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Why Must Physicians Know About Oral Diseases?

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Why Must Physicians Know About Oral Diseases?

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Background: Poor oral health reflects social inequalities, hence the prevention of oral diseases should be a priority in developed and underdeveloped countries around the world. Medical practitioners must play an active role in oral health promotion. **Summary:** Proper knowledge of oral diseases is crucial in medical practice due to the following reasons: (a) Periodontal disease is associated with multiple systemic conditions of medical interest, (b) a large number of systemic diseases have oral manifestations, (c) many drugs are associated with oral adverse drug reactions, (d) physicians are generally not sufficiently trained to detect oral cancer manifestations, (e) physicians could play a pivotal role in oral public health, and (f) early detection of oral diseases by physicians could improve the oral health status of the population. **Conclusions:** Physicians need to get more involved in oral health promotion. Moreover, oral health education should be included in the curriculum of future medical students.

Good oral health is an essential part of general health; however, there is the widespread perception that oral diseases are limited to the scope of dental practice. Medical curricula traditionally overlook oral diseases mostly because the wrong perception of considering the dentist as solely responsible for the prevention and the treatment of oral diseases. In general terms, there is a lack of knowledge by physicians about the systemic implications of poor oral health. Scarce integration exists between dentist and other health care professionals (especially physicians) in academic, research, and professional fields.¹

There are many reasons for physicians to know more about oral diseases:

1. Compelling evidence links periodontal disease with systemic conditions of medical interest including diabetes,² preg-

nancy complications,³ cardiovascular disease,⁴ respiratory diseases,⁵ cancer,⁶ and rheumatoid arthritis.⁷

2. A number of systemic diseases like AIDS, diabetes, autoimmune diseases, and hematological malignancies have oral manifestations (Table 1).⁸ In addition, many drugs are associated with adverse drug reactions (ADR) in the mouth (Table 2).⁹
3. Physicians do not frequently examine the mouth and are not sufficiently trained to detect oral cancer.¹⁰
4. Physicians could play a pivotal role in develop oral public health policies by collaborating with dentists as part of an interdisciplinary team.
5. Early detection of oral disease by physicians and the opportune referral of patients to dentists could improve the oral health status of the population and reduce the burden of oral-related systemic complications.

Few papers concerning the relevance of oral health education to physicians have been published. A detailed oral health curriculum for medical students was recently developed at the University of Washington with emphasis in five topics: dental public health, caries, periodontal disease, oral cancer, and oral-systemic interactions.¹¹ This effort shows the importance of improving the knowledge of oral and systemic health among medical students and building multidisciplinary teams between different health care professionals. The goals of this review are to discuss the implications of oral diseases in medical patient care and to highlight the need for physicians to get more involved in oral health promotion and oral disease prevention. We aim to provide a rationale for the inclusion of oral health topics in the medical curricula in order to develop a solid academic and professional communication between dentistry, medicine, nursing, and other healthcare professionals.

ORAL DISEASES: A GLOBAL PUBLIC HEALTH CONCERN

Some diseases affecting the oral cavity are the most prevalent chronic diseases in children and adults worldwide. Severe to moderate periodontitis affects approximately 10 to 15% of

We would like to thank Professor Javier Botero for donating the clinical photographs of periodontitis and gingivitis included in this article.

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TABLE 1
Oral manifestations of systemic diseases

