Open Access Journal of
Gerontology & Geriatric Medicine
ISSN: 2575-8543

Juniper Publishers
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Review Article
Volume 8 Issue 3 - November 2024
DOI: 10.19080/OAJGGM.2024.08.555742

OAJ Gerontol & Geriatric Med

Chronic Disease and Oral Manifestations in Aging Populations

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Submission: October 29, 2024; **Published:** November 13, 2024

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Abstract

This review assesses the relationship between oral health and chronic diseases, focusing on how systemic conditions can influence oral health and how oral manifestations can serve as indicators of chronic disease in aging populations. It is crucial to integrate oral health into our overall health strategies. The review found a significant correlation between poor oral health and chronic diseases. Cardiovascular conditions were frequently associated with oral inflammation such as gingivitis, caries and periodontitis.

Conclusion: The findings emphasize the importance of considering oral health in the management of chronic diseases. Oral manifestations provide valuable diagnostic insights into progression of the systemic condition. Incorporating routine oral health assessments and interventions into chronic diseases and management protocols could improve patient outcomes and overall health.

Keywords: Oral Health; Chronic Diseases; Periodontal Diseases; Diabetes; Oral Manifestations

Abbreviations: CAD: Coronary Artery Disease; HSL: Health Sciences Library; SAD: Small Airway Disease; COPD: Chronic Respiratory Diseases; GFR: Glomerular Filtration Rate; CKD: Chronic Kidney Disease; HIV: Human Immunodeficiency Virus

Introduction

People worldwide are living longer. Today most people can expect to live into their sixties and beyond. By 2030, 1 in 6 people in the world will be aged 60 years or over. At this time the share of the population aged 60 years and over will increase from 1 billion in 2020 to 1.4 billion. By 2050, the world's population of people aged 60 years and older will double (2.1 billion). The number of persons aged 80 years or older is expected to triple between 2020 and 2050 to reach 426 million [1].

Methods

This methodological approach enabled a comprehensive evaluation of the intersection between chronic diseases and oral health in an aging population, contributing valuable insights into the management of oral manifestations associated with systemic health conditions. A thorough literature review was conducted to explore the connection between oral health and chronic diseases. The review followed rigorous procedures to ensure high-quality results. Specifically, two scholarly databases authorized by Howard University were utilized: the Louis Stokes Health Sciences Library (HSL) and PubMed. These databases provided comprehensive access to relevant academic articles and research studies to compare and support research.

Overview

The progression of systemic diseases may cause numerous changes in health outcomes, and may also affect the oral cavity. Therefore, a well planned and executed clinical examination will help to ensure early detection. Chronic diseases are those long-lasting conditions that often progress slowly and persist over an extended period, sometimes for a lifetime. Unlike acute illnesses, these require continued ongoing treatment to control the symptoms. The most common chronic diseases which present with an oral systemic connection are cardiovascular disease, pulmonary disease, diabetes, and kidney disease. Each of these conditions have significant oral implications, highlighting the importance of integrating oral health and overall health management [2]. The ability to maintain good oral hygiene is well studied and includes economic, social, psychological and physical health. Garcia et. al [3] reported that the greater the number of

missing teeth, the poorer the quality of life. Some of these oral manifestations include gingivitis, dry mouth, oral candidiasis, caries, halitosis, oral mucosal changes, gingival hyperplasia, ulcers and much more [4] (Figure 1). Regular access to dental care and routine check-ups can help prevent periodontal disease and enable healthcare providers to better assess and manage patients' overall health [4].

