

The Link between Oral Health and General Health

- what is the evidence –

OUR MOUTH IS THE DOORWAY TO OUR BODY

One of the ways bacteria, both harmful and harmless, enter our body is through our mouth: when we breathe; when we eat; or when we touch our mouth with our hands or other objects. The oral cavity has the second largest number of bacteria of any area of our bodies. The temperature inside our mouths, the neutral nature of our saliva, and the constant supply of nutrients from the food we eat provides the ideal environment for bacteria to thrive.

If we do not clean our teeth after eating and drinking, particularly after sugary food and drink, the bacteria in our mouth feed on the food particles and turn them into acids which can damage our teeth and gums. Over time, if left untreated, this leads to dental caries and gum disease.

Early dental caries and gum disease (gingivitis) can be prevented or successfully treated. If not treated however, it can develop into periodontitis and become much more serious. Periodontitis is a major disease and requires treatment. The inflammation of periodontitis has been linked to the development of other systemic diseases such as type 2 diabetes, cardiovascular disease, respiratory disease, neurological diseases such as dementia, and adverse pregnancy outcomes.



Most oral diseases can be prevented with a simple but effective daily oral hygiene routine – cleaning teeth twice daily for two minutes with a fluoride toothpaste if available. Severe oral diseases however are more difficult and costly to treat.

IMPACT OF ORAL DISEASES ON OTHER PARTS OF OUR BODY

If oral diseases such as periodontitis are left untreated, the chemicals from the local inflammation can spread through our blood stream to other parts of our body. This is called systemic inflammation which means inflammation affecting other body systems such as our pancreas, heart, lungs and brain.

Additionally, the multiplying harmful bacteria in our mouth can also spread through our blood stream to other parts of our body. This is called systemic bacteraemia which means excessive harmful bacteria in our body. Systemic inflammation and systemic bacteraemia can not only cause disease in other parts of our body, but can exacerbate (make worse) diseases which are already present.

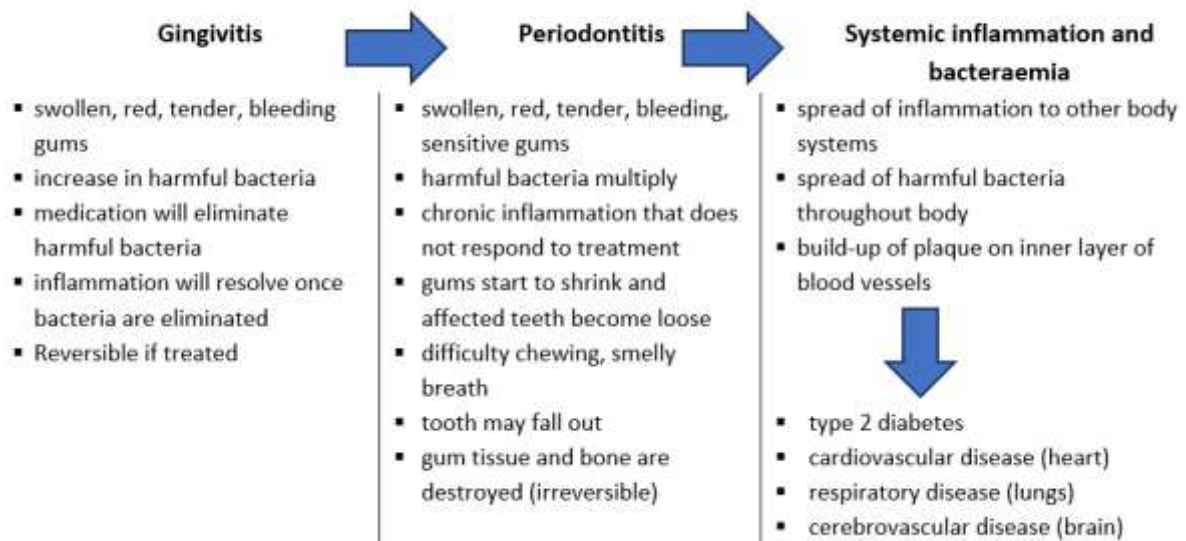
THE LINK BETWEEN ORAL DISEASES AND OTHER DISEASES

There has been a lot of research over many years which link oral diseases such as periodontitis with serious diseases such as diabetes, cardiovascular disease (heart), respiratory disease (lungs) and cerebrovascular disease (brain). The way that oral diseases such as periodontitis link to diseases in other parts of our body is shown in the diagram from King et al (2022) and on the following page.

