ORIGINAL ARTICLE

CHRONIC PERIODONTITIS, A SILENT HAZARDOUS DISEASE

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ABSTRACT

Background: Chronic periodontitis is a common disease, which occurs as an outcome of tooth supporting tissue's inflammation (periodontal ligament and gums), initiated by the exposure of the periodontium to dental plaque. By the action of various toxic products liberated from pathogenic plaque bacteria there is periodontal destruction, as well as hosts inflammatory responses elicited against plaque bacteria and their products. Inflammatory processes can be considered as the most essential functional part of pathophysiology of atherosclerosis resulting in cardiovascular disease (CVD). Elevated levels of C – reactive Protein (CRP) have been associated with CVD and regarded as independent determinant of atherosclerosis. This study has been carried out to assess the possible relationship between chronic periodontitis and CVD determinants.

Subjects and Methods: This cross sectional study involved a total of 100 subjects including 50 chronic periodontitis patients and 50 healthy controls between the ages of 35 – 40 years. The patients were obtained from de-Montmorency College of Dentistry, Lahore. A detailed personal history, past medical and dental history was taken. Patients of chronic periodontitis were selected using Community Periodontal Index of Treatment Needs (CPITN), according to inclusion and exclusion criteria. Blood sample were drawn and CRP was measured by using standard enzyme linked immunosorbent assay (ELISA) method. These parameters were compared in chronic periodontitis patients with age and gender matched healthy controls, to observe the significance of difference.

Results: The results of this study showed that serum CRP which was a strong independent risk marker of CVD is statistically significantly elevated in chronic periodontitis patients as compared with age and gender matched healthy controls. The correlation between serum CRP and severity of chronic periodontitis was also highly significant.

Conclusions: The results of this study suggest that elevated CRP in chronic periodontitis patients may predispose them to the development of early atherosclerosis. Because of the significant association of elevated inflammatory mediators with CVD, their determination may help to improve the prediction and prevention of CVD in chronic periodontitis patients as well as these results is expected to bring awareness in people about oral hygiene.

Keywords: Atherosclerosis, CVD, periodontitis.

INTRODUCTION

Chronic periodontitis is most frequently occurring disease distinguished by an inflammation of tissues that support the teeth, resulting in obliteration of the periodontal ligament and destruction of adjacent bone that support the teeth. A large number of people get affected by this disease and it is especially common in adults.[1-4] Periodontitis is usually a low level infection which may exist with moderate systemic inflammatory response. A patient of chronic periodontitis normally faces perturbation of their systemic homeostasis.[5,6] With every patient the systemic response may vary and it is not necessary that all periodontitis patients manifest with the same systemic response.[7,8] It is a common understanding that variable genetic or environmental factors (e.g. cigarette smoking or obesity etc) may produce different levels of systemic response in each patient.[9-11] This disease initiated by an insignificant collection of chiefly anaerobic Gram – negative bacteria originates in microbial biofilms on the tooth surface.[12,13] Gram negative bacteria are known to release lipopolysaccharides. Lipopolysaccharides and other microbial substances access gingival tissue and cause inflammatory reaction, which destroys the periodontal ligament and alveolar bone.[12,14-16] This characterization classified periodontitis into chronic periodontitis, aggressive periodontitis, periodontitis secondary to systemic disease, necrotizing periodontitis and periodontitis associated with endodontic lesions.[1,17]

Chronic periodontitis also called adult periodonti-

tis, is more evident in adults especially in those who are above 35 years. This is in general noticeable in people who have plaque and calculus deposits. Surveys reveal that this type of periodontitis is most common in African Americans. It is also observed that even the young individuals can get this disease resulting in tooth loss and bone destruction.[18-20]

Periodontal diseases are very common and they are prevalent in almost all ages but still evidence shows that its occurrence increases with individual's age About 50% of the adult population has gingivitis and 30% have periodontitis as defined by the presence of three or more teeth with pockets of ≥ 4 mm.[21,22]

In addition a number of factors predispose to the development of periodontitis which include dental plaque, smoking / tobacco use, Genetics, *Pregnancy* and puberty, stress, medications and Diabetes mellitus etc.