Disease	Description of Oral Manifestations
Gastroesophageal Reflux Disease	Acidic reflux decreases salivary pH, resulting in enamel erosion and exposure of the underlying dentin. These changes are more common on the palatal surfaces of the teeth.
Diabetes	Xerostomia is a common symptom in diabetic patients caused by a decrease in salivary flow. Some patients develop a bilateral enlargement of the parotid gland known as diabetic sialadenosis. Diabetes is a risk factor for Candida infections, caries, and periodontal disease.
Multiple Myeloma	Tumor involvement of mandible is associated with jaw pain, swelling, loosened tooth, and pathologic fractures. Amyloid deposits produce macroglossia in some patients. Hairy leukoplakia and opportunistic infections as candidiasis may occur secondary to immunosuppression.
Ulcerative Colitis (UC)	Oral ulcerations resulting from immune mediated vasculitis are a common finding in periods of exacerbation of colonic disease. Pyostomatitis vegetans is a well-known condition associated with UC; the disease is characterized by erythema, pustules, superficial erosions and thickening of oral mucosa. Noncaseating granulomas are frequently seen in oral biopsy samples in patients with UC.
Anemia	Anemia is associated with multiple oral conditions including recurrent aphthae, mucosal pallor, atrophic glossitis, migratory glossitis (also known as geographic tongue), angular stomatitis, and candidal infections.
Kawasaki Disease	Kawasaki disease is frequently associated with erythema of the mucosa and swelling of papillae (strawberry tongue).
Systemic Lupus Erythematosus (SLE)	Oral ulcerations are major diagnostic criteria of SLE. Ulcerations are usually painless and occur in the oral and nasopharyngeal cavities. Salivary gland involvement occurs in some patients with SLE leading to secondary Sjogren's syndrome.
Rheumatoid Arthritis (RA)	Involvement of temporomandibular joint frequently causes pain and restricted jaw function in patients with RA.

the adult population, but even less severe gum inflammation disease—gingivitis—affects over 80 to 90% of the adults on a global scale.¹² In addition, the majority of children living in developed and developing countries suffer from dental caries.¹³ Oral cancer is the eighth most common type of cancer worldwide, generally associated with elevated mortality rates and high medical costs, as in most cases it is detected at advanced stages.¹⁴ Oral manifestations of HIV infection are also common. Approximately 40 to 50% of HIV-positive patients have an oral fungal, bacterial, or viral infection.¹⁵ A less frequent but devastating oral disease is noma (*cancrum oris*), an illness associated with malnourishment and characterized by advanced necrosis of oral and facial soft tissues. Most cases of noma occur in the sub-Saharan region but sporadic cases are reported in Europe, Asia, South America, and North America.¹⁶

Poor oral health is a valuable indicator of social disparities in both developed and developing countries. Commonly, the most affected people live in low socioeconomic strata and in rural areas with limited access to health care. Oral health inequalities could be partially explained due to inadequate oral health promotion and prevention. Treatment of oral diseases and their

advanced sequelae are generally not included in the medical insurance systems of most countries; oral hygiene products are usually unaffordable to poor people and rural areas have an inadequate supply of dental services.¹⁷ Poor oral health is associated with a reduction in the quality of life, dental pain, tooth decay, malnutrition, malocclusion, loss of working and school hours, undetected oral cancer, and dental infection.^{17,18} The World Health Organization (WHO) recently developed a global strategy with emphasis on the prevention and control of non-communicable diseases linked by common risk factors (smoking and unhealthy diet) including diabetes, cancer, cardiovascular diseases, chronic obstructive pulmonary disease (COPD), and oral diseases.¹⁷

IMPORTANT ORAL DISEASES OF MEDICAL INTEREST

Gingivitis

Plaque-induced gingivitis is an inflammation of the gums (Figure 1) resulting from the mucosal immune response induced by microbial overgrowth on teeth surfaces (dental biofilm per plaque).¹⁹ Epidemiological studies have shown plaque-induced

TABLE 2
ADRs in the mouth

ADR	Drugs Most Commonly Associated With ADR
Gingival Hyperplasia Dry Mouth	Phenytoin, ciclosporin, and calcium-channel-blockers (nifedipine) Retinoids, tricyclic antidepressants, alpha-receptor antagonists, anticholinergics, histamine H1 antagonists, phenothiazines, diuretics, antihypertensive agents, benzodiazepines, opioids, bronchodilators (ipatropium), cytotoxics, decongestants, histamine H2 antagonists, protease inhibitors, and proton pump inhibitors
Lichen Planus Apthous Stomatitis	Gold salts, NSAIDs, and ACE inhibitors NSAIDs, beta-blockers, bisphosphonates, protease inhibitors, mycophenolate, sulfonamides, and tacrolimus.
Candidiasis	Corticosteroids, immunosuppressants, cytotoxics, broad-spectrum antibiotics, and drugs causing xerostomia
Salivary Gland Swelling and Pain	Clozapine, naproxen, iodides, anti-thyroid agents, antihypertensives, cytotoxics, phenothiazines, insulin, phenytoin, ranitidine, nifedipine, and sulphonamides
Disturbed Taste	Beta-lactam antibiotics, ACE inhibitors, biguanides, anti-thyroids, opiates, protease inhibitors, proton pump inhibitors, and retinoids
Mucositis Tooth Discoloration	Immunosuppressants and antineoplastic drugs Tetracyclines, ACE inhibitors, terbinafine, and etidronate
Mucosal Pigmentation	Minocycline, chloroquine, amiodiaquine, bismuth, quinidine, clofazimine, phenytoin, and amiodarone