The chemicals from local inflammation released when our body responds to local disease in our mouth, enter our blood stream and affect other body systems such as our pancreas, heart, lungs and brain. The multiplying harmful bacteria from local disease in our mouth also enter our blood stream and spread throughout our bodies. Some of the disease that are linked to periodontitis, such as diabetes, cardiovascular disease, respiratory diseases, cerebrovascular diseases, and gestational diabetes are briefly explained further below.

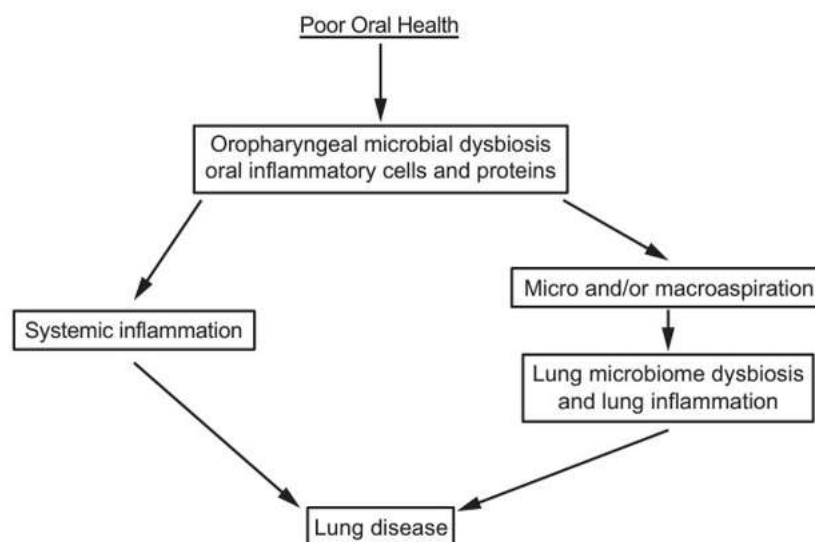
The underlying message is the role nurses and midwives can play in promoting oral health care to prevent the development of periodontitis and exacerbating other debilitating and preventable general health conditions.

HOW LOCAL DISEASE CAN SPREAD



King et al 2022 p.200

THE IMPACT OF ORAL HEALTH ON LUNG HEALTH



Gaeckle et al 2020

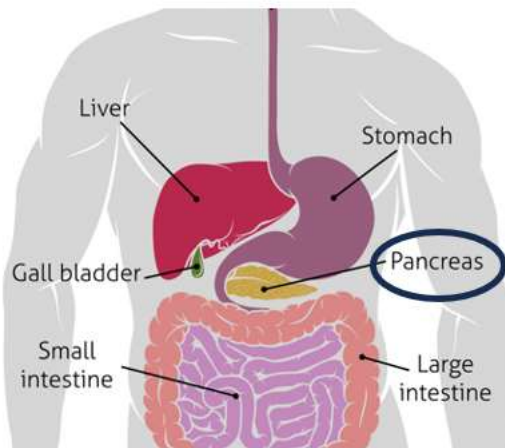
(a) Diabetes

Diabetes is a disease where the glucose (sugar) in our blood is too high. There are different types of diabetes:

- Type 1 diabetes is when your pancreas does not produce insulin, or not enough insulin, to break down the glucose (sugar) in your blood for use as energy.
- In type 2 diabetes, our body stops using the insulin produced by our pancreas properly, which can lead to high levels of blood sugar. Over time, type 2 diabetes can cause serious damage to our body, especially to nerves and blood vessels.

