Prevalence of periodontitis in a population of patients on dialysis in Colombia

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ABSTRACT

The aim of this study is to establish the prevalence of Chronic Periodontitis (CP) in patients with Chronic Kidney Disease (CKD) and to ascertain its relationship with several factors or indicators of micro inflammation. One hundred and thirty-five CKD patients on dialysis treatment were included. Biochemical parameters, clinical attachment level and pocket depth were recorded according of the American Academy of Periodontology and the CDC (CDC-AAP). Gingivitis and CP were recorded based on the biofilm-gingival interface (BGI) periodontal diseases classification. The rate of non-response to the survey was 10 percent. A total 2,636 teeth in 135 patients were examined, of whom 52.5% were males. Average age was 55.7 years (SD ± 1.32); 41.4% had a smoking history; 78/135 patients were on hemodialysis and 57/135 on peritoneal dialysis; 55.5% had been on dialysis for more than three years. Prevalence of gingivitis and periodontitis was 14.8%, 95% CI (9.7-21.9) and 82.2%, 95% CI (74.7 – 87.8), respectively; according to the BGI Index. Severity of CP was: No periodontitis, 14.0% 95% CI (9.1 - 21.1); mild, 11.1% 95% CI (6.7 - 17.7); moderate, 28.8% 95% CI (21.7 - 37.1); and severe, 45.9% 95% CI (31.6-54.47). Peritoneal dialysis and time on dialysis > 3 years increase the chance of having periodontitis, OR 11.0 95% CI (2.2-53.8) and OR 7.6 95% CI (1.1-50.2), respectively. In view of the high prevalence of CP in this population, programs designed to ensure better periodontal and gingival care in the population on dialysis need to be established.

Prevalencia de enfermedad periodontal en una población de pacientes en diálisis en Colombia

RESUMEN

El objetivo de este estudio fue establecer la prevalencia de Periodontitis Crónica (PC) en pacientes con enfermedad renal crónica (ERC) en diálisis y determinar la relación de su presencia con algunos indicadores de micro inflamación. Un total de 135 pacientes con ERC en terapia dialítica fueron incluidos en este estudio. Se evaluaron parámetros bioquímicos, nivel de inserción clínica (NIC) y profundidad de sondaje (PS), de acuerdo con la Asociación Americana de Periodoncia y el CDC de Atlanta (CDC-AAP). También fue evaluada, la gingivitis y la PC de acuerdo con la clasificación interface biopelicula-encia (BGI). La tasa de no respuesta a la encuesta fue del 10%. Un total de 2636 dientes en 135 pacientes fueron evaluados, (52.5% hombres, edad promedio 55.7 ± 1.32), 56% con antecedente de tabaquismo. 78/135 en hemodiálisis y 57/135 en diálisis peritoneal, el 55.5 % con un tiempo en diálisis mayor a tres años. La prevalencia de gingivitis por la clasificación BGI fue del 14.8% IC 95% (9.7 - 21.9) y de periodontitis 82.2% IC 95% (74.7 – 87.8). La severidad de la PC fue: sin periodontitis 14.0% 95% IC (9.1 - 21.1); leve 11.1% 95% IC (6.7 - 17.7); moderada 28.8% 95% IC (21.7 - 37.1) y severa 45.9% 95% IC (31.6-54.47) La diálisis peritoneal y el tiempo en diálisis aumentaron la chance de tener PC: OR 11.0 95% IC (2.2-53.8) y OR 7.6 95% CI (1.1-50.2) respectivamente. Por la alta prevalencia de PC en esta población, es necesario establecer programas para asegurar el cuidado de la salud periodontal en esta población en diálisis.

Palabras clave: Periodontitis crónica; prevalencia; diálisis peritoneal, insuficiencia renal crónica.

INTRODUCTION

Chronic kidney disease (CKD) has become recognized as a key independent risk factor for several adverse health outcomes including cardiovascular disease (CVD)[1]. There is evidence that supports an inverse relationship between glomerular filtration rate (GFR) and degree of systemic inflammation in these patients[2]. Several epigenetic and genetic factors

influencing chronic inflammatory status have been identified, including reduced cytokine clearance, frequent infections, presence of oxidative stress, intestinal dysbiosis, periodontal disease, metabolic acidosis, deficit of vitamin D, and dialysis-related factors[2]. All these factors serve to perpetuate chronic inflammatory status, which leads to the occurrence of cardiovascular complications, protein-energy wasting, anemia and bone mineral disease; and to increased mortality rates in this population[2].