Note. ADR = adverse drug reaction; NSAID = nonsteroidal anti-inflammatory drug; ACE = angiotensin-converting enzyme.

gingivitis to be prevalent at all ages of dentate populations, and this disease has been considered to be the most common but benign form of periodontal disease.²⁰ However, plaque-induced gingivitis is a chronic disease that increases cytokine production at local level and might also stimulate systemic inflammatory effects.²¹ Long-lasting and untreated gingivitis could also have important side effects on pregnant women and by extrapolation of these findings on other important diseases such as cardio-

vascular disease or diabetes. Few reports have focused on the systemic effects of gingivitis. Besides the reversible and benign nature of this disease, dentists usually diagnose gingivitis and then refer the treatments to dental hygienists for dental prophylaxis. It has been hypothesized that in susceptible patients, the overgrowth of certain microorganisms in human gingivitis could lead to periodontal disease onset and more systemic consequences of the gingival infection.²⁰ Physicians must know how to prevent gingivitis and teach patients good oral hygiene habits.

Physicians also need to be aware of other less common but important type of gingivitis related with hormone increase, such as puberty-associated gingivitis and pregnancy-associated gingivitis. There are other important gingival diseases associated with medications such as drug-influenced gingival enlargement by anticonvulsants (phenytoin), calcium channel blockers (nifedipine), and immunosuppressors (cyclosporine) that need to be addressed by physicians and dentists.⁹ Finally, there are other gum diseases including leukemia-associated gingivitis, chronic desquamative gingivitis, necrotizing ulcerative gingivitis, and acute herpetic gingivostomatitis that may be recognized by physicians.^{20,22} The complex nature of different types of gingivitis requires the integrated work of dentists and physicians, aimed to perform a precise diagnosis and treatment.

FIG. 1. Gingivitis. Note the marked redness and inflammation of the gingiva on the lower front teeth. Physicians should aim to differentiate the inflammatory signs of gingivitis as compared to healthy tissue (i.e., gingiva on the upper front teeth).

Periodontitis

Periodontitis is the result of a chronic inflammatory response to biofilm accumulation on teeth surfaces, which courses with gingival inflammation, bleeding gums, and the destruction of alveolar bone and connective tissue support ultimately leading

FIG. 2. Periodontitis. (A) Note the gingival recession on the second upper left molar. (B) and (C) Dental radiographs depicting alveolar bone loss (bone resorption). The diagnosis of periodontal disease involves an additional level of complexity where the dentist plays a key role in the interdisciplinary approach to oral diseases.

to tooth loss (Figure 2).²⁰ The etiopathogenesis of periodontal disease involves a chronic infection by key bacterial periodontopathogens (*Porphyromonas gingivalis*, *Tannerella forsythensis*, *Treponema denticola*, *Aggregatibacter actinomycetemcomitans*, among others) and a subsequent immune response leading to destruction of bone and gum tissue surrounding the tooth.²³ Diabetic subjects, HIV-positive persons, patients receiving immunosuppressive drugs, and genetically susceptible individuals (i.e., polymorphism of IL-1 gene) develop an exaggerated immune response to the bacterial challenge and are more susceptible to suffer periodontal disease.²³ Some herpes viruses like human cytomegalovirus (HCMV) have also been recently implicated in the pathogenesis of periodontal disease.²⁴

