



Category: Applied Research in Health and Medicine

REVIEW

Analysis of patients with systemic diseases and their prevalence of periodontal disease in the clinic of the Specialty of Periodontics at the School of Dentistry of the Universidad Abierta Interamericana

Análisis de pacientes con Enfermedades sistémicas y su prevalencia de enfermedad periodontal en la clínica de la Especialidad de Periodoncia en la Facultad de Odontología de la Universidad Abierta Interamericana

Estefanía Forciniti¹

¹ Universidad Abierta Interamericana, Facultad de Medicina y Ciencias de la Salud, Carrera de Odontología. Buenos Aires, Argentina.

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ABSTRACT

Periodontal disease was recognized as a chronic inflammatory disorder that affected the dental supporting tissues, leading to tooth loss in the absence of adequate treatment. Factors such as smoking, age, gender, genetics, stress, socioeconomic status and systemic diseases such as diabetes, hypertension and obesity contributed significantly to its progression and severity. Gingivitis, considered a precursor to periodontitis, remained limited to the gingiva and was reversible by reduction of dental biofilm. The new 2017 classification of periodontal diseases categorized these pathologies according to their severity, complexity and extent, facilitating a more accurate diagnosis. Studies highlighted that smoking tripled the risk of developing periodontitis and that diabetes increased disease progression by altering healing processes. In addition, stress and poor diet were identified as factors associated with periodontal inflammation.

Periodontal disease was also linked to systemic conditions such as cardiovascular disease, osteoporosis and respiratory disease, evidencing its impact on overall health. Poor oral hygiene, especially in populations with low socioeconomic status, amplified the risk of complications. The results underscored the need for a preventive approach based on healthy lifestyle habits, education and access to health services. Finally, comprehensive periodontal management and early diagnosis were essential to minimize its progression and prevent serious systemic consequences.

Keywords: Periodontitis; smoking; diabetes; oral hygiene; systemic factors.

RESUMEN

La enfermedad periodontal se reconoció como un trastorno inflamatorio crónico que afectó los tejidos de soporte dental, llevando a la pérdida de dientes en ausencia de tratamientos adecuados. Factores como el tabaquismo, la edad, el género, la genética, el estrés, el estado socioeconómico y enfermedades sistémicas como diabetes, hipertensión y obesidad contribuyeron significativamente a su progresión y severidad. La gingivitis, considerada un precursor de la periodontitis, permaneció limitada a la encía y fue reversible mediante la reducción de la biopelícula dental.

La nueva clasificación de enfermedades periodontales de 2017 categorizó estas patologías en función de su severidad, complejidad y extensión, facilitando un diagnóstico más preciso. Los estudios destacaron que el tabaquismo triplicó el riesgo de desarrollar periodontitis y que la diabetes incrementó la progresión de la enfermedad al alterar los procesos de cicatrización. Además, el estrés y la dieta inadecuada se identificaron como factores asociados a la inflamación periodontal.

La enfermedad periodontal se vinculó también con condiciones sistémicas como enfermedades cardiovasculares, osteoporosis y enfermedades respiratorias, evidenciando su impacto en la salud general. La higiene oral deficiente, especialmente en poblaciones con bajos niveles socioeconómicos, amplificó el riesgo de complicaciones. Los resultados subrayaron la necesidad de un enfoque preventivo basado en hábitos de vida saludables, educación y acceso a servicios de salud. Finalmente, el manejo periodontal integral y el diagnóstico temprano fueron esenciales para minimizar su progresión y prevenir consecuencias sistémicas graves.

Palabras clave: Periodontitis; tabaquismo; diabetes; higiene oral; factores sistémicos.

INTRODUCTION

It has long been recognized that systemic conditions can contribute to expressing certain types of periodontal disease.