Acute phase markers are part of the innate immune response to Chronic Periodontitis and have been detected in systemic circulation. Platelet-lymphocyte ratio (PLR) and C-reactive protein are considered to be biomarkers of systemic inflammation[3,4].

The presence of urea in saliva and increased levels of blood urea nitrogen (BUN) have been associated with uremic stomatitis, which normally disappears after BUN values return to normal range[3, 5].

Patients with non-dialysis CKD, those receiving renal replacement therapy with dialysis and even patients with renal transplantation, experience changes in periodontal tissues. These patients usually have increased levels of plaque, calculus and gingival inflammation, as well as gingival hyperplasia and increased prevalence and severity of periodontal disease[5].

Chen et al. have shown a positive correlation between periodontal index, age and time on dialysis. Furthermore, they found an association between the presence of severe periodontal disease and low albumin levels in the population on hemodialysis, which might imply that systemic inflammatory status is a consideration in patients receiving renal replacement therapy[6].

According to a number of reports, 58.9% of prevalent hemodialysis patients have moderate to severe periodontitis[6]. In Thai population the prevalence of severe periodontal disease is 15.9% among the older population and greater prevalence of poor periodontal status in severe (23%) and moderate (25%) CKD (all groups had mean ages >50 years) is observed. The high prevalence of poor periodontal status in patients with severe and moderate CKD,was confirmed[7]. A study conducted in Colombia found that the prevalence of gingivitis among patients on dialysis ranged from 35% to 38%[8] .

The aims of this study are to estimate the prevalence of periodontal disease in the population on dialysis and to evaluate the severity and activity of periodontal compromise as a component of systemic inflammation, to establish which factors could be associated to this pathology.

MATERIALS AND METHODS

An analytical cross-sectional study was conducted, including patients aged 18 and above who had been on dialysis for more than 90 days, with at least six natural teeth, on chronic anticoagulation therapy within therapeutic range, who received care at seven renal clinics in Bogota. Patients who had taken antibiotics during the previous 3 months were excluded. A 2-stage sampling method was used. A probability proportional to size design was used in the first stage, and simple random sampling without replacement in the second stage.

Demographic and clinical variables such age, sex, cause of CKD, dialytic therapy, smoking history, time on dialysis, albumin and PRL were considered in this study. Data were obtained from the RTS Versia® electronic clinical history system and the periodontal assessments database. Periodontal measurements were performed by a single experienced periodontist using a Welch Allyn medical endoscope cold light source and a 15 mm long standard periodontal probe (UNC-15, Hu-Friedy. IL, USA). Measurements of plaque index (PI)[9], bleeding on probing (BOP), pocket depth (PD) and clinical attachment loss (CAL) were recorded at 6 sites per tooth. Root fragments and furcation measurements were excluded. The average value was calculated for each tooth using the measurements at six sites per tooth, and the average value was calculated per subject.

Silness and Loe plaque index was used to score the PI, i.e., 0: No plaque, 1: Presence of plaque only detectable by using the probe, 2: Moderate and visible plaque, 3: Abundance of plaque covering more than one third of the tooth surface.[9]

Bleeding sites were considered for the BOP, and an average value was determined for each subject. The pocket bleeding (PB) was calculated from the proportion of tooth surfaces with pockets per subject. An average value per subject was also calculated for CAL.

Periodontitis was diagnosed based on the Biofilm-Gingival Interface (BGI) index, the main independent variable[10].

Definition and severity of periodontitis were based on the CDC-AAP surveillance proposal, which was

also used to compare the findings of other studies conducted locally[11]. This database has quality controls in place to guarantee the soundness and confidentiality of the information. For the descriptive analysis, we used percentages for categorical variables and means or medians with their respective dispersion measures for continuous variables. Logistic regression was used to conduct multivariate analysis. The statistical analysis was performed using Stata 14® software. This study was conducted with the approval and oversight of an institutional research ethics committee. RTS Ruling number 003, May 17, 2016.

RESULTS

A total 2,636 teeth from 135 patients were examined. Participants' mean age was 55.7 years (SD = 1.32); 52.5% were male; and time on dialysis treatment was longer than 3 years in 55.6% of patients. Details are provided in Table 1.

According to the BGI index, prevalence of gingivitis and periodontitis was 14.8%, 95% CI (9.70-21.95) and 82.2%, 95% CI (74.73-87.85), respectively. Prevalence of periodontitis according to the CDC-AAP severity classification was as follows: Healthy, 14.0%, 95% CI (9.1 - 21.1); mild, 11.1%, 95% CI (6.7 - 17.7); moderate, 28.8%, 95% CI (21.7 - 37.1); and severe, 45.9%, 95% CI (31.6-54.47). See Table 2.