The prevalence and severity of periodontal disease vary in different parts of the globe depending on how the disease is defined in epidemiological studies. Severe to moderate periodontitis affects at least 10% of the adult population and is more prevalent in older adults, minorities, diabetics, and individuals with low socioeconomic and educational status.¹²

Periodontitis produces a systemic inflammatory response associated with an increase of acute phase reactants.²⁵ In addition, periodontal infection appears to be linked with multiple systemic conditions, including diabetes, atherosclerosis, and pregnancy-related complications. Therefore, it is not surprising that periodontitis is receiving a growing attention as a disease of medical interest. Periodontal medicine is a new field devoted to the study of the oral-systemic interactions as a multidisciplinary approach involving the participation of dentistry, medicine, and basic biomedical sciences.²⁶

Periodontitis and diabetes. A large number of case-control and cohort studies have shown that periodontal disease is more severe in diabetic individuals compared to the nondiabetic population.²⁷ There is a twofold to threefold increased risk for periodontal disease in diabetic patients compared to nondiabetic individuals.²⁸ Furthermore, the extent and severity of periodontal disease is directly related to poor glycemic control and di-

abetes duration.²⁹ Some reports from longitudinal studies have shown that periodontal disease alters the glycemic control in diabetic individuals and is associated with an increased risk of diabetic nephropathy, cardiovascular diseases, and mortality.^{28,30,31} Because of clinical findings, some authors have described the relationship between periodontal disease and diabetes as bidirectional, which means that periodontal disease is more common and severe in diabetics, and once the disease is established, it could have deleterious effects in the glycemic control of diabetic patients.² A number of small-scale clinical trials have shown that periodontal treatment performed in diabetic individuals with periodontitis improves the glycemic control.^{32,33} However, other studies found no benefit of periodontal therapy on glycosylated hemoglobin levels in diabetic patients with periodontitis. Moreover, cumulative evidence from randomized controlled trials have found no significant improvement in glycemic control after periodontal treatment.³⁴ The conflicting results could be caused by the inclusion of well-controlled diabetic patients as well as different types of periodontal disease severity, limited sample sizes, inadequate randomization, no method for allocation concealment, attrition and lack of blinding of the outcomes assessors. Further randomized clinical trials following CONSORT and larger sample sizes are needed to determine the effects of periodontal therapy on the glycemic control of diabetic persons.³⁵

Periodontitis and cardiovascular disease. Several epidemiological studies have suggested that periodontal disease is a risk factor for acute myocardial infarction, peripheral vascular disease, and cerebrovascular accidents.⁴ Patients with periodontitis have increased levels of C-reactive protein, fibrinogen, and other acute phase reactants related to elevated risk for myocardial infarction and stroke.³⁶ Furthermore, some periodontal pathogens (*Porphyromonas gingivalis*, *Aggregatibacter actinomycetemcomitans*, *Prevotella intermedia*, and *Eikenella corrodens*) have been found in atherosclerotic plaques, and recent studies have shown that such bacteria have the ability to invade endothelial cells and promote foam cell formation, suggesting a possible role of periodontal bacterial invasion with the progression of atherosclerosis.³⁷

The role of periodontal disease as a risk factor for cardiovascular disease is still controversial, mainly because the heterogeneity of diagnosis and classification of periodontal disease among studies. A recent meta-analysis on the subset of five cohort studies (86,092 patients, follow-up > 6 years) found an increased incidence of coronary heart disease (relative risk = 1.24, 95% CI 1.14–1.36, $p < .0001$) in patients with less than 10 teeth.³⁸ In the subset of cross-sectional studies in the meta-analysis an increased prevalence of coronary heart disease (OR = 1.59, 95% CI 1.329–1.907, $p < .001$). The association between periodontal disease and cardiovascular disease is stronger when systemic inflammatory and serologic markers are used to define the systemic bacterial exposure from periodontitis.³⁹ Despite the positive association between periodontitis and cardiovascular events in most meta-analysis, heterogeneity among the epidemiological studies, biases, and

unadjusted confounding factors (smoking and nutrition) are major limitations to list periodontal disease as a risk factor for atherosclerosis and cardiovascular disease, more studies are needed to confirm this association.