- When pregnant women develop high levels of glucose in their blood during their pregnancy it is called gestational diabetes.
- Pre-diabetes is when our blood sugar is higher than it should be, but not high enough for a diagnosis of type 2 diabetes.

Our pancreas has two roles: it produces enzymes which help to digest our food, particularly protein; and it produces the hormone insulin which helps to control blood sugar.



Research has demonstrated from many studies that if inflammation and bacteria from oral diseases spread throughout our bodies, we are more likely to develop type 2 diabetes than someone who does not have inflammation and bacteria spread from oral diseases. Research has also shown that people with periodontitis are more likely to have type 2 diabetes, and also that people with type 2 diabetes are more likely to have periodontitis.

Type 2 diabetes is a chronic illness that can have very serious consequences such as problems with vision (retinopathy); reduced blood supply to our feet which can lead to amputation if not treated; heart attack and stroke; problems with our kidneys (nephropathy); nerve damage (neuropathy); and mental health issues.

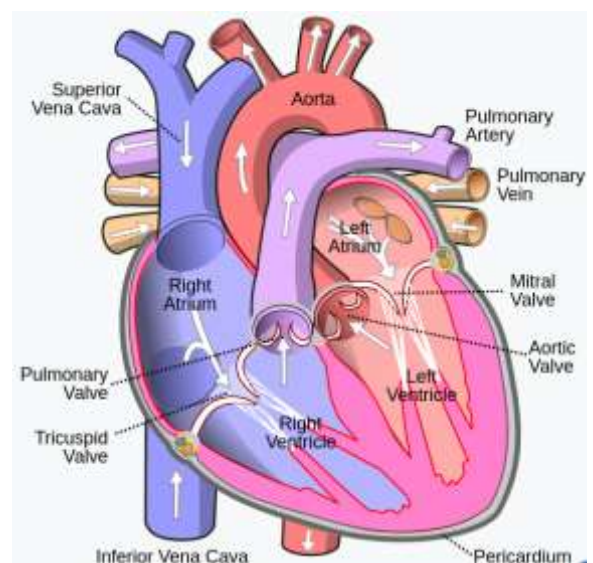
(b) Cerebrovascular diseases

Recent research studies have linked the oral disease periodontitis to the development of dementia and Alzheimer's disease. The studies found that older people with periodontitis were more likely to develop dementia and Alzheimer's disease than those people who did not have periodontitis.

The studies also found that older people with dementia and Alzheimer's disease were more likely to have periodontitis than older people who did not have either disease. The way that periodontitis is thought to be linked to the development of dementia and Alzheimer's disease is through systemic inflammation and systemic bacteraemia. Older people, particularly those in institutions and those with dementia, have a very high incidence of oral hygiene neglect.

(c) Cardiovascular diseases

The systemic inflammation and systemic bacteraemia from severe gum disease (periodontitis) can affect the valves in our heart which regulate the flow of blood between the upper chambers in our heart (atrium) and the lower chambers (ventricles). When the valves of our heart are not healthy, blood flow from our hearts to our lungs and to the rest of our bodies is affected. Systemic inflammation and systemic bacteraemia from severe gum disease can also cause plaque to build up on the inside walls of our blood vessels reducing blood flow through the blood vessels which can cause a blockage in the blood vessels.

