

The Impact of Oral Health on Systemic Health: Current Challenges and Future Prospective

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ABSTRACT:

Oral pathology is a broad topic, but this article will focus on the oral conditions that have an established or accepted relationship with systemic health: caries and the periodontal disease-gingivitis and periodontitis. Dental caries is probably the most common infectious disease across humanity. Primary anticipation of disease is the best move toward but often difficult to achieve. From a primary care point of view, it is vital that physicians and dentists augment collaboration and share in sequence that can impact the patient's health. Optimization of patients' physical condition is the aim of both the medical and dental professions.

Key Words: Oral Health, Systemic Health, Dental.

Introduction:

The oral cavity has been described as "the casement to general health (Alpert, 2017)." According to Seymour, statements such as "You cannot have good general health without good oral health" and "The mouth is part of the body" are now considered obvious (Seymour, 2007). The oral cavity is also the junction of dentistry and medicine, semi-independent professions that share the same common goal of civilizing the health and quality of life of patients. At the heart of each profession is the basic concept that appropriate interventions within the structure of that discipline will have an overall positive impact on patients' health, welfare, and quality of life (Reissmann *et al.*, 2013).

It has been estimated that more than 100 systemic diseases and upward of 500 medications have oral manifestations, which are typically more prevalent in the older inhabitants.

Access to dental and medical care is a complex issue; availability of care, cost of care and insurance, cultural issues, and fear are all factors that remain patients out of the office. From a population health viewpoint, it should not matter who at first examines the patient and identifies a risk factor or early evidence of a disease; what matters is that the patient gets the care he or she wants (Reissmann *et al.*, 2013).

Oral cavity:

The mouth and oral cavity are focal points for the communication of the body with the external surroundings. Speech, chewing, swallowing, and the early stages of digestion are all vital physiological functions that engage the oral cavity, and the mouth plays a role in psychological identity (Jin *et al.*, 2016). There are multiple surface types in the oral cavity, and each is colonized with an exclusive population of 500-700 species of bacteria, viruses, fungi, and

protozoa, a good number of which are considerably virulent and many of which have not been cultivated. The level of oral hygiene significantly impacts the makeup of the oral microbiome. Persons with good oral hygiene tend to have a simple flora dominated by gram-positive cocci and rods and some gram-negative cocci, while those with poor oral hygiene have a shift to a more diverse and complex flora dominated by anaerobic gram-negative organisms (Scannapieco, 2009). The oral cavity is also bathed in a complex mixture of fluids, collected primarily of saliva and gingival crevicular fluid, that plays a major role in maintaining a healthy oral environment. Saliva, like many other bodily functions, has an optimal range; underproduction (xerostomia), overproduction (sialorrhea), and alterations in chemical makeup can lead to bidirectional impacts on health. Bacteria and saliva play a direct role in the development of the dental biofilm, which is commonly referred to as *plaque* in the lay community. Currently, there is a better understanding that not all plaque is bad and that the interrelationship between saliva and bacteria can protect the teeth by helping uphold mineralization and reducing exposure to dietary acid (Kaidonis & Townsend, 2016). The initial bacteria attach to salivary molecules that are absorbed on the tooth surface. The bacteria reproduce and lay down a polymer matrix that serves as the framework for more bacteria to attach themselves. A commensal microflora of streptococcal species characterizes the biofilm associated with healthy teeth and gingiva. These organisms prove to be beneficial by meddlesome with the colonization of more pathologic species. However, a disruption in the oral ecosystem (*dysbiosis*) can lead to the predominance of carbohydrate-fermenting gram-positive species, which leads to tooth demineralization, thereby beginning the procedure of oral pathosis (Larsen & Fiehn, 2017).