Randomized clinical trials are another useful approach to study the impact of periodontal treatment on cardiovascular disease. Most studies have emphasized on biomarkers of inflammation and endothelial function as outcomes for reversibility. For example, a recent well-designed randomized clinical trial found that treatment with scaling and root planning (subgingival plaque debridement) in patients with severe generalized periodontitis improves brachial artery flow-mediated dilation.⁴⁰ Despite increasing data from case-control and cohort studies that supports the association between periodontal disease and systemic inflammation, there is no direct evidence that periodontal treatment reduces hs-CRP levels in patients with periodontitis.⁴¹ More trials evaluating the effect of periodontal therapy on endothelial function are in progress, including one study from our group (clinicaltrials.gov identifier NCT00681564) designed to evaluate the vascular function after periodontal therapy and the correlation between endothelial dysfunction and infection burden. The impact of periodontal treatment in patients at risk for cardiovascular disease needs to be clarified in future studies.

Periodontitis and pregnancy complications. Periodontitis in pregnant women has been associated with preeclampsia, preterm birth (PTB) and low birth weight (LBW).^{3,42} Conversely, few studies do not support the association between periodontitis and pregnancy complications.^{43,44} Two systematic reviews of case-control studies and prospective cohorts had found an increased risk for LBW and PTB in pregnant women with periodontal disease.^{45,46} Another meta-analysis found an increased risk for preeclampsia in pregnant women with periodontal disease (odds ratio = 1.76, 95% CI 1.43–2.18).⁴⁷ Some interventional studies had shown that women who receive periodontal treatment had fewer PTB and LBW babies compared to nontreated women.⁴⁸ However, there is no strong evidence that treatment of periodontal disease will reduce the risk of pregnancy complications. Despite the controversy regarding pregnancy complications in association of periodontal disease, oral examination, periodontal treatment, and caries control are currently recommended in most prenatal care guidelines.

Periodontitis and respiratory disease. A recent systematic review reported good evidence (I, Grade A recommendation) that professional oral health care reduce the risk of respiratory infections among high-risk elderly adults living at nursing homes and intensive care units (ICUs).⁵ Poor oral hygiene and periodontal disease in patients with COPD promote the oropharyngeal colonization by respiratory pathogens and increase the risk for respiratory infections.⁴⁹ However, evidence for an association between COPD and periodontitis is still scarce and conflicting.

Periodontitis and cancer. Chronic inflammation is associated with increased angiogenesis, oxidative stress, mutagenesis, reduced apoptosis, and cellular proliferation.⁵⁰ Systemic

inflammation from periodontitis has been proposed as a risk factor for pancreatic, hematological, kidney, gastrointestinal, and lung cancer in a number of epidemiological studies.^{6,51} Most prospective cohorts evaluating the association between periodontitis and cancer classify the periodontal status using the method self-reported periodontal disease, a frequent cause of error in the classification of periodontal disease (information bias). Moreover, common risk factors shared for periodontal disease and cancer like smoking and high-fat diet usually are not appropriately adjusted in several of these studies. Association between periodontitis and cancer needs further confirmation from well-designed prospective cohorts and case-control studies.

Dental Caries

Caries is the most common long-lasting infectious disease in children and adults in many developed and developing countries. Approximately 60 to 90% of children living in developed countries suffer from caries. The prevalence of caries is relatively low in Africa; however, an increase in prevalence in most African countries is expected in the upcoming years due to inadequate water fluorination policies, increasing consumption of sugars, and inadequate access to dental care. Caries prevalence decreased in the last 20 years in most developed countries mainly because water fluorination policies, a trend not observed in developing countries.¹³

Caries shares common risk factors with other slow communicable rate diseases, especially the unhealthy nutrition with high consumption of sugars.⁵² Untreated caries could lead to tooth loss, dental pain, and oropharyngeal infections.⁵³ In children from developed countries, caries prevalence and severity are in direct relation with the body mass index (BMI).⁵⁴ Controversially, malnourishment and iron deficiency are associated with an increase in caries prevalence and severity, especially in children from developing countries.⁵⁵