Contemporary studies have indicated that periodontal disease can increase the risk of cardiovascular and respiratory diseases and osteoporosis and also accelerate the progression of diabetes. (1)

Periodontal disease is the second most common oral pathology. A systematic review of the global burden of 291 diseases reported that severe periodontitis is the sixth most prevalent condition, affecting about 11% of

the world's population and that its presence increases with age and in populations with low socioeconomic status. (2)

The prevalence of severe periodontitis increased gradually with age, showing a pronounced increase between the third and fourth decades of life, driven by a peak in incidence around the age of 38. It peaked at the age of 40 and remained stable at older ages. Although new cases of severe periodontitis developed with increasing age, the incidence was low and relatively constant at more advanced ages.. (3)

DEVELOPMENT

Periodontal disease

Periodontal disease results from an altered and exacerbated immunoinflammatory response to periodontal pathogens. Periodontal diseases are usually divided into infections that affect the underlying dental support tissues of the periodontium, including the periodontal ligament and the alveolar bone, known as periodontitis. Periodontal disease is the most common chronic inflammatory disorder in adults and can lead to tooth loss in the absence of adequate treatment. (5)

Gingivitis

Gingivitis is an inflammatory lesion caused by the interaction between dental biofilm and the host's immune response. It remains contained within the gum without spreading to the periodontal ligament, cementum, and alveolar bone. This lesion is reversible by reducing the dental biofilm levels present at the gingival margin or apices. Controlling gingival inflammation is fundamental for the primary prevention of periodontitis. (6)

Periodontal disease is closely related to non-communicable diseases such as pancreatic cancer, diabetes, atherosclerotic circulatory disease, osteoporosis, rheumatoid arthritis, lung disorders, chronic kidney disease, obesity, and Alzheimer's disease, high blood pressure, hepatitis, hypothyroidism, and different habits such as smoking. Therefore, there has been a continuous interest in evaluating the composition of the dental microbiota associated with health and disease.

Table 1. Prevalence of conditions modifying the risk of periodontal disease.

<i>Condición Modificadora</i>	<i>Prevalencia(%)</i>
Diabetes**	8,7
Obesidad*****	58
Alcohol*	12.4
Drogas Ilícitas*	5.4
Estrés*	4.6
Asistencia a citas de mantenimiento	NR
Hábito de fumar***	20.0
Raza-Etnia	NR
Edad	NR
Factores sociodemográficos	NR
Sexo	NR
Nivel socioeconómico(Pobreza)****	30,2
Control de placa y autocuidado	NR

Source: Marín Jaramillo R, Duque Duque A. Conditions modifying the risk of periodontal disease: a narrative review of the evidence in Latin America. *CES odontol* [Internet]. 2021 [cited 2022 Aug 3];34(1): 83.

The association of local, functional, and systemic etiological factors with periodontal diseases can vary at different times during a person's life, from which it follows that the timely identification of such factors is essential to reduce the state of the current disease, prevent its onset, stop its progress, a necessary condition to determine its onset, progress, and extent. (7)

A new classification of periodontal diseases

The new 2017 classification of periodontal and peri-implant diseases and disorders is the product of the work of many experts who classify them into four groups:

- Group 1: Periodontal health, diseases and gingival disorders.
 - Group 2: Periodontitis.
- Group 3: Periodontal manifestations of systemic diseases and developmental and acquired alterations.
Group 4: Peri-implant diseases and alterations.

Periodontitis

In the context of clinical care, a patient is considered a “case of periodontitis” when:

Loss of clinical interdental attachment is detected in 2 or more non-adjacent teeth, or 2. Loss of clinical attachment is detected on free surfaces ≥ 3 mm with PPD > 3 mm in 2 or more teeth.

3. An individual case of periodontitis should be further characterized using a simple matrix describing the disease's STAGE and DEGREE. The STAGE depends on the severity of the disease and its presentation, as well as the complexity of the necessary treatment. It also includes a description of the EXTENT AND DISTRIBUTION in the dentition. The extent is evaluated after determining the stage, and the percentage of teeth present in the mouth is described, along with the level of severity that defines the stage (Table 2). The GRADE provides information on the biological characteristics of the disease, including history and analysis based on the rate of progression of periodontitis, risk assessment of further progression, and analysis of possible poor treatment outcomes (Table 3). (8)

Stages

Periodontitis staging is based on the disease's severity, complexity, and distribution. Four stages are considered;

- Stage I: initial periodontitis.