Oral pathology:

Oral pathology is a broad topic, but this article will focus on the oral conditions that have an

established or accepted relationship with systemic health: caries and the periodontal diseases – gingivitis and periodontitis. Dental caries is probably the most common infectious disease across humanity. The commonness varies across different populations, as public water fluoridation programs have greatly impacted the disease in those areas where it is available, but caries still occurs in epidemic proportions in disadvantaged areas (Scannapieco, 2013). Caries is a polymicrobial disease that results from the demineralization of dental enamel by lactic acid that is created when cariogenic bacteria in the biofilm digest dietary fermentable carbohydrates. Periodontal diseases are a group of chronic immuneinflammatory diseases caused by the bacteria in the biofilm and primarily in tooth supporting structures. Gingivitis and periodontitis are two forms of periodontal disease that continue living on a spectrum ranging from bleeding, erythematous, and inflamed gingival tissue to the loss of alveolar bone. Gingivitis, the milder form of periodontal disease, is characterized by local erythema, swelling, and easy bleeding. Gingivitis is usually pain free; as a result, patients can go years without diagnosis of the disease, but it is easily treatable once identified (Pihlstrom *et al.*, 2005). Periodontitis, the hammering of connective tissue and bone, is the result of chronic inflammation caused by the importunate presence of pathologic bacteria in the biofilm (Pihlstrom *et al.*, 2005). The bacteria mount up in pockets and pull the gingiva away from the teeth. This process triggers the body's immune rejoinder, which leads to damage to the supporting structures. Periodontitis is a leading cause of tooth loss around the world (Pihlstrom *et al.*, 2005).

Systemic conditions impacted by oral health:

The benefits of good oral health are well studied and include economic, social, psychological, and physical health. Garcia *et al.*, reported that the greater the number of missing teeth, the poorer the excellence of life (Garcia *et al.*, 2000). Poor dentition also leads to issues with chewing and

can negatively collision nutritional intake. These relationships are obvious, but the significant impact and relationship of oral and serious systemic conditions are areas that call for increased association.

Among the systemic conditions that are impacted, either coincidentally or causally, by oral conditions are atherosclerotic disease, pulmonary disease, diabetes, pregnancy, birth weight, osteoporosis, and kidney disease.

Atherosclerotic disease:

Atherosclerosis, the pathologic tapering of arteries due to the deposition of cholesterol and cholesterol products in vessel walls, is the primary cause of most cases of coronary heart disease and cerebrovascular disease. Studies done many years ago have shown that patients with a time gone by of myocardial infarction or cerebrovascular attacks have worse oral health than control individuals (Tabeta *et al.*, 2014). Annually, cardiovascular disease accounts for approximately 32%-50% of deaths in the United States and 29%-31% worldwide and may be one of the best studied associations between oral health and systemic health (Kao *et al.*, 2008). Elevated blood cholesterol, hypertension, diabetes, and smoking are the traditionally discussed risk factors for cardiovascular disease. Growing bodies of evidence indicate that chronic inflammation, metastatic infection, and vascular injury from endotoxins are promising oral cavity-based etiologies of cardiovascular diseases (Joshipura *et al.*, 1996).

Pulmonary disease:

Pulmonary diseases such as pneumonia, chronic obstructive pulmonary diseases (including emphysema), and exacerbations of chronic bronchitis all engage the aspiration of bacteria from the oropharynx into the lower respiratory tract. At one time, it was thought that only patients with endotracheal and orogastric tubes, swallowing disorders, and impaired awareness were at risk of aspiration. However, studies have shown that up to 50% of healthy persons aspirate oropharyngeal contents while asleep

(Garcia *et al.*, 2000). The teeth, periodontium, and biofilm all can anchorage and serve as reservoirs for pathologic bacteria, and the presence of periodontal disease changes the milieu, making it easier for pathogens to attach and multiply (Kao *et al.*, 2008). The development of an infection is multifactorial and depends on more than just the presence of bacteria, as the body has multiple echelons of defense to put off bacteria from seeding the lower respiratory tract. These defenses are limited in patients who are critically ill and intubated, and multiple interference studies have shown that improving the oral hygiene of ventilated critical care patients decreases the risk of ventilator-associated pneumonia (Garcia *et al.*, 2000; Scannapieco, 2005). The confirmation on the causality and relationship between pulmonary infections and oral health is inconclusive but trending toward a positive unidirectional relationship.