Chronic Diseases/Conditions in Howard University College of Dentistry (HUCD) Older Patients	Oral Manifestations
Hypertension	Periodontitis, Caries
Diabetes	Severe Periodontitis, Caries
Heart Failure (CHF)	Periodontitis, Poor Healing
Kidney Disease	Dry Mouth, Caries, Periodontitis
Oral Cancer	Oral Lesions, Periodontal Disease, Caries
Tobacco & Alcohol	Oral Lesions, Staining, Periodontitis, Caries
HIV	Oral Lesions, Periodontitis, Caries
Other (Liver, Pancreas)	Periodontitis, Poor Healing
Hematological Diseases	Severe Periodontitis, Caries
Hepatitis	Severe Periodontitis, Caries
Asthma	Dry Mouth, Caries, Periodontitis
Sinusitis	Dry Mouth, Caries, Periodontitis
COPD	Periodontitis, Caries
Thyroid Diseases	Severe Periodontitis, Caries, Poor Healing
Pulmonary Diseases	Dry Mouth, Fungal and other Infections

Figure 1: Chronic Diseases at Howard University College of Dentistry.

Cardiovascular Disease and Hypertension

Cardiovascular disease encompasses a range of disorders affecting the heart and blood vessels. The main types of cardiovascular disease include hypertension, coronary artery disease (CAD), heart failure, arrythmias, stroke, valvular heart disease, congenital heart defects and aortic disease. The most common cardiovascular disease is coronary artery disease (CAD) which is characterized by the coronary arteries becoming narrowed or blocked due to the build-up of plaque [5]. This reduced blood flow leads to angina and if severe can lead to a heart attack. Hypertension is also a key component of cardiovascular health. Hypertension increases the risk of developing other serious cardiovascular diseases such as heart disease, stroke and heart failure. It can damage blood vessels and organs over time [5]. Elevated blood pressure can increase the risk of developing oral health issues such as gum disease, which can lead to inflammation and damage to the tissues surrounding the teeth. Anti-hypertensive medications can cause side effects like dry mouth, which can contribute to increased caries and infections [6]. Patients with cardiovascular disease may face challenges maintaining optimal oral hygiene due to their medical condition or medications which can lead to dry mouth or other oral complications.

Heart disease and oral health are closely interconnected, with emerging evidence highlighting how poor oral hygiene can contribute to cardiovascular problems [7]. Chronic periodontal disease characterized by inflammation and infection of the gums has been linked to an increased risk of heart disease. The likely mechanism of action involves spread of bacteria from oral infections into the bloodstream, leading to inflammation and potential arterial plaque. Thus, it is important to maintain good oral hygiene with regular check-ups and management of disease to prevent dental issues but also to support and reduce the risk of cardiovascular complications [7].

Pulmonary Disease

Pulmonary disease and oral health are intricately linked, with research indicating that conditions affecting the lungs can

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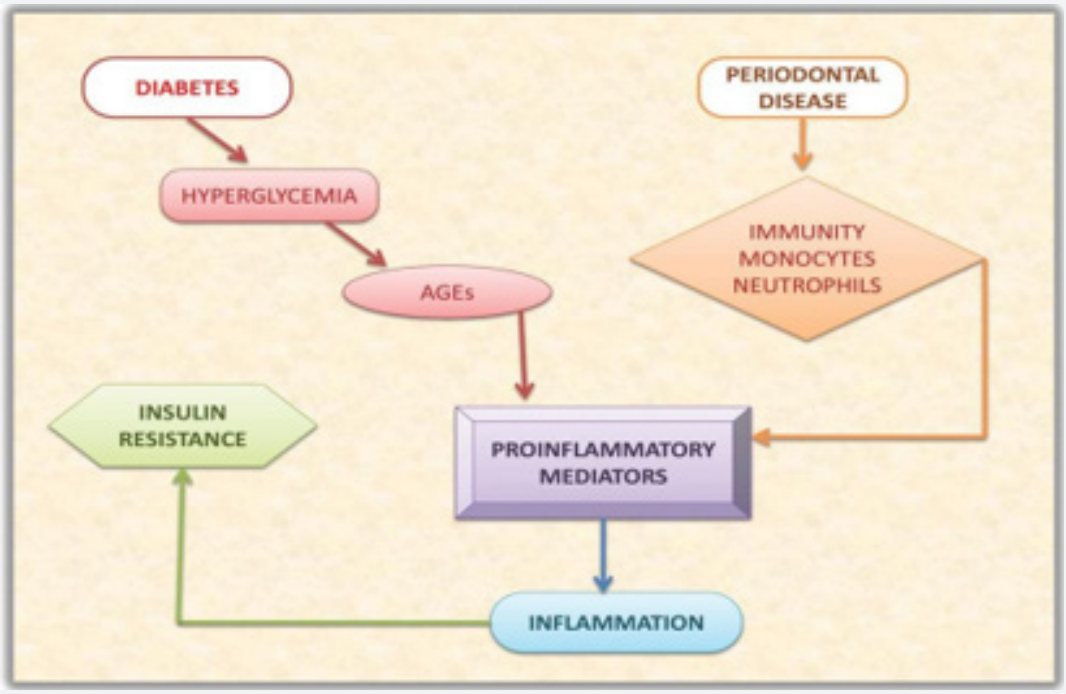
significantly impact overall health. COPD involves respiratory symptoms and persistent, often progressive airflow limitation due to abnormalities of the airways (bronchitis and bronchiolitis) and/or alveoli (emphysema), caused mainly by exposure to noxious gases or particles [8]. Small airway disease (SAD) is a major factor in COPD, as an early sign of emphysema and a precursor to pre-COPD. (SAD) in COPD has been widely acknowledged to be associated with poor reversible airflow limitation and heightened symptom burden, particularly in the aging population. The critical elements of SAD underlying inflammation in COPD are airway remodeling, mucus plugging, immune cell infiltration, small airways loss, and emphysematous destruction [8].

