Periodontal Disease Severity and Systemic Diseases Prevalent in a Caribbean Catchment Area of Patients

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ABSTRACT

Objective: *To describe associations between the prevalence of periodontal disease severity and co-existence of systemic disease(s) and a smoking habit amongst periodontal referrals in a Caribbean catchment area of patients.*

Methods: *A total of 100 patients completed a medical history questionnaire and were categorized for periodontal disease severity, using clinical and radiographic parameters for association with the prevalence of systemic diseases.*

Results: *Twenty-two per cent presented with moderate periodontal disease (M/F ratio: 1:2.7). 68% of patients examined presented with severe periodontal disease (M/F ratio: 1:1.35). Amongst patients of the same mean age of 48 years presenting with moderate or severe periodontal disease, there was a two-fold increase in the number of missing teeth, amongst patients with severe periodontal disease. In this category there was twice the proportion of smokers and twice the number of mobile teeth, compared with those with moderate periodontal disease. In addition, there was twice the prevalence of diabetics and three times the proportion of patients with combined systemic diseases amongst those with severe periodontal disease, compared with those presenting with moderate periodontal disease, who were predominantly hypertensive or had rheumatoid arthritis. A history of smoking, diabetes mellitus and a combined manifestation of systemic diseases appeared to be more prevalent amongst those with severe periodontal disease. All these findings were significant (p < 0.001).*

Conclusion: *An association between severity of periodontal disease and co-existence of systemic diseases may have implications for a unified therapeutic strategy for health.*

Severidad de la Enfermedad Periodontal y Enfermedades Sistémicas en una Zona de Captación de Pacientes en el Caribe

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RESUMEN

Objetivo: *Describir las asociaciones entre la prevalencia de la enfermedad periodontal y la co-existencia de enfermedades sistémicas y el hábito de fumar entre los casos periodontales referidos en una zona de captación caribeña de pacientes.*

Métodos: *Un total de 100 pacientes contestó un cuestionario de historia médica y fueron clasificados en correspondencia con la severidad de la enfermedad periodontal, usando parámetros clínicos y radiográficos para la asociación con la prevalencia de las enfermedades sistémicas.*

Resultados: *El veintidós por ciento presentó la enfermedad periodontal moderada (proporción M/F: 1:2.7). El 68% de los pacientes examinados presentó la enfermedad periodontal severa (proporción M/F: 1:1.35). Entre los pacientes de la misma edad promedio de 48 años que se presentaron con la*

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enfermedad periodontal moderada o severa, hubo un aumento doble en el número de dientes perdidos entre los pacientes con la enfermedad periodontal severa. En esta categoría hubo una doble proporción de fumadores y dos veces el número de dientes móviles, en comparación con aquellos que presentaban enfermedad periodontal moderada. Además, hubo dos veces más prevalencia de diabetes y una proporción tres veces mayor de pacientes con enfermedades sistémicas combinadas entre aquellos que presentaban enfermedad periodontal severa, en comparación con aquellos que tenían la enfermedad periodontal moderada – quienes eran predominantemente hipertensos o padecían de artritis reumatoide. Antecedentes de hábito de fumar, diabetes y una manifestación combinada de enfermedades sistémicas resultaron ser más prevalentes entre los que padecían la enfermedad periodontal severa. Todos estos hallazgos fueron significativos (p < 0.001).

Conclusión: *Una asociación entre la severidad de enfermedad periodontal y la co-existencia de enfermedades sistémicas puede tener implicaciones en una estrategia terapéutica unificada para la salud.*

INTRODUCTION

Specific bacterial pathogens cause periodontal disease. The resulting host immuno-inflammatory response although protective, can be excessive in contributing to periodontal destruction and loss of tooth support (1), modulated by genetic, environmental and systemic factors (2). There is an association between periodontal disease, cardiovascular disease (3) and diabetes (4). The extent of the inflammatory burden caused by periodontal disease can influence systemic diseases with a similar inflammatory pathology and *vice versa,* raising an important issue regarding periodontal and systemic health affecting each other. It is relevant that uncontrolled diabetes mellitus is associated with more severe destructive periodontal disease. This damage appears to be worse in smokers (5) and an association with existing cardiovascular disease has been identified (6).