Diabetes mellitus:

Diabetes is a disease of disrupted glycemic control resulting from a lack of insulin production (type 1) or systemic insulin resistance (type 2). In 2008, it was predictable that 18 million people worldwide had diabetes.20 Diabetes presents numerous challenges to the patient, and prolonged exposure to hyperglycemia is the primary cause of the litany of complications created by diabetes. Long-drawn-out hyperglycemia has negative effects on the heart, eyes, kidneys, and peripheral nerves, and researchers now suggest that periodontal disease should be well thought-out a major complication of diabetes (Lamster *et al.*, 2008)

The association between diabetes and periodontitis is truly bidirectional, as it is well proven that hyperglycemia negatively impacts oral health and severe periodontitis can negatively impact glycemic control (Garton & Ford, 2012). Those with diabetes have at least a 3 times greater risk of periodontitis than those without diabetes (Alpert, 2017; Pihlstrom *et al.*, 2005). However, studies have shown that

patients with well-controlled diabetes have no greater than before risk of periodontitis compared to individuals without diabetes. Gingival pockets that are deeper than 4 mm are more common in diabetics than non diabetics, and patients with pockets greater than 2 mm deep are at an increased risk of diabetes compared to patients with pockets less than 1.3 mm deep. Individuals with diabetes also suffer from superior amounts of alveolar bone loss, abscess formation, and poor healing (Scannapieco, 2005).

Pregnancy complications and low birth weight:

Pregnancy is a time of great change in a woman's body, and the changes impact both the oral cavity and the maternal-fetal complex. Gastric acid secretion and the reflux of the acid into the oral cavity leads to worsening of enamel erosion, increased caries risk, xerostomia, and increased tooth mobility and loss (Kim *et al.*, 2007). Although pregnancy is a normal condition, non-obstetric providers are often uncertain to care for pregnant patients out of apprehension for the potential impact on the pregnancy. It is predictable that between 22% and 34% of pregnant women will consult a dentist while pregnant, and only 50% of women would address an oral issue while pregnant (Silk *et al.*, 2008). In spite of the fact that there is some good evidence that oral conditions can negatively impact pregnancy (increasing the incidence of preeclampsia, low birth weight, stillbirth, and spontaneous abortions), there are no strategy for the managing of oral condition in pregnant women (Silk *et al.*, 2008; Vamos *et al.*, 2015). To restore confidence of patients and providers, it might be time for professional societies to join forces and create some guidelines for addressing conditions that are known to impact the mother and her unborn fetus. The changes in the gingiva that occur throughout pregnancy are associated with the changes in estrogen and progesterone levels.

These hormonal changes are most theatrical between the second and eighth months of

pregnancy, and the gingival changes agree with this period. The hormones cause capillary dilation that result in gingival hypertrophy and inflammation. Subsequent to the changes in the gingiva, there is a change in the oral flora, including an increase in the amount of anaerobic bacteria. These anaerobes kick off an inflammatory process that has systemic impacts (Garcia *et al.*, 2000). This outlying oral infection triggers an inflammatory process similar to bacterial vaginitis, resulting in myometrial contractions and preterm birth.5 Preterm, low-birth-weight infants are probably the best studied obstetric complication of periodontal disease; the attendance of periodontal disease in the mother results in a 7.5 times greater risk of this complication (Scannapieco, 2005).

Other conditions:

In osteoporosis, an inequity between bone loss and formation results in decreased bone mineral density. Decreased bone density in the jawbone leads to greater alveolar bone resorption, increasing the depth and number of gingival pockets, which in turn allows invasion by periodontal pathogens (Amar & Han, 2003; Kuo *et al.*, 2008). This chronic infection leads to local and systemic increases in interleukin 6, which is a known predictor of bone loss. As with many of the circumstances already discussed, it is impossible to state that periodontal disease is causal to osteoporosis, but the studies seem to lean toward a positive association between the conditions. At present there is no strong evidence to suggest that treating periodontal disease will have a collision on osteoporosis (Amar & Han, 2003; Kuo *et al.*, 2008).

UPTO THIS OH PAPER:

Our mouths are full of bacteria. Germs in the mouth (bacteria) use the sugar in food to make acids. Over time, the acids can attack the tooth, creating decomposes leading to a cavity. These bacteria, along with mucus and other particles, continually form a sticky, colorless film called "plaque" on teeth. Brushing and flossing help get rid of plaque. Plaque that is not removed can

solidify and form “tartar” that brushing doesn’t clean. Only professional cleaning by a dental health professional can take away tartar (Slade *et al.*, 2007).