Chronic respiratory diseases, such as chronic obstructive pulmonary disease (COPD), SAD and asthma, particularly in smokers, often lead to symptoms of dry mouth, increased susceptibility to oral infections and other oral health issues due to the medications used and altered breathing patterns. Xerostomia occurs due to the underproduction of saliva by the salivary glands. This can occur due to breathing through the mouth or medications commonly prescribed for pulmonary conditions, such as bronchodilators and antihistamines. There is an increase in oral infections as saliva has microbial properties that help to control the growth of bacteria and fungi in the mouth. For example, Candida yeast can proliferate easily due to dry mouth leading to oral thrush. Medications used to treat pulmonary diseases such as antibiotics or inhaled corticosteroids, can affect the taste buds or cause a metallic or bitter taste. Poor oral health also can exacerbate pulmonary conditions with increased risk of respiratory infections and existing lung conditions.

Diabetes

Diabetes is a chronic disease characterized by elevated levels of blood glucose due to issues with either insulin production (type 1) or systemic insulin resistance (type 2). As of 2024, approximately 38 million persons have diabetes in the United States, and 1 in 5 are undiagnosed [9]. Type 2 diabetes accounts for most of the cases due to factors such as obesity, sedentary lifestyle and aging. [10] Patients with diabetes face a higher risk of developing various oral health issues. High blood sugar levels lead to increased glucose in the saliva which fosters the growth of harmful bacteria and yeast in the mouth. This creates an environment which is conducive to gum diseases such as gingivitis and periodontitis and exacerbates dry mouth and oral infections. The effects of diabetes on oral health have been studied extensively [11]. Diminished salivary flow is a common oral feature of diabetes and may or may not include symptoms of a burning sensation in the mouth or tongue and concomitant enlargement of the parotid salivary glands. People with diabetes and periodontal infection have a greater risk of worsening glycemic control over time compared to people with diabetes who do not have periodontitis [11]. Many studies have shown that periodontal therapy improves glycemic control in people with diabetes.



Indurkar, Maya S., et al. "Oral Manifestations of Diabetes." Clinical Diabetes, American Diabetes Association, ! Jan. 2016, clinical.diabetesjournals.org/content/34/1/54.

Figure 2: Bi-directional relationship between periodontal disease and diabetes.

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Periodontal therapy in diabetic patients improved glycemic control by 17.1%, compared to 6.7% in diabetic patients who did not receive periodontal therapy [12]. Greater complications may be associated with longstanding diabetes which can be explained by lower immunity and other concomitant diseases. Effective treatment of periodontal infection and reduction of periodontal inflammation is associated with a reduction in A1C and can reflect a bidirectional improvement both periodontal disease and diabetes [13] (Figure 2).