Considering the limit between gingivitis and periodontitis, stage I represents the early stages of attachment loss. Patients with stage I have developed periodontitis due to persistent gingival inflammation and dysbiosis of the biofilm. In this stage, there is a clinical attachment loss of 1 to 2 mm in the most affected tooth, with bone destruction of less than 15% of the coronal third of the root. Its early diagnosis offers opportunities for timely intervention.

- Stage II: moderate periodontitis.

This indicates that periodontitis is already established. It is characterized by the most affected tooth showing a loss of attachment of 3 to 4 mm, bone loss involving only 15% to 33% of the coronal third of the root, and complexity factors being probing depths less than or equal to 4 mm with horizontal bone destruction in most teeth. Its extent can be localized or generalized.

Stage III: severe periodontitis with potential for additional tooth loss. Here, periodontitis causes significant damage to the attachment apparatus and, if left untreated, can lead to the loss of one or more teeth. This stage is characterized by the presence of attachment loss equal to or greater than 5 mm in the most affected tooth and bone loss extending to the middle or apical third of the root. Complexity factors are observed, such as probing depths greater than or equal to 6 mm, intraosseous defects greater than or equal to 3 mm, with possible involvement of furcation II or III, and a history of tooth loss of one to four teeth due to periodontitis. The extension can be localized or generalized.

- Stage IV: advanced periodontitis with potential for tooth loss.

This is the most advanced stage. Periodontitis has caused considerable damage to the periodontal support, and there is a history of multiple teeth lost to the disease, which has led to a loss of masticatory function. In this stage, as in stage III, a loss of attachment of 5 mm or more and deep bone lesions extending to the apical part of the root in the most affected tooth is observed; it is differentiated by presenting tooth absence, leaving less than 20 teeth present, dental hypermobility due to secondary occlusal trauma and collapse of the posterior containment.

The stages are established in each clinical case based on the medical history, periodontal data, and radiographic images.

Three elements determine severity:

- Interdental insertion loss (PIC).

- Radiographic bone loss.
- Tooth loss.
- The loss of clinical interdental insertion should be assessed from the most affected site; radiographic bone loss is evaluated with the percentage of loss of bone support presented by the root, and tooth loss is determined by the number of teeth lost attributable to periodontitis.

The complexity aims to control the current disease and manage function and aesthetics; it is determined by local factors present, such as probing depth, type of bone loss (horizontal or vertical), degree of furcation involvement, ridge defects, and the need for complex rehabilitation due to masticatory dysfunction, secondary occlusal trauma, bite collapse, and the number of remaining teeth.

The extent of periodontitis is determined according to the amount of destroyed and damaged tissue. According to the teeth affected periodontally, it is specified as localized when less than 30% of the teeth are compromised and generalized when more than 30% of the teeth are compromised. A molar/incisor distribution is assigned when only the first molar and the incisors are involved.

Table 2. Periodontitis stages.