Cardiovascular disease (CVD) is a significant cause of morbidity and mortality amongst Caribbean people living in England (7). Additive increases in cytokine levels when both diabetes and CVD are present is suggestive of a common pathological process (8). Several studies have demonstrated the relevance of these diseases to morbidity in Caribbean populations, but few have linked them to the prevalence or severity of periodontal diseases. The blood glucose level is a risk marker for CVD among apparently healthy individuals without diabetes (9). Co-existence of severe periodontal disease in such cases could contribute to the prognosis of the triad of disease presentation. This has potential for a unified therapeutic strategy such as the preventive use of aspirin as an anti-atherosclerotic and anti-diabetic agent (10).

The association between risk factors for rheumatoid arthritis (RA) and severity of periodontal disease (11) is relevant. Biomarkers of inflammation associated with CVD were found to be elevated in women with RA (12). The recognition and management of patients in these categories of risk is an important health service issue, with possible implications for prognosis and treatment outcome of co-existing periodontal disease. The purpose of this study was to identify systemic risk factors in patients referred, for management

of periodontal diseases, to a dental teaching hospital located in a Caribbean catchment area of London, England. In this pilot study of 100 referred periodontal patients, the authors have presented data related to co-existing systemic diseases and a smoking habit in order to identify associated factors of possible relevance to the severity of periodontal disease in these subjects.

METHODS

New patients referred for periodontal consultation at a consultant clinic at King's College Dental Hospital, King's College, London, were examined prior to placement on the waiting list. The criteria for referral by dental practitioners were based on the presence of severe disease for age, acute, refractory conditions and also those associated with medical conditions requiring special management. A medical history questionnaire was filled in by every patient, including a history of smoking. Other details recorded were the age and gender of patients examined. The study was registered as required by the Audit Committee of King's College Hospital Trust, King's College, London.

Clinical examination for periodontal pockets consisted of a basic periodontal examination. In this system, the deepest gum pocket depths were recorded for each sextant of the mouth, using a periodontal pocket probe. The probe used for this study was fully calibrated in millimetres. Other parameters of the clinical examination were gingival recession, tooth mobility and missing teeth.

Radiographic examination and diagnosis

Radiographic examination consisted of a dental orthopantomogram and long cone periapical radiographs of individual teeth where required. Based on the proportion of root length supported by bone of up to a third, half and less than half, a diagnosis of early, moderate or severe periodontal disease was made. A diagnosis of gingivitis was made when there was no evidence of bone loss, presenting with gingival inflammation only. The clinical and radiographic parameters of patients in each of the categories of chronic marginal

gingivitis, early, moderate and severe periodontal disease were analyzed in relation to the coexistence of diabetes, cardiovascular disease, arthritis and a smoking history.

The data are presented as the proportion of individuals in each category of periodontal disease with details of age and gender in relation to the proportion presenting with each of the above systemic diseases mentioned and a smoking habit.

Statistical testing

The chi-square (X^2) test was used as a basic statistical test for comparison of sample proportions of moderate and severe periodontal disease, presenting with missing teeth, hypertension, arthritis, diabetes, a smoking habit and combined systemic diseases. This enabled significance testing of the association between severity of periodontal disease and the prevalence of systemic diseases.

RESULTS

Findings of those with chronic marginal gingivitis or early periodontal disease

Amongst the 100 patients examined, 10% of the sample presented with chronic marginal gingivitis or early periodontal disease. They were all female. Of the 10%, 8% were in the age range of 20–38 years with clear medical histories and 2% were aged 48–75 years with hypertension and arthritis. The mean age of this sample was 34 years. It is notable that there were no smokers in this category. Due to the small number of patients in this category, the data were not analyzed further.