Untreated gum disease can go forward to “periodontitis” (which means “inflammation around the tooth”). In periodontitis, gums pull away from the teeth and form places (called “pockets”) that become infected. The body’s immune system fights the bacteria as the infection spreads and grows below the gum line. Bacterial toxins and the body’s natural response to infection start to break down the bone and connective tissue that hold teeth in place. If not treated, the bones, gums, and tissue that hold up the teeth are destroyed. Otherwise functional teeth may eventually become loose and have to be removed. Overall, 70% of tooth loss is due to tooth decay, 20% due to periodontal diseases and 10% due to other causes (Brown *et al.*, 1989; National Health Strategy, 1992). Periodontal disease is one of the most widespread diseases and if untreated becomes a serious and destructive chronic infection.

The *World Oral Health Report* (2003) stated clearly that the association between oral health and general health is proven by evidence. Since that report, new evidence has emerged further intensification the case. Oral health and general health are related in four major ways:

1. Poor oral health is associated with major chronic diseases
2. Poor oral health causes disability
3. Oral health issues and major diseases share common risk factors
4. General health problems may cause or worsen oral health conditions.

Obesity:

Obesity is a jeopardy factor for hypertension, blood fat abnormalities, heart disease and stroke, and there is now confirmation that obesity is also associated with periodontitis (Pischon *et al.*, 2007). High waist circumference

was shown to be related with periodontitis in young adults aged 18–34 years, but not in older adults (Al-Zahrani *et al.*, 2003). Saito *et al.* have shown an association between upper body obesity and periodontal disease in adults (Saito *et al.*, 2001).

Flabby children in public and private schools in the US have also been shown to be more likely to have dental decay than non-obese children (Tripathi *et al.*, 2010). While some studies of the relationship with decay are conflicting, it has been recently found that areas of decay between teeth were more frequently diagnosed in teenagers of 15 years who were overweight compared to normal-weight individuals (Alm *et al.*, 2008). A recent study has shown that childhood obesity is coupled with reduced flow rate of saliva and dental decay (Mod  r *et al.*, 2010).

Respiratory diseases:

Not only cardiovascular diseases and diabetes, but also cancer and respiratory (lung) disease are major causes of death in developed countries. This study examined the friendship between oral health and deaths from cardiovascular diseases, cancer, and respiratory problems among older Japanese. Self-administered questionnaires were mailed to participants in the Aichi Gerontological Evaluation Study (AGES) Project in 2003. Several years later, deaths were analysed for 4,425 respondents. Three categories of oral health were used: 20 or more teeth; 19 or fewer teeth and eat everything; 19 or fewer teeth and eating difficulty. Sex, age, body mass index (BMI), self-rated health, present illness, exercise, smoking, alcohol, education, and income were taken into account.

During 4.28 years’ follow-up, 410 people had died; 159 from cancer, 108 from cardiovascular diseases, and 58 from respiratory disease. Statistical models of risk showed that, compared with the respondents with 20 or more teeth, respondents with 19 or fewer teeth and with eating difficulty had a 1.83 and 1.85 times higher hazard ratio for deaths from cardiovascular

disease and respiratory disease, respectively. There was no significant association with cancer deaths. This study showed that oral health predicted cardiovascular and respiratory disease deaths but not cancer deaths in older Japanese.

A 2006 systematic review looked at the association between respiratory diseases and oral health (Azarpazhooh & Leake, 2006).

Stroke:

Cerebrovascular ischemic strokes are the commonest kind of stroke and occur as a result of an obstruction, usually a clot, within a blood vessel supplying blood to the brain. The underlying condition is the development of fatty deposits lining the vessel walls, causing hardening of the arteries. After heart disease, stroke is the next most important consequence of hardening of the arteries. Stroke remains the third leading cause of death (after heart disease and cancer) in most urban countries.

Studies have found that poor dental health is associated with stroke. Beck and colleagues (1996)²⁷ did not divide hemorrhagic (bleeding) stroke from ischemic stroke (clot) but observed a very strong relationship of periodontal disease with the occurrence of stroke among US veterans (RR 2.8, CI 1.45-5.48). The veterans are known to have higher disease experience of stroke, but combining both causes of stroke power have underestimated the true impact of periodontal diseases (Meurman *et al.*, 2004).