Thyroid Diseases

For diagnoses of diseases of the thyroid --related to hyperthyroidism (thyrotoxicosis), these complaints may include weight loss, anxiety or nervousness, increased sweating, tremulousness, diarrhea, palpitations, muscular weakness, heat intolerance, or history of treatment of an "overactive" thyroid.

For diagnoses related to hypothyroidism, typical problems include fatigue, weight gain, depression, lethargy, dry skin, cold intolerance, voice change, change in menses, muscle cramps, or treatment of a thyroid condition [14,15]. Thyroid enlargement (goiter) may present in the context of hyper- or hypothyroidism. It may also occur in a patient with normal thyroid hormone production (euthyroid patient). Typical complaints related to thyroid enlargement include generalized neck swelling (diffuse goiter), neck mass (uninodular or multinodular goiter), dysphagia, neck pain, or hoarseness [15].

Symptoms of Hypothyroidism Include:

- Slower-than-usual heart rate, feeling tired (fatigue), unexplained weight gain, feeling sensitive to cold Dry skin and dry and coarse hair.Depressed mood.Heavy menstrual periods (menorrhagia).

- **Hyperthyroidism:** Hyperthyroidism is a condition in which the thyroid gland is overactive. Patients with this condition are more susceptible to a wide range of dental problems from cavities and dry mouth to osteoporosis. Over time, poor oral conditions can also cause gum disease in these patients.

Symptoms of Hyperthyroidism Include:

- Faster-than-usual heart rate (tachycardia). Difficulty sleeping. Unexplained weight loss. Feeling sensitive to heat, Clammy or sweaty skin, Feeling anxious, irritable or nervous, Irregular menstrual cycles or a lack of periods (amenorrhea).

Both conditions can cause an enlarged thyroid (goiter), but it's more common in hyperthyroidism. Thyroid disorders can have a significant impact on dental health [16].

Dental Conditions and Thyroid Diseases

- **Dry mouth**: Reduced saliva production can lead to dry mouth, which can make it harder to clear away food and bacteria from your mouth. This can increase your risk of tooth decay and gum disease.

- **Gum disease:** Thyroid disorders can increase your risk of gum disease, or periodontal disease. Your gums may bleed or become inflamed more easily.

- **Delayed healing:** Thyroid disorders can make it harder for your body to heal itself, which can delay the healing of mouth sores.

- **Tongue enlargement:** An underactive thyroid, or hypothyroidism, can cause your tongue to enlarge, which is called macroglossia.

- **Delayed tooth eruption:** In children, an underactive thyroid can delay tooth growth.

- **Taste distortions:** Thyroid disorders can impact your sense of taste.

Improving the health and quality of life for patients with thyroid disease includes close monitoring of symptoms to ensure better patient outcomes.

Kidney Disease

There are two main types of kidney disease, either acute kidney injury or chronic kidney disease. The onset is characterized by a rapid decline in kidney function within hours to days while CKD, is a progressive loss of kidney function over three months. CKD is irreversible and gradually worsens over time. This is determined by a Glomerular filtration rate (GFR) of less than 60ml/min for at least three months [4]. There is a connection between kidney disease and oral health partly due to the impact of kidney disfunction on the body's overall ability to maintain healthy tissues [17].

Chronic kidney disease can lead to systemic inflammation and alterations in immune function, which can adversely affect the gums and other oral tissues. Oral health conditions such as bleeding, altered drug metabolism, impaired immune function, and other dialysis-related complications require immediate attention [4,18]. Furthermore, medications used to manage kidney disease, including certain antibiotics and immunosuppressants can have side effects such as dry mouth or gingival overgrowth. Maintaining good oral health is crucial for individuals with kidney disease, as oral infections and gum disease can potentially worsen their overall health and complicate kidney treatment [19]. Regular dental check-ups, effective oral hygiene practices and communication between healthcare providers are essential for managing oral health and minimizing the impact of kidney disease.