		ESTADÍO I	ESTADÍO II	ESTADÍO III	ESTADÍO IV
Gravedad	NIC interdental en la zona de mayor pérdida	1-2 mm	3-4 mm	≥ 5 mm	≥ 5 mm
	Pérdida ósea radiográfica	1/3 coronal (<15%)	1/3 coronal (15-30%)	Extensión al 1/3 medio o apical de la raíz	Extensión al 1/3 medio o apical de la raíz
	Perdidas dentarias	No hay pérdida de dientes debido a periodontitis		Pérdida de dientes debido a periodontitis ⁽¹⁾ ≤ 4	Pérdida de dientes debido a periodontitis ⁽¹⁾ ≥ 5
Complejidad	Local	PS máxima ≤ 4 mm	PS máxima ≤ 5 mm	Presenta además al ESTADÍO II : PS ≥ 6mm	Presenta además al ESTADÍO III: <u>Necesidad de rehabilitación compleja</u> debido a: Disfunción masticatoria \trauma oclusal secundario (movilidad ≥ 2) Defecto severo de reborde Colapso oclusal Menos de 20 dientes remanentes (10 pares opuestos)
		Pérdida ósea Mayormente horizontal	Pérdida ósea mayormente horizontal	PO vertical ≥ 3 mm Lesión de furcación grado II o III Defecto de reborde moderado	
Extensión y distribución(2)	Agregar al ESTADÍO como descriptor	Para cada ESTADÍO agregar la extensión y distribución: LOCALIZADA <30% dientes afectados/ GENERALIZADA ≥30% dientes involucrados / PATRÓN INCISIVO-MOLAR			

Source: Asquino N, Bueno L, Mayol M. Classification of periodontal and peri-implant diseases and conditions 2017. 2019 Aug. pp 8-155. Available at: <https://tinyurl.com/mr46k5u6>.

Figure 1.



Source: Tonetti MS, Greenwell H, Kornman KS. Staging and grading of periodontitis: Framework and proposal of a new classification and case definition. *J Clin Periodontol.* 2018;45(Suppl 20):S149-S161.

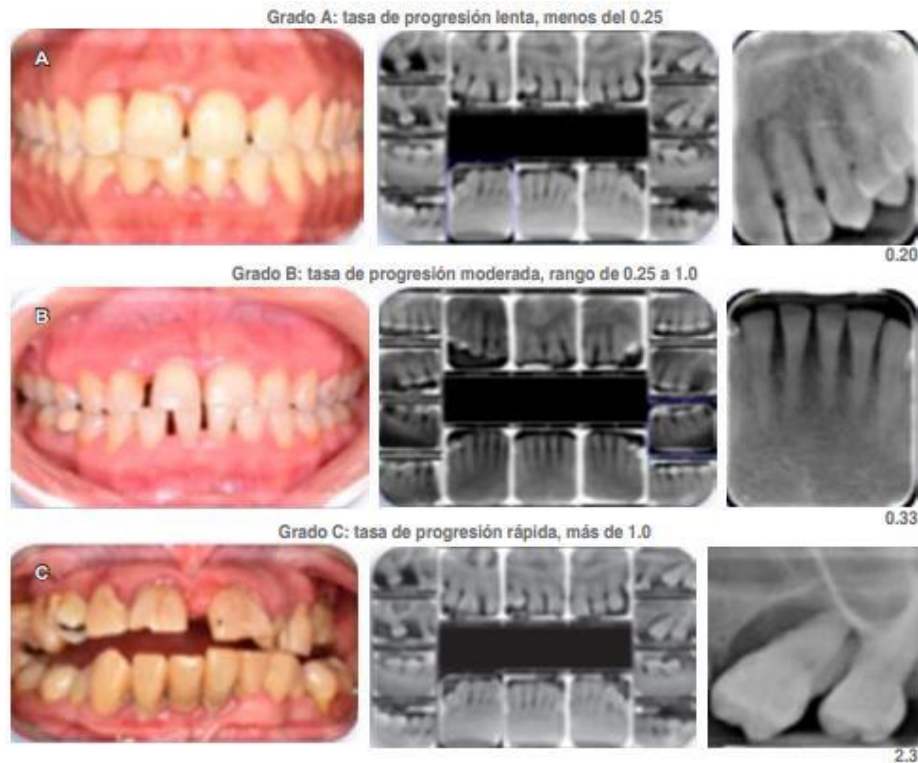
Grades

The grade allows the rate of progression to be considered.

- Grade A: slow progression.
- Grade B: moderate progression,
- Grade C: rapid progression.

To assign the grade, the main criterion should be the rate of progression of the loss of osseous or insertion level over time, based on available direct or indirect evidence. (9)

Figure 2.