Kidney diseases:

Changes in the mouth, such as periodontal disease and other cryptogram of poor oral health, are common in patients with chronic kidney disease and may make a payment to increased health complications and death charge because of consequences such as inflammation, infections, protein-energy wasting, and complications from hardening of the arteries. Poor oral health in CKD patients may thus characterize an important, but often unnoticed, problem. The penalty of poor oral health may be more severe in CKD patients because of

advanced age, common existing additional diseases such as diabetes, concurrent medications, and a state of abridged immune function that may increase the risk for consequences of periodontitis and other oral and dental conditions. Poor situation of teeth and other signs of poor oral health should be an 'alarm clock' also at early stages of CKD. However, it remnants to be determined whether and how more successful management of poor oral health and periodontitis will diminish the risk complications in CKD patients (Akar *et al.*, 2011).

Peripheral vascular disease:

Hardening of the arteries, for example in the legs, called peripheral vascular disease (PVD), may result in abridged blood flow. Meurman *et al.*, 2004, in a recent review, have concluded that periodontal disease appears to increase the risk of PVD. However, this declaration needs to be confirmed by further studies.

Dementia:

Tooth loss from any cause has been reported to be associated with Alzheimer's disease and dementia (Gatz *et al.*, 2006; Stein *et al.*, 2007). A new revision included more than 4,000 Japanese participants, aged 65 and older, who underwent a dental examination and a psychiatric appraisal. Compared with participants who still had many of their natural teeth, those with fewer or no teeth were much more likely to have experienced some memory loss or have early-stage Alzheimer's disease. Impaired deferred memory and calculation has been shown to be associated with periodontal disease as shown by blood tests (Noble *et al.*, 2009).

Aspiration pneumonia:

An association has been suggested between poor oral health and aspiration pneumonia (inhaling bacteria that cause lung infection) in the middle of elderly people. Risk factors include troubles with swallowing, needing help with feeding, and the infective contribution of poor oral hygiene

and dental decay (Gomes-Filho *et al.*, 2009; Chalmers, 2001).

Oral cancers:

Studies point to that periodontal disease and use of daily mouthwash containing alcohol may be independent causes of cancers of the head, neck, and oesophagus (Guha *et al.*, 2007).

Possible explanations for relations with chronic disease Scientists are at present exploring several mechanisms that may attach and explain why periodontal diseases are related to chronic circumstances discussed above (Beck *et al.*, 1996). Studies propose that in people with periodontal disease, chewing and tooth-brushing may discharge harmful bacteria into the bloodstream. This may reason problems elsewhere in the body. For example, a number of kinds of bacteria that cause periodontal disease have been found in patients' hardened arteries in the heart and elsewhere, and in the fluid adjacent the unborn baby (amniotic fluid). Oral bacteria could also harm blood vessels or cause blood clots by releasing toxins that seem like proteins found in artery walls or the bloodstream. The immune system's response to these toxins could harm vessel walls or make blood clot more easily. It is also likely that inflammation in the mouth "revs up" inflammation throughout the body, counting in the arteries, where it can lead to heart attack and stroke (Spahr *et al.*, 2006).

CONCLUSION:

Optimization of patients' physical condition is the aim of both the medical and dental professions. Atherosclerotic vascular disease, pulmonary disease, diabetes, and pregnancy-related complications are the major situation that have an effect on a large percentage of the inhabitants and have been well studied for their association to oral health, but it is probably safe to take for granted that there are other circumstances that have some degree of friendship. Although a lot of of the studies on behavior of oral disease have not shown a statistically important impact on these systemic

conditions, neither profession will deny that maximizing a patient's health is advantageous. Primary anticipation of disease is the best move toward but often difficult to achieve. From a primary care point of view, it is vital that physicians and dentists augment collaboration and share in sequence that can impact the patient's health. Most patients with these chronic circumstances probably do not think that a difficulty in their mouth can affect their heart or bones. Modifying any coexisting circumstance may be enough to prevent a significant, perhaps life-threatening medical conclusion.

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