depression, physical inactivity, diabetes, infrequent social contact, excessive alcohol consumption, head injury, and air pollution

Despite a lack of clarity, evidence from certain studies suggests that patients with periodontal disease might be more prone to developing cognitive diseases such as Alzheimer's disease (AD), mild cognitive impairment, and dementia

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Emerging evidence suggests a link between periodontal disease and cognitive impairment or AD

AD, a neurological disorder, is the leading cause of cognitive impairment and dementia in elderly individuals

- People older than 65 are at a higher risk of developing AD
- Affects over 33.9 million people worldwide
- Sixth leading cause of death in the United States

- Patients with dementia show –
  - Higher incidence of periodontitis
  - Impaired physical condition and neglect of oral hygiene
  - Greater oral health related stressors
- Key periodontal pathogens found in the brains of patients with AD

- Periodontitis is associated with an increase in inflammatory mediators—serum CRP, IL-10, and CNF-α—which could lead to systemic diseases like AD
- Higher incidence of cognitive decline is observed in people with poor oral health
- Tooth loss is associated with dementia and earlier death, possibly due to loss of signalling from teeth to the brain and/or due to the changes in nutrition

Common risk factors of periodontitis and AD

Ageing

Obesity

Smoking

Chronic stress

Female hormonal fluctuations

Chronic kidney disease

Diabetes

Disease development in 40% of patients with high risk of dementia is avoidable through modification of common risk factors

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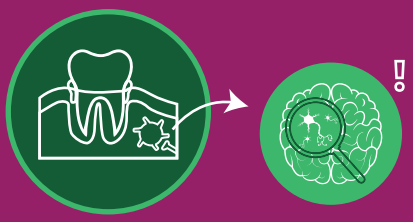
Mechanisms for the development of AD in patients with periodontitis

Porphyromonas gingivalis → Key player in pathogenesis of periodontitis

Chronic infection with *P. gingivalis* associated with the pathogenesis of AD is observed in patients with periodontitis

Exact mechanism of pathogenesis of AD is unclear, but a proposed mechanism in patients with periodontitis is presented here

Intravascular route



Oral pathogenic bacteria *(P. gingivalis)* enter alveolar capillaries

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Circulation to cerebral capillaries using monocytes as transportation vehicles

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Infected monocytes secrete adhesion molecules, facilitating entry of bacteria into neural tissue

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Low-grade chronic systemic inflammation in neural tissue

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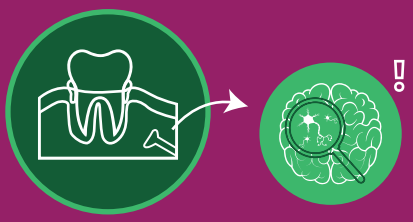
Increased permeability of the blood–brain–barrier, allowing bacteria to enter

Peripheral neural route



Bacteria from periodontal plaques enter the trigeminal nerve

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Trigeminal nerve fibres terminate in the intercranial ganglia, facilitating the survival of periodontal bacteria

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Ganglionic axons → potential route towards brain stem nuclei for bacterial invasion

Pathogen-induced amyloidogenesis → Cognitive decline

Periodontitis is a modifiable risk factor for the treatment and possible prevention of AD

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Management of periodontitis and oral health should be a priority for both dental practitioners and physicians

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Recommendations for managing periodontitis in patients who have mild cognitive decline or are at an elevated risk of developing it

Dental and medical professionals should co-operate to:

- **Increase:**
  - **Patient compliance**
  - **Effectiveness of care**
- **Educate patients with dementia, and their caregivers, about the link between poor dental health and increased risk for cognitive impairment**
- **Help identify patients at risk of cognitive decline**

Dental practitioners should:

- Provide information on lifestyle intervention plans, which can mitigate common risk factors of periodontitis and AD
- Conduct a dental evaluation using bleeding on probing, clinical attachment level, and X-ray assessment techniques
- Provide dental intervention plans depending on the severity of periodontitis and encourage routine dental check-ups
- Conduct scaling, subgingival debridement, root planning, or surgery, depending upon patient requirements
- Educate patients on the benefits of good oral hygiene

Medical practitioners should:

- Encourage regular dental check-ups
- Conduct, in elderly patients:
  - A thorough patient evaluation to assess cognitive abilities, social functioning, daily activities, and dental condition
  - A risk analysis to identify lifestyle habits that increase risk for both periodontitis and AD
- Do a quick screening of oral health during the follow-up for patients with dementia

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