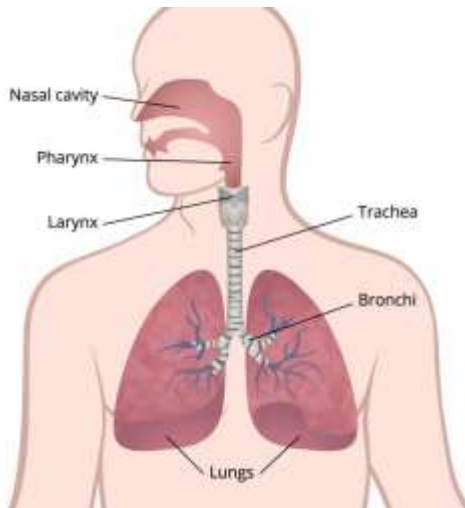


(d) Oral cancer

Poor oral hygiene, a high sugar intake, all forms of tobacco use, and harmful intake of alcohol are all risk factors for oral cancer as they can lead to the development of local inflammation and high levels of bacteria in our mouth. In many countries, there are not many oral health professionals or oral health services so access is difficult and costly. Oral cancers have a high morbidity and mortality. Death rates for men are more than double those for women, linked to the higher rates of tobacco use among men. A healthy daily oral hygiene routine, having a dental or health professional check inside your mouth for any sign of disease is also important, as well as eliminating or reducing risk factors such as a high sugar intake, all forms of tobacco use, and harmful intake of alcohol.

(e) Respiratory diseases

Research studies have linked severe gum disease with lung diseases such as pneumonia. You can see from this picture that the air we breathe through our nose and mouth can travel directly to our lungs. Bacteria from infections in our nose or mouth can cause infection in our lungs. Our lungs can also be affected by local inflammation and local bacteria travelling through our blood stream and affecting other parts of our body, including our lungs. The diagram by Gaeckl et al (2020) on the preceding page shows how systemic inflammation can directly affect our lungs but lungs can also be affected by micro and macro aspiration of bacteria through our nose and mouth (Gaeckle et al 2020).



(f) Pregnancy

Oral health is particularly important during pregnancy. Pregnant women should be encouraged to adopt a daily oral hygiene routine. This protects them from developing oral diseases such as gingivitis or periodontitis. For women planning a pregnancy, a dental checkup before conception or very early in the pregnancy is recommended. Any dental issues can then be dealt with before they become more serious. During pregnancy, changes in hormone levels can make gums more sensitive to the bacteria in the mouth, making it easier for gums to become inflamed and infected. Gingivitis if left untreated can quickly develop into periodontitis which is associated with adverse pregnancy outcomes such as preeclampsia, preterm birth, and gestational diabetes, as well as poor outcomes for the neonate.

Research has found that:

- Pregnant women with periodontal disease are at increased risk of developing preeclampsia and delivering a preterm and/or a low birthweight baby.
- Treatment of periodontitis has a 'reducing impact' on adverse pregnancy outcomes.
- The association between adverse pregnancy outcomes and periodontitis was due to the transport of biofilm bacteria into the bloodstream and subsequently the placental tissue and that the most frequent consequences of periodontitis in pregnant women were preterm birth, low birthweight, preeclampsia, and perinatal mortality.
- Periodontitis is associated with a statistically significant increased risk for gestational diabetes mellitus (GDM) compared with women without periodontitis.
- Bacteria in the mouths of pregnant women with GDM is unique from that of healthy pregnant women with the majority of the alterations found pointing to a pro-inflammatory environment with high levels of bacteria associated with periodontitis.

IMPACTS OF ORAL DISEASE

Untreated oral disease can result in social and mental consequences also. Dental caries, gingivitis, periodontitis and tooth loss can be unsightly which impacts on self-confidence and self-esteem, often leading to reduced social interaction, isolation or even stigmatization. Severe untreated oral diseases can have a negative impact on school attendance; educational achievements; employment opportunities; and reduced productivity at work.

There are many reasons to keep our mouths healthy: our teeth can last us all our lives if we look after them; having all our teeth helps to maintain the shape of our face; we can eat and chew our food comfortably; we can talk comfortably; we can smile and laugh confidently; we do not have smelly breath; we do not have pain or discomfort that disturbs our sleep; we do not lose time at school or work because of toothache; disease in our mouth will not cause disease elsewhere in our bodies; and a healthy mouth costs less money to look after than an unhealthy one.