It is almost never painful and cause insignificant signs of red, inflamed and bleeding gums. Gingivitis in general is left unresolved and step by step leads to periodontitis which is grave form of infection. Common periodontitis symptoms are constant troublesome bad breath or bad taste in the mouth, changes in teeth occlusion while chewing food, shifted or loosened teeth, discharge coming from teeth and gums, gums recession, teeth that give the impression of being longer because of apical shift of gums.[2,23,24]

Acute – phase proteins are closely associated proteins and in inflammation their circulating level may step up or down. C-reactive protein (CRP) is one of them, secreted by the liver as a consequence of inflammation. Infections and many other diseases may result in high levels of CRP. Patients with raised levels of CRP are at a high risk for diabetes, hypertension and cardiovascular disease.[22,23] In a recent joint consensus conference of American Heart Association (AHA) and the Center for Diseases Control (CDC), the researchers identified three different risk categories based on serum CRP levels i.e. low, medium and high risk patients.[25]

Periodontitis has been conventionally considered as a chronic inflammatory oral disease. It can cause troubles in routine life of many people as it results in teeth loss. In latest researches, there exists the argument of regarding periodontitis as an independent risk factor for the development of atherosclerosis.[26] It can have severe consequences on systemic health. Cellular/ molecular studies disclose that there might be a possible association of periodontitis with alteration in systemic health.[28] It may perhaps be explained by specific bacterial interactions with inflammatory mechanisms. Among many hypotheses, one is that atherosclerosis may manifests itself because of harmful effects of bacteria at vascular endothelial cells; another hypothesis claims that inflammatory cytokines might induce atherosclerosis.[27,28]

MATERIALS AND METHODS

It was a cross sectional, analytical study and a total of 100 subjects having approximately equal number of both genders and 35 – 40 years of age were included in the study. The patients were recruited from the outpatient department of the Teaching Dental Hospital, attached with de-Montmorency College of Dentistry, Lahore. Out of these, 50 subjects were those with history of chronic periodontitis, where as 50 age and sex matched healthy subjects were taken as controls. A detailed personal history, past medical and dental history was taken. Patients of chronic periodontitis were selected using Community Periodontal Index of Treatment Needs (CPITN), according to inclusion and exclusion criteria. Blood sample were drawn and CRP was measured by using standard enzyme linked immunosorbent assay (ELISA) method. These parameters were compared in chronic periodontitis patients and age and gender matched healthy controls to observe the significance of difference.

Dental examinations were performed, according to the WHO protocol by using flat dental mirrors and periodontal probes.

All dental variables were assessed at six different sites around each tooth.

To determine severity of disease we used the CPITN score, average probing depth and gingival bleeding index.

Serum CRP was determined in duplicate by ELISA.

Statistical Analysis

Statistical analysis was carried out with the SPSS version 18. The data was expressed as mean ± standard deviation. The significance of differences between two groups of data was done by applying student's t-test after verification of normality of data and equality of variance. The significance of differences between three or more groups was done by applying ANOVA –test after verification of normality of data and equality of

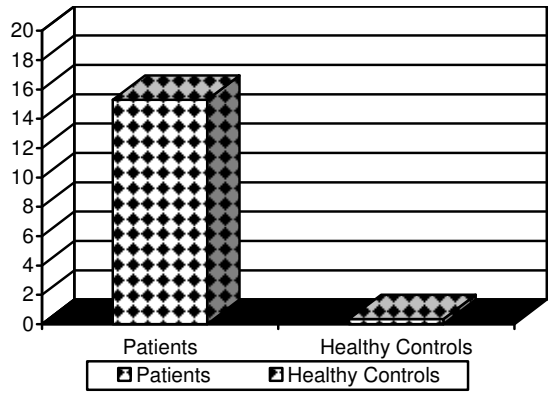

Fig. 1: *Serum CRP in Patients of Chronic Periodontitis and Healthy Controls.*

variance. For qualitative variables, Chi-square test was used to determine the inference. P-value < 0. 05 was considered statistically significant and p < 0. 001 was considered highly significant.

RESULTS

The comparison of anthropomorphic parameters between patients of chronic periodontitis and healthy controls is given in table 1. No significant differences were observed in values of age (p = 0.258), gender (p = 0.791), and socio economic status (p = 0.492) between patients of chronic periodontitis and healthy controls.