Findings amongst moderate and severe periodontal disease categories

Amongst the samples of individuals with coincidentally the same mean age of 48 years presenting with moderate or severe periodontal disease (Table), the severe disease category presented with the following findings, when compared with moderate periodontal disease: a two-fold increase in the prevalence of individuals with missing teeth in patients with severe disease; a 50% increase in the number of missing teeth per person; a 4-fold increase in the prevalence of hypertension; a 10-fold increase in the prevalence of arthritis; twice the proportion of diabetics; twice the proportion of smokers and three times the proportion of patients with combined systemic diseases. Those with moderate disease were predominantly hypertensive or had rheumatoid arthritis.

A history of smoking, diabetes and combined manifestations of systemic disease appear to be more relevant to the manifestation of severe periodontal disease. Differences in the above local and systemic parameters between moderate and severe periodontal disease were significant ($p < 0.001$), using the chi-square test.

Table: Comparison of variables in patients with moderate and severe periodontal disease

Variable	Levels of periodontal disease	
	Moderate (n = 22)	Severe (n = 65)
Mean age	48 years	48 years
Male: Female ratio	1:2.7	1:1.35
Mean pocket probing depth	6 mm	7 mm
Mean recession	1–2 mm	4 mm
Mean number of Grade 1 mobile teeth	2–3	7
% of individuals with missing teeth	18%	30%
Mean number of teeth missing	5	7
% of individuals with hypertension	40%	10%
Arthritis	23%	2%
Diabetes	5%	8%
Smoking	14%	29%
Average number of cigarettes/day	12	17
Combination of hypertension with arthritis, diabetes, smoking or all three	5%	16%

DISCUSSION

In the samples studied, the mean age of those with moderate periodontal disease was similar to that presenting with severe periodontal disease and therefore can be compared for other parameters of periodontal disease severity. In view of the virtual absence of relevant medical history in the chronic marginal gingivitis/early periodontal disease group (data not presented), they serve as controls for correlation of these parameters with the moderate and severe disease group. This is a suitable foundation for discussion of systemic disease presentation.

It is of interest that a high proportion of individuals in the moderate periodontal disease group presented with hypertension alone or arthritis alone amongst the systemic conditions discussed. This was also true of the small proportion of individuals presenting with hypertension (10%) or arthritis (10%) alone in the early periodontal disease category in the sample under study. These subjects with hypertension or arthritis were older than others in this group. They were all under treatment. It is possible that effective treatment of two disease entities commonly cited in the literature in association with periodontal disease severity resulted in a moderate presentation of disease which may have been more severe otherwise. Others have reported such associations in the mild/moderate disease category (2).

Other studies have demonstrated that amongst non-smokers, cardiovascular disease, diabetes and rheumatoid disease correlated significantly with the number of missing teeth, as an index of periodontal disease (13). In our study,

amongst those with severe periodontal disease, there was a significantly greater proportion of individuals who smoked and a significant number presented with more than one systemic disease, compared with those who had moderate periodontal disease. A significant proportion of subjects with moderate periodontal disease presented with hypertension or arthritis alone. There were also more mobile and missing teeth in the severe periodontal disease category.

Combined presentations of systemic conditions consisting of hypertension with a) diabetes, b) arthritis or c) a smoking habit and combinations of all three, presented with three-fold greater prevalence in the severe disease category than moderate disease; this was associated with significantly greater numbers of missing teeth for age and greater daily consumption of cigarettes. These associations have been reviewed (5, 6, 14–16).

Diabetes and smoking were also the most prevalent single factors, in those presenting with severe periodontal disease, compared with those with moderate disease. These findings are substantiated by others (17) who found that diabetes, increasing age and use of tobacco products had a statistically significant effect on bone loss in an under-served low-income population of Northern-Manhattan. The study sample investigated demonstrated a significant proportion of subjects with combined presentation of systemic disease in the severe periodontal disease category. This may be a reflection of the magnitude of the inflammatory burden which is of relevance for such an association.

Certain trends have been identified in this pilot study, with questions arising regarding the significance of periodontal health for systemic health and the potential for suitable therapeutic strategy that is likely to benefit periodontal and systemic health in these subjects.

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