Source: Tonetti MS, Greenwell H, Kornman KS. Staging and grading of periodontitis: Framework and proposal of a new classification and case definition. *J Clin Periodontol.* 2018;45(Suppl 20):S149-S161. (10)

Table 3. Degrees of periodontitis.

			GRADO A Lenta tasa de progresión	GRADO B Moderada tasa de progresión	GRADO C Rápida tasa de progresión
Criterio primario	Evidencia directa de progresión	Datos longitudinales PO-RX o de pérdida de NIC	No hay evidencia de PO-RX ni de pérdida de NIC en los últimos 5 años	Pérdida < 2 mm en los últimos 5 años	Pérdida \geq 2 mm en los últimos 5 años
	Evidencia indirecta de progresión	Relación % PO-RX/edad	< 0,25	0,25-1	> 1
Factores modificadores	Factores de riesgo	Fenotipo	Grandes depósitos de biofilm con niveles bajos de destrucción	Destrucción proporcional a los depósitos de biofilm	Destrucción supera las expectativas según depósitos de biofilm. Patrón clínico que sugiere periodos de progresión rápida y/o patología de aparición temprana (ej. patrón molar-incisivo, falta de respuesta esperada al tratamiento habitual)
		Fumar	No fumador	< 10 cig/día	\geq 10 cig/día
		Diabetes	Glucemia normal/no diagnóstico de diabetes	HbA1c < 7% en paciente con diabetes	HbA1c \geq 7% en paciente con diabetes

Source: Asquino N, Bueno L, Mayol M. Classification of periodontal and peri-implant diseases and conditions 2017. 2019 Aug. pp 8-155. Available at: <https://tinyurl.com/mr46k5u6>.

The new classification prioritizes the definition of primary systemic disease, referring to pathologies such as neoplasms or syndromes that affect periodontal tissues independently of the biofilm.

Patients with severe attachment loss often have minimal levels of bacterial plaque on the affected teeth, indicating that the amount of plaque does not significantly influence the periodontal disease process.

Numerous components define risk assessment. Risk is the probability of an individual developing a specific disease in a given period. The risk of developing the disease varies from one individual to another.

(11)

Risk factors

Risk factors are environmental, behavioral, or biological factors that, when present, increase the likelihood that a subject will develop the disease. Risk factors are identified through longitudinal studies of patients with the disease of interest.

Smoking

Firstly, we can mention a common habit among patients: tobacco use as a risk factor for periodontal disease. This factor is well-established for periodontitis. There is a direct relationship between smoking and the prevalence of periodontal disease. This relationship is independent of other factors, such as oral hygiene or age. Studies comparing the response to periodontal treatment in smokers, ex-smokers, and non-smokers have shown that smoking hurts the response to treatment. However, people who used to smoke respond similarly to non-smokers. (12) Several studies have linked smoking to a greater likelihood of developing periodontitis. When the behavior of smokers is assessed by the interventions used in their treatment, they have a less favorable outcome. (13)

One of the first periodontal alterations is gingival recession and epithelial hyperplasia. Between 25-30% of smokers present with gingival recession. On the other hand, high levels of inflammatory mediators such as interleukin-1 and prostaglandin E2 have been detected in smokers, which can induce leukoplakia. When the individual stops smoking, most areas with these white mucosa lesions tend to reverse. (14)

It is widely believed that long-term tobacco use depresses or inactivates taste receptors and the salivary reflex. Presumably, this can lead to altered taste receptors and changes in salivary secretion. Evidence from cross-sectional and case-control studies in various populations shows that adult smokers are approximately three times more likely to suffer from periodontitis than non-smokers. Likewise, the association between smoking and attachment loss is strongly related to the definition of periodontitis, which establishes that it is more severe in smokers, with attachment loss in smokers being six times greater than in non-smokers. Although periodontal disease is a multifactorial entity, salivary pH should be considered as one factor contributing to the initiation or development of periodontal lesions in smokers, perhaps by promoting the formation of dental calculus, increasing nicotine absorption, or probably both. (15)

Age

Both the prevalence and severity of periodontal disease increase with age. Evidence of attachment loss in patients may have greater consequences in younger patients.