Table 1: *Comparison of anthropomorphic parameters between patients of chronic periodontitis and healthy controls*

Parameter	*Patients Mean ± SD (n = 50)*	*Healthy Controls Mean ± SD (n s= 34)*	*P-value*
Age (years)	37.26 ± 1.41	37.61 ± 1.41	0.258*
Gender	50% Male (25) 50% Female (25) SD = 0.5051	52.9% Male (18) 47.1% Female (16) SD = 0.50	0.791*
Socioeconomic Status	10% Rich (5) 74% Middle Class (37) 16% Poor (8) SD = 0.51	14.7% Rich (5) 61.8% Middle Class (21) 23.5% Poor (8) SD = 0.62	0.492*

The comparison of basic parameters in patients of chronic periodontitis and healthy controls are shown in table 2. No significant differences (p>0.05) were observed in values of BMI, arterial pulse, fasting blood glucose etc but there was statistically significant difference (p-value < 0.05) in oral temperature of the two groups (101.63 ± 7.40°C and 98.62±7.19°C).

Table 2: *Comparison of basic parameters in patients of chronic periodontitis and healthy controls.*

Parameter	*Patients Mean ± SD (n= 50)*	*Healthy Controls Mean ± SD (n= 34)*	*P-value*
BMI (Kg/m2)	24.41 ± 0.78	24.20 ± 0.67	0.218
Arterial pulse (per minute)	74.14 ± 3.27	73.67 ± 3.09	0.517
Fasting blood glucose (mg/dl)	89.50 ± 10.21	90.0 ± 10.73	0.830
Systolic BP (mm Hg)	79.0 ± 10.73	78.23 ± 2.42	0.101
Diastolic BP (mm Hg)	122.0 ± 1.47	120.88 ± 1.93	0.311
Pulse pressure (mm Hg)	40.60 ± 2.60	40.88 ± 2.29	0.610
Oral temperature (°C)	101.63 ± 7.40	98.62 ± 7.19	0.003*

Dental variables in patients of chronic periodontitis and healthy controls are summarized in table 3.

Table 3: *Comparison of dental variables in patients of chronic periodontitis and healthy controls.*

Parameter	*Patients Mean ± SD (n= 50)*	*Healthy controls Mean ± SD (n= 34)*	*Difference in p-value*
Color and Texture of gingival	40% (Shiny grey and red, no stippling) 60% (Red, shiny, no stippling) => 100% periodontitis	64.71% (Coral Pink with stippling) 35.29% (pigmented with stippling) => 0% periodontitis	
Bleeding from gums	100% bleeding (70% Severe Bleeding and 30% Moderate Bleeding)	3.76% bleeding	
Number of tooth intact	28.66 ± 1.99	28.17 ± 2.36	0.33
Dentition involved in periodontitis in percentage	79.07 ± 3.85	0.00 ± 0.00	0.001*
Teeth with furcation involvement	7.64 ± 2.36	0.00 ± 0.00	0.001*
Extent of bone loss	34.02 ± 15.16	0.00 ± 0.00	0.001*

Parameter	*Patients Mean ± SD (n= 50)*	*Healthy controls Mean ± SD (n= 34)*	*Difference in p-value*
Radio graphic analysis of disease severity	100% 60% Severe 40% Moderate	0%	
calculus index	4.89 ± 0.60	0.25 ± 0.41	0.001*
Community Periodontal Index of Treatment Needs (CPTIN):	3.86 ± 0.35	0.11 ± 0.32	0.001*
Mean Pocket depth	6.86 ± 0.70	0.64 ± 0.64	0.001*
Number of mobile teeth	7.64 ± 2.36	0.00 ± 0.00	0.001*
Gingival recession	100% 60% Severe 40% Moderate	0%	

Bleeding from gums was negligible in controls but in most of patients there was severe bleeding while probing. Calculus index in CP patients was 4.89 ± 0.60 and in controls was 0.25 ± 0.41. Community Periodontal Index of Treatment Needs (CPTIN) in CP patients was 3.86 ± 0.35 and controls was 0.11 ± 0.32. Mean Pocket depth in CP patients was 6.86 ± 0.70 and in controls was 0.64 ± 0.64. Number of mobile teeth in CP patients was 7.64 ± 2.36 and in controls was 0.00 ± 0.00. Gingival recession in CP patients was severe in 60% of patients and moderate in 40% patients and was not observed in controls.