HIV/AIDS

Human Immunodeficiency Virus (HIV) is a disease that is spread by contact with bodily fluids of an HIV infected individual, most commonly through sexual practices, sharing

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needles, mother to child during pregnancy. The virus targets and weakens the immune system, specifically attacking CD4 cells, which diminishes the body's capacity to fight off infections. If left untreated, the CD4 counts will progressively go lower and when it goes below 200 [20], the patient is diagnosed with AIDS. HIV/AIDS can significantly impact oral health, often manifesting in a variety of oral conditions that may serve as indicators of the disease's progression or complications. The oral cavity can reveal early signs of HIV infection. Common oral manifestations include oral candidiasis, kaposi's sarcoma, oral hairy leukoplakia, gingival hyperplasia, herpes simplex virus, dry mouth and periodontal disease [4]. Oral health is a crucial component of overall health management in individuals with HIV/AIDS. Regular dental check-ups, good hygiene practices and timely treatment of oral conditions can help manage these manifestations and improve quality of life [4,21].

Discussion

The chronic diseases highlighted in this review are some of the leading causes of death in the United States. Oral health risk factors or manifestations may be warning signs of the onset of a disease or a worsening condition. Some of the chronic diseases studied in this review include heart disease, kidney disease, diabetes, HIV, oral cancer, and substance abuse (tobacco use and alcohol). Each of these chronic diseases are defined as lasting over a one-year period and requiring extensive treatment to keep under control. Emerging findings have shown a connection between the presence of oral diseases and chronic conditions such as the ones listed above [22]. As individuals age, systemic changes can increase the numbers of chronic diseases. Chronic diseases such as cardiovascular disease, diabetes, thyroid diseases and kidney diseases are associated with declines in the immune systems, tissue and vascular systems and impaired organ function.

Current research shows a bidirectional relationship between oral health and chronic diseases. Emerging findings have shown a connection between the presence of oral diseases and chronic conditions. The most common systemic conditions and oral manifestations noted at the Howard University College of Dentistry are challenging in that many patients have three or more diseases simultaneously (Figure 1). Collaborative care strategies are put in place to manage complex patients. Patient management should include requests for lab values and full narrative on the chronic diseases in patients needing extensive dental procedures, particularly in those patients with severe cardiovascular diseases and diabetes.

Well written requests for medical consult from the dentist are critical for the physician. Medical professionals should provide a detailed summary by organ system affected. As the population is living longer, patients have numerous diagnoses and the severity of oral disease is greater in many patients with poor systemic health. Detailed medical consultations will afford the dentists an opportunity to adjust treatment planning execution and avoid serious complications, in hopes that this information can be a guide for improved medical consults and better patient outcomes.

Medications can cause various oral manifestations, often categorized by their primary effects on oral health may consist of antihypertensives, diabetic medications, cardiovascular medications, psychotropic medications, inhaled medications and antiretrovirals. Antihypertensives like hydrochlorothiazide and losartan can cause xerostomia (dry mouth), increasing the risk of dental caries and oral infection. Diabetes medications include metformin and insulin, which cause possible altered taste and dry mouth.

Cardiovascular drugs like amlodipine and Simvastin are known to cause gingival hyperplasia and oral mucosal changes. Amitriptyline and Lyrica (Anti-Psychotics) are known to also cause dry mouth. Inhaled medications such as Spiriva and Pro-air can cause oral candidiasis and dryness. Antiretrovirals like Truvada and Atripala can cause oral mucosal lesions and dry mouth. Therefore, as the number of medications increases, the risk of various oral health issues tends to increase due to the overlap.

Conclusion

Chronic diseases such as diabetes, cardiovascular disease, renal diseases affect various aspects of the patient's oral health including periodontal status, caries and gingival health. Research continues to show a link between systemic diseases and oral health. The growing evidence continues to highlight the bidirectional nature of the oral and systemic diseases and their significant influence on each other. As the population ages treatment of the older dental patient is becoming more complex. Treatment management must meet the critical needs of the aging population [23].

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