According to evidence, risk determinants such as genetic factors indicate that genetic differences between individuals explain why some develop periodontal disease and others do not.

Gender

Gender plays a role in periodontal disease. Surveys in the United States have shown that men have more attachment loss than women. In addition, those with poorer oral hygiene than women, as evidenced by higher levels of plaque and calculus. Therefore, the gender difference in the prevalence and severity of periodontitis seems to be more related to prevention practices than to genetic factors. (16)

Genetic

Genetic factors play an important role in susceptibility to the disease. However, the complex interactions between the host response mechanisms and the action of pathogenic microorganisms have made it more challenging to clarify the role of genetic factors in periodontal disease. The influence of genetic factors on periodontitis offers different types of periodontal disease. (17)

Socioeconomic

Socioeconomic status: Although gingivitis and poor oral hygiene may be related to low socioeconomic status, the cause is more likely to be attributed to lower dental awareness and a lower frequency of visits to the dentist. Thus, we can conclude that, although it depends on the patient, the socioeconomic factor is not considered a determinant that generates risk in periodontal disease.

Stress

Emotional stress can interfere with normal immune function and produce higher levels of hormones in the circulation, affecting the periodontium. Stressful events lead to a higher prevalence of periodontal disease, and there is a relationship between psychosocial factors and risk behaviors such as smoking, poor oral hygiene, and chronic periodontitis. (18)

Diabetes

Diabetes is an obvious risk factor for periodontitis. Epidemiological data shows that there is a higher prevalence and severity of periodontitis in patients with diabetes mellitus one and two than in those who do not have it. It corresponds to a group of metabolic diseases characterized by the maintenance of a condition of hyperglycemia that may have its origin in defects in insulin secretion, alterations in the action of insulin on target cells, or both processes. Periodontal repair in diabetic patients, even without proper metabolic control of the disease, shows significant deficiencies. (19)

With diabetes mellitus, the processes of healing and repair are affected, among other mechanisms, by the appearance of reactive oxygen species, TNF-alpha, and AGE. These compounds inhibit collagen production by osteoblasts and fibroblasts, promote local and systemic inflammation, and increase the apoptosis of cells altered by local inflammation. Periodontal infection, being chronic, generates a massive and prolonged release of inflammatory mediators, which produces a constant peripheral blockage of cellular insulin receptors and impedes the hypoglycaemic action of this hormone. (20)

Some authors believe that the decrease in saliva in patients with diabetes is related to an increase in diuresis or polyuria, which implies a notable decrease in extracellular fluid and saliva production, which influences the participation of healing and immunity in the oral cavity. (21)

Cardiovascular diseases

The relationship with cardiovascular disease has a debatable association. However, nowadays, the scientific evidence evaluated in recent decades could justify the association of periodontal disease with cardiovascular disease.

Periodontitis is a risk factor for atherosclerosis and coronary heart disease.

Atherosclerosis is a progressive disease characterized by the accumulation of lipids and fibrous elements in the large arteries. It is one of the most important contributors to the development of cardiovascular disease. Oral microorganisms contribute to the formation of atheromas since periodontal pathogens help stimulate endothelial cells via the bloodstream and recruit monocytes and serum fibrinogens that contribute to vasculitis and atherosclerotic lesions.

Obesity.

Obesity is another of the most important health risks; it is associated with higher morbidity and mortality; this condition is aggravated by a series of diseases such as hypertension, coronary heart disease, osteoarthritis, and type 2 diabetes. Studies indicate that periodontitis is associated with a systemic state of chronic inflammation characterized by increased circulating levels of C-reactive protein and tumor necrosis factor-alpha (TNF-alpha).