Serum CRP in healthy controls and age, gender matched periodontitis patients (Fig. 1). Serum CRP (mean ± SD) was highly significantly raised (p< 0.001) in patients of chronic periodontitis(15.28 ± 15.90 mg/l) as compared to healthy controls (0.34 ± 0.26 mg/l).

Serum CRP (mean ± SD) was highly significantly elevated (p < 0.001) in severe chronic periodontitis (23.29 ± 16.14 mg/l) as evaluated against moderate (3.26 ± 1.05 mg/l) and healthy controls (0.34 ± 0.26 mg/l) (Fig. 2).

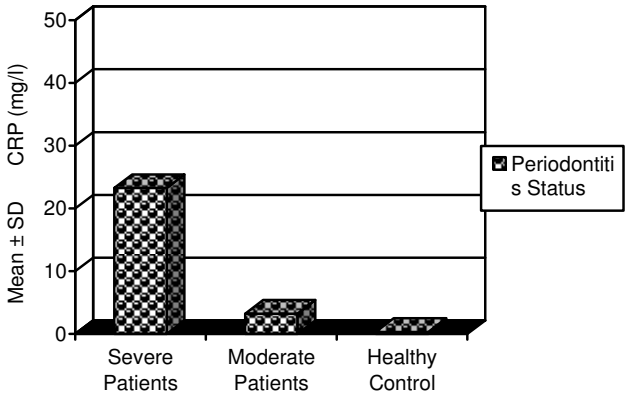

Figure 2: *C-reactive protein (mg/l) concentration in patients with severe, moderate periodontitis and healthy controls.*

DISCUSSION

Gums inflammation (gingivitis) if not treated on time and permitted to grow, ends in chronic periodontitis in which alveolar bone that supports teeth is invaded and destroyed. It is characterized by sensitive and mobile teeth, pocket formation, gums recession, root exposure etc.[1-4]

Increased CVD risk in patients of chronic periodontitis as indicated by inflammatory biomarkers, after adjustment for age, race, hypertension, diabetes, smoking, obesity has been reported in a number of studies.[29-31] This study was conducted in Pakistan to satiate the escalating requirement considering the variable genetic, environmental, traditional, socioeconomic and dietary factors.

In the present study, patient's levels of serum CRP in chronic periodontitis was compared to healthy controls and was found to be significantly raised (p = 0. 001). It also illustrates the assessment of serum CRP in healthy controls, severe and moderate periodontitis patients. Serum CRP was highly significantly raised (p < 0. 001) in patients of severe patients with chronic periodontitis as compared to moderate disease and healthy controls. These results reveal that via systemic inflammation there is sufficient share of untreated severe periodontitis on future atherosclerotic development. C-reactive protein plays principal role in the future prediction of CVD. Furthermore, CRP may play a direct active role in the atherosclerotic process.[22,23] Our data presented here adds to the evidence that biomarkers of systemic inflammation, which are believed to indicate an enhanced risk for the development of

CVD, are elevated in patients with chronic periodontitis.

It is ***concluded*** that oral diseases can affect the health and a clean mouth reflects a healthy body and this study revealed that the serum concentration of the CRP was significantly raised in chronic periodontitis patients as compared to healthy controls. In future, there is possibility of addition of periodontitis in the list of factors considered risk for CVD and treatment of periodontitis has to become a regular component of the therapy for patients of CVD with poor oral hygiene. The results of this study are expected to bring awareness in people about oral hygiene and to evaluate the adverse effect of periodontitis on cardiovascular health.

Limitations of the Study

The present study comprised of 100 subjects divided in two groups, having equal number of both genders and 35 – 40 years of age. Out of these, 50 subjects were those with chronic periodontitis, where as 34 age and sex matched healthy subjects were taken as controls. It was a cross sectional, analytical study and there is clear need of future longitudinal studies with large sample size to further evaluate the high risk of early atherosclerosis in chronic periodontitis patients and the effect of treatment of this disease on CVD.

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