Oral Cancer

Oral cancer ranks as the eighth most common type of cancer worldwide.^{14,56} Even though oral cancer is preventable and treatable if early diagnosis is established, the mortality rate from oral cancer has not declined in the past 20 years.⁵⁷ Furthermore, oral cancer is the third most common type of cancer in some south-central Asian regions. It is concerning that some studies have shown significant racial disparities at stage of diagnosis of oral cancer and survival, as a result of inequalities in oral health.⁵⁸

Oral Disease in HIV-Positive Patients

Approximately 40 to 50% of HIV+/AIDS patients have an oral fungal, bacterial, or viral opportunistic infection. Oral lesions commonly found in HIV-positive persons are frequently the first clinical sign of immunosuppression. Oral manifestations associated with HIV include oral linear gingival erythema, candidiasis, HIV-associated periodontitis,

hairy leukoplakia, histoplasmosis, Kaposi's sarcoma and non-Hodgkin's lymphoma.¹⁵ Periodontitis is also more frequent and severe in HIV+/AIDS patients compared to immunocompetent persons.⁵⁹ The most affected people are those living in developing countries because the inadequate access to antiretroviral drugs and dental care. Recently, the WHO Oral Health Program has made a call for action to national and international health authorities to prevent the oral manifestations of HIV/AIDS (additional information can be found at http://www.who.int/oral_health).¹⁵

ROLE OF PHYSICIANS AS ACTIVE PROMOTERS OF ORAL HEALTH

Physicians may have an advantageous position compared to the dentists to provide early patient counseling about oral health. This statement is supported because children and adults attend advisable offices more often than to dental offices and are more likely to be affiliated to medical than to dental insurance.⁶⁰ Furthermore, physicians are more likely to work in rural and underserved areas than dentists, which represent a remarkable opportunity for physicians to work as active players in oral health promotion.⁶¹

Physicians could play an important role in promoting oral public health by encouraging patients to avoid known risk factors for oral diseases and promoting oral hygiene practices. Physicians routinely see preschool children prior to the dentists, a unique opportunity to provide dental preventive services and encourage parent awareness of dental checkups.⁶² In addition, formulation by physicians of systemic fluoride to children living in areas without fluorinated water supply and the application of fluorinated varnishes in high-risk patients could help to prevent in some extent tooth decay and avoid the need of expensive dental treatments.⁶³ Early diagnosis of gingivitis and caries by the physician, along with patient referral to dental care, surely will improve the overall oral health status of the population.

Physicians need to be familiar with the fact that diabetics are at more risk for periodontal disease and advised to work along with dentists in the treatment of these high-risk patients. In addition, doctors should advise women willing to get pregnant to have a dental and periodontal checkup. Despite the evidence linking periodontitis with systemic diseases, most physicians still are unaware of the potential benefits of maintaining a good oral health.

Medical practitioners do not frequently examine the mouth and are not sufficiently trained in detecting oral cancer.⁶⁴ The appropriate oral examination performed by physicians could increase the diagnosis of oral cancer at early stages, which is associated with a significantly better prognosis compared to patients diagnosed at advanced stages.¹⁰ The role of physicians in oral health is summarized in Figure 3.

The potential benefits of physicians as active players in oral health need to be emphasized in medical schools, where cur-

FIG. 3. Summary of the importance for physicians to get actively involved in oral health. Note. COPD = chronic obstructive pulmonary disease.

riculum contents in oral health may be largely insufficient. It is time to change the perception of dentists and dental hygienists as the only ones responsible for maintaining good oral health in the population. For example, the periodontal medicine group at the Universidad del Valle at Cali is leading a nationwide proposal to include oral contents in the curriculum of medicine, nursing, and studies of other health care professionals in Colombia. We strongly believe these efforts will facilitate the development of effective public health policies, aimed to improve oral health as the long-term goal.

In conclusion, we recommend that the effort initiated by some medical programs to teach oral medicine to their medical students spread worldwide. These new competencies given to physicians will improve the relationship between dentistry and medicine, but largely will benefit an extensive part of the population without easy access to dental care.

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