Rheumatoid arthritis

Both periodontal disease and rheumatoid arthritis can be seen to present destructive inflammatory lesions characterized by an accumulation and persistence of inflammatory infiltrates in local lesions. These types of patients are usually more likely to show periodontitis compared to patients who do not have arthritis. In contrast, moderate to severe periodontitis patients were more susceptible to arthritis. These observations suggest that it is essential to warn patients about their high risk of developing both diseases. Interleukin 6 is found at higher levels in inflamed gingival tissue, crevicular fluid, and plasma in patients with periodontitis. (22)

Osteoporosis

Although evidence suggests an association between osteoporosis and periodontal disease, there is no consensus due to the variation in the measurements of osteoporosis and periodontitis. Larger populations and standardized measurements are required to identify whether or not osteoporosis is a risk factor for periodontitis and, if so, to what extent it contributes to the overall risk of this disease.

Diet

Most chronic conditions, such as cardiovascular disease, diabetes, cancer, obesity, and oral disease, are closely related to diet. An association has been found between vitamin C deficiency and greater severity of periodontal disease. (23)

Respiratory diseases

Respiratory infections offer a lesser association, but the oropharyngeal region, adenoids, and maxillary sinuses can behave very differently in the face of the source of contamination with pathogenic microorganisms in susceptible individuals. The association between respiratory and periodontal disease is quickly established when a condition diminishes the host's defense mechanisms. An infection of the respiratory tract begins with the contamination of microorganisms from the oral cavity to the epithelium of the lower respiratory tract through aerosol droplets or by breathing oral secretions from those who have poor oral hygiene and contain high concentrations of oral microorganisms and pathogens. Periodontitis influences the incidence of pulmonary infections in episodes of pneumonia, particularly in high-risk patients. Patients with periodontal disease carry high levels of proteolytic bacteria such as *Porphyromonas gingivalis* and spirochetes that produce enzymes such as proteases. The increase in these enzymes and various hydrolytic salivary proteins is due to the increase in bacterial biofilm complexes, which destroy the protective domains of the host's secretion components and diminish the host's non-specific response against respiratory pathogens in high-risk patients. The results of various analyses corroborate the possible association between periodontal and respiratory diseases, indicating a positive correlation between poor oral hygiene, developing periodontal diseases, and the latent risk of developing respiratory diseases. (24)

Lifestyles (oral hygiene)

Oral hygiene habits differ around the world and vary according to culture. People in high-income countries generally adopt healthier lifestyles, including regular tooth brushing, fluoride toothpaste, and oral hygiene aids. However, oral hygiene habits show significant variations between countries according to income, level of education, and place of residence. The WHO reports that the level of education is a particularly relevant factor in oral hygiene practices. In this regard, it has been observed that regular oral hygiene practices are less frequent in low- and middle-income countries and are associated with indicators of socioeconomic status. (25)

CONCLUSIONS

Periodontal disease is a chronic inflammatory disorder that affects the tissues supporting the teeth and can progress to cause tooth loss if not adequately treated. Several factors, such as smoking, age, gender, genetics, socioeconomic status, stress, and systemic diseases, such as diabetes, high blood pressure, and obesity, have been identified as determining factors in the progression and severity of this pathology.

The new classification of periodontal diseases allows for a more precise understanding of their stage and degree, highlighting the importance of early and personalized diagnosis. Advances in understanding risk factors and the interaction between immunological mechanisms and systemic conditions have demonstrated the relevance of comprehensive care that encompasses both periodontal management and the prevention of related diseases.

It is essential to recognize the influence of lifestyle and oral hygiene habits in preventing periodontal diseases. Regular oral hygiene practices, associated with adequate education and awareness, are essential to control this condition.

Finally, the importance of approaching periodontal disease from a multidisciplinary perspective is emphasized. This approach prioritizes patient education, access to quality health services, and the implementation of preventive strategies based on scientific evidence to improve oral and general health.

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CONFLICT OF INTEREST

None.