REFERENCES

DIABETES

KING S et al 2022 *Oral health and cardiometabolic disease: understanding the relationship* Internal Medicine Journal 52:198-205 available from <https://onlinelibrary.wiley.com/doi/epdf/10.1111/ijmj.15685>

LARVIN H et al 2021 *Risk of incident cardiovascular disease in people with periodontal disease: a systematic review and meta-analysis* Clin Exp Dent Res 7:109–22 available from <https://onlinelibrary.wiley.com/doi/epdf/10.1002/ce2.336>

STOHR J et al 2021 *Bidirectional association between periodontal disease and diabetes mellitus: a systematic review and meta-analysis of cohort studies* available from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8249442/>

CARDIOVASCULAR DISEASES

SANZ M et al 2020 *Periodontitis and cardiovascular diseases: consensus report*. J Clin Periodontol 47:268–88 available from <https://onlinelibrary.wiley.com/doi/epdf/10.1111/jcpe.13189>

SEITZ M et al 2019 *Current knowledge on correlations between highly prevalent dental conditions and chronic conditions: an umbrella review* available from https://www.cdc.gov/pccd/issues/2019/18_0641.htm

RESPIRATORY DISEASES

GAECKLE N et al 2020 *The Oral-Lung Axis: the impact of oral health on lung health* Respiratory Care Vol.65 No.8 available from <https://rc.rcjournal.com/content/65/8/1211.short>

MANGER D et al 2017 *Evidence summary: the relationship between oral health and pulmonary disease* British Dental Journal Vol.222 No.7 p.527-533 available from <https://www.nature.com/articles/sj.bdj.2017.315>

CEREBROVASCULAR DISEASES

LOUGHMAN A et al 2023 *Unlocking modifiable risk factors for Alzheimer's Disease: does the oral microbiome hold some of the keys*. Journal of Alzheimer's Disease 92(4):1111-1129 available from <https://pubmed.ncbi.nlm.nih.gov/36872775/>

ZHANG L et al 2023 *Tooth loss and the risk of cognitive decline and dementia: a meta-analysis of cohort studies* Clin Exp Dent Res 7:109–22 available from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10150074>

BEYDOUN M et al. 2020 *Clinical and bacterial markers of periodontitis and their association with incident all-cause and Alzheimer's disease dementia in a large national survey*. Journal of Alzheimer's Disease 75(1)

<https://pubmed.ncbi.nlm.nih.gov/32280099/>
SADRAMELI M 2020 *Linking mechanisms of periodontitis to Alzheimer's Disease*. Current Opinion in Neurology 33(2):230-238
<https://pubmed.ncbi.nlm.nih.gov/32097126/>

PREGNANCY

DAALDEROP L et al 2018 *Periodontal disease and pregnancy outcomes: Overview of Systematic Reviews* available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6191679/>

ALNASSER B et al 2023 *The potential association between periodontal diseases and adverse pregnancy outcomes in pregnant women: a systematic review of randomized clinical trials*. Cereus 15(1) available from:

<https://pubmed.ncbi.nlm.nih.gov/36733569/>

BUTERA A et al 2023 *Periodontitis in pregnant women: a possible link to adverse pregnancy outcomes*. Healthcare 11(10) p.1372

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10218064/>

ABARIGA S et al 2016 *Periodontitis and gestational diabetes mellitus: a systematic review and meta-analysis of observational studies*

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5101727/>

BENDEK M et al 2021 *Periodontitis and gestational diabetes mellitus: a potential inflammatory vicious cycle* Int J Mol Sc 22:11831

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8584134/>

BUNPENG N et al 2022 *Association between gestational diabetes mellitus and periodontitis via the effect of reactive oxygen species in peripheral blood cells* Journal of Periodontology 93(5) p.758-769 available from

<https://aap.onlinelibrary.wiley.com/doi/abs/10.1002/JPER.21-0455>

ESTÉVEZ-LLORENS R et al 2023 *Periodontal status and gestational diabetes mellitus: a case control study*

Journal of Dentistry and Oral Disorders
<https://austinpublishinggroup.com/dental-disorders/fulltext/jdod-v9-id1177.pdf>

CORREA J et al 2023 *The oral microbiota and gestational diabetes mellitus* Frontiers in Clinical Diabetes and Health Care 4

<https://www.frontiersin.org/articles/10.3389/fcdh.c.2023.1120920/full>