We found that patients on peritoneal dialysis, OR 11.0 95% CI (2.2-53.8), who had been on dialysis for more than 3 years, OR 7.6 95% IC (1.1-50.2) had greater chances of developing periodontitis. Further details are provided in Table 3.

DISCUSSION

The prevalence of CP found in the study population is high, including the prevalence of severe periodontitis according to the CDC-AAP diagnostic criteria[11, 12]. Interestingly, nearly 86.0% of the study population had developed some degree of periodontitis. This result is higher than the 61.8% reported in the ENSAB IV (Spanish acronym for the fourth National Oral Health Study)[13]. In our study, the non-response rate to the assessment was

Table 1: Summary of descriptive data for the sample population

Characteristics of the sample	n= 135	
	n	%
Age [mean, SD] years	55.7 (1.32)	15.33
Male	71	52.59
Dialytic therapy		
Hemodialysis	*78*	*57.78*
Peritoneal dialysis	57	42.22
Smoking history	56	41.48
Time on dialysis		
Less than 1 year	*17*	*12.59*
1 to 3 years	*43*	*31.85*
More than 3 years	75	55.56
Cause of CKD		
High blood pressure	*51*	*37.78*
Diabetes Mellitus	*34*	*25.19*
Other	*21*	*15.56*
Obstructive	*17*	*12.59*
Glomerular	*12*	*8.89*
Albumin [mean; SD] gr/dl	4	0.44
PLR >= 140	77	72.64

CKD= Chronic Kidney Disease; SD= Standard Deviation;
PLR: Platelet to Lymphocyte Ratio

Table 2: Severity and activity of periodontal disease.

n= 135					
Severity of Periodontitis			Activity of Periodontitis		
Periodontal disease (CDC-AAP)	*n*	*%*	*BGI Index*	*n*	*%*
0. No periodontitis	19	14.07	1. Healthy	4	2.96
1. Mild	15	11.11	2. Gingivitis	20	14.81
2. Moderate	39	28.89	3. Mild pocket bleeding	10	7.41
3. Severe	62	45.93	4. Moderate pocket bleeding	20	14.81
			5. Severe pocket bleeding	81	60.00

Table 3: Logistic regression multivariate analysis.

Periodontitis	Odds Ratio	P value	[95% Conf. Interval]	
Smoking history	0.87	0.84	0.22	3.39
Female	0.38	0.16	0.10	1.47
Age; years	1.04	0.07	1.00	1.08
Peritoneal Dialysis: Hemodialysis	11.06	0.00	2.27	53.87
Less than 1 year	Ref			
1 to 3 years	5.04	0.11	0.70	36.43
More than 3 years	7.63	0.04	1.16	50.23
PLR	0.40	0.17	0.11	1.47
Albumin; gr/dl	0.98	0.98	0.25	3.89
PLR: Platelet to Lymphocyte Ratio				

10%, which is not a high figure for dental assessment in patients with chronic disease. These patients did not attend their medical follow-up appointments.

According to the BGI index, periodontitis prevalence is also high in the "Severe pocket bleeding" category (60.0%) and may represent a source of systemic micro-inflammation, since this index accounts for bleeding and periodontal pocket activity. No other study was found assessing the presence of gingivitis and periodontitis in these patients as described in the present study.

Of the 2,636 teeth evaluated, mean bleeding on probing per examined subject was 65.6% ± SD 31.4%; which demonstrates a high level of periodontal tissue inflammation in this study sample. Nevertheless, no association was found between inflammatory market platelet-lymphocyte ratio (PLR) and presence of periodontitis, possibly because of the sample size. This suggests the need for further research on the potential association between CP and inflammation biomarkers such as interleukin 6 and highly sensitive C-reactive protein.

The multivariate analysis showed an association between treatment with peritoneal dialysis and duration on dialysis longer than 3 years and presence of CP. However, these estimators do not ensure the best accuracy, which could also be explained by the sample size, which was originally calculated to estimate the prevalence of periodontal disease. Severity and activity of CP in these patients were higher than reported in published studies on the general population.

CONCLUSIONS

In view of the high prevalence of CP in this population, programs designed to ensure better periodontal and gingival care in the population on dialysis need to be established. As a conclusion, the presence of periodontitis in these patients was higher than in the general population.

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