Association Between Chronic Periodontal Disease and Cardiovascular Risk Factor C-Reactive Protein in Blood

Peer review status:
No

Corresponding Author:
Dr. Shivaji Raju Uddarraju,
Assistant Professor, Vishnu Dental College, Department of Oral and Maxillo Facial Surgery - India

Submitting Author:
Dr. Gadde Praveen,
MDS, Public Health Dentistry - India

Other Authors:
Dr. A Anitha,
Assistant Professor, Mamata Dental College, Department of Public Health Dentistry - India
Dr. Md Zabirunnisa,
Assistant professor, Vishnu Dental College, Department of Public Health Dentistry - India

Article ID: WMC004554
Article Type: Original Articles
Submitted on: 12-Feb-2014, 08:06:02 AM GMT  Published on: 12-Feb-2014, 09:48:48 AM GMT
Article URL: http://www.webmedcentral.com/article_view/4554
Subject Categories: DENTISTRY
Keywords: Chronic periodontitis, cardiovascular diseases and CRP levels

How to cite the article: Uddarraju S, Praveen G, Anitha A, Zabirunnisa M. Association Between Chronic Periodontal Disease and Cardiovascular Risk Factor C-Reactive Protein in Blood. WebmedCentral DENTISTRY 2014;5(2):WMC004554

Copyright: This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC-BY), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Source(s) of Funding:
None

Competing Interests:
None
Association Between Chronic Periodontal Disease and Cardiovascular Risk Factor C-Reactive Protein in Blood

Author(s): Uddarraju S, Praveen G, Anitha A, Zabirunnisa M

Abstract

Background: Periodontal disease is one of the major reasons for tooth loss. Accumulating evidence suggests that chronic infections, such as periodontitis, are associated with increased risk for cardiovascular diseases (CVD) possibly through providing a systemic inflammation and found that 25 to 50% increase in risk of CVD for those with periodontitis when compared to those with no or minimal periodontitis.

Aim: To evaluate the association between chronic periodontal disease and cardiovascular risk factors like C-reactive protein levels in blood.

Materials and methods: A hospital based study was conducted among the patients who came to the out-patient department. Fifty Subjects including both males and females were selected by systematic random method and community periodontal index was recorded on all subjects. Subjects were divided into healthy group (controls) and chronic periodontitis group (cases) based on present/absent of loss of attachment. Blood samples were collected from all subjects for the measurement of CRP levels in the serum.

Results: Mean CRP values in controls and cases were 0.812 and 2.35 respectively which was statistically increased in cases (p=0.001).

Conclusion: Chronic periodontitis patients may have high risk of getting cardiovascular diseases since cardiovascular risk factor such as increased levels of CRP are associated with Periodontitis.

Introduction

Periodontitis is a chronic inflammatory disease, which destroys connective tissue and bone that support the teeth. Periodontal disease is one of the major reasons for tooth loss and impaired oral health. Poor oral health may have a profound effect on general health and the experience of pain, problems with eating: chewing, smiling and communication due to missing teeth have a major impact on people’s daily lives and well-being. Severe periodontitis, which may result in tooth loss, is found in 5–20% of most adult population worldwide. India is experiencing a rapid health transition, with large and rising burden of chronic diseases and the Global Burden of Disease Study, estimated that the number of deaths attributable to chronic diseases would rise from 3-78 million in 1990 (40.4% of all deaths) to 7-63 million in 2020 (66.7% of all deaths).

Among all the chronic diseases, cardiovascular diseases are the most prevalent diseases which are responsible for high morbidity and mortality among young adults. Compared with all other countries, India suffers the highest loss in potentially productive years of life, due to deaths from cardiovascular disease in people aged 35–64 years (9.2 million years lost in 2000). By 2030, this loss is expected to rise to 17.9 million years—940% greater than the corresponding loss in the USA, which has a population a third the size of India’s population. Accumulating evidence suggests that chronic infections, such as periodontitis, are associated with increased risk for cardiovascular diseases (CVD) possibly through providing a systemic inflammation and found that 25 to 50% increase in risk of CVD for those with periodontitis when compared to those with no or minimal periodontitis.

Over the last few years, there have been a lot of promising clinical markers proposed to link inflammation and CVD. C-reactive protein is a type I acute phase protein that is produced by the liver in response to diverse inflammatory stimuli. These stimuli include heat, trauma, infection and hypoxia. In healthy individuals CRP levels are found in trace amounts, i.e. < 0.3 mg/l. Serum levels of CRP could exceed 100 mg/l in the presence of overwhelming systemic infection, which provides a useful marker for tracking the course of infection. The prevalence of CVD seems to be highest in those individuals in whom periodontitis coexists with elevated CRP levels and most of the risk factors for cardiovascular diseases are also regarded as risk factors for periodontal diseases.

Studies have been conducted to know the association between chronic periodontitis and cardiovascular diseases but the mechanism of the association is not yet clearly understood. Even though, some studies...
have been conducted to know the association among chronic periodontitis, CRP levels and CVD, the exact mechanism behind the association is not clear.

Hence the aim of the present study is to evaluate the association between chronic periodontal disease and cardiovascular risk factors like C-reactive protein levels in blood.

**Methods**

A cross sectional survey was conducted on a sample of patients who came to the out-patient department of Sri Sai College of Dental Surgery, Vikarabad, Andhra Pradesh over a period of 6 months from March 2011 to August 2011. The age group of the study subjects ranged from 30 to 60 years old. Ethical clearance was obtained from the Ethical Committee of Sri Sai College of Dental Surgery, Vikarabad.

Pilot study was conducted on 6 cases and 6 controls (convenience sample) in Sri Sai College of dental surgery, out-patient department from the representative population to know the feasibility of the study and for sample size calculation. Participants were explained about the study and written consent was taken from every subject who participated in the study. Sample size was determined from the pilot study and total sample size was determined as 25 in each group. Systemically healthy subjects were selected by systematic random sampling technique (every 3rd person).

After the selection of subjects based on inclusion and exclusion criteria, periodontal examination was done to all subjects. Community periodontal index was recorded for all subjects. According to community periodontal index, subjects were divided in to two groups, one group containing participants without chronic periodontitis and the other group containing participants with chronic periodontitis. Those subjects who are having loss of attachment of less than 4 mm in all sextants using community periodontal index procedure were considered as healthy group (Controls). Those subjects who are having loss of attachment of more than 4 mm for at least one sextant using community periodontal index procedure were considered as chronic periodontitis group. (Cases). Both the groups were matched for age and sex and all the subjects were sent to clinical pathology laboratory for collection of blood samples and for the analysis of CRP levels in serum.

Serum C-reactive protein levels were assessed quantitatively by means of a commercially available particle enhanced immunoturbidimetry technique (Auto span Turbiglod CRP test kit). The reference range in this method is 6-8mg/ L. All subjects who had participated in the study were sent for Echocardiography to know whether any abnormalities are present related to cardiovascular system. Body Mass Index (BMI) was measured to all subjects and the subjects who have more than 25kg/m² have been excluded from the study.

The collected data was entered in to Microsoft excel 2007 and subjected to statistical analysis using SPSS version 16.0. The quantitative data was summarized using means and standard deviations. The statistical test used was t-test and the level of significance was considered as <0.05.

**Results**

A total number of 50 subjects with the age range between 30 to 60 years were participated in the study. All the subjects who participated in the study were systemically healthy people. Subjects were classified into two groups based on the periodontal attachment loss. Control (healthy) group were 25 and Cases (Chronic Periodontitis) group were 25. The mean age of the subjects in control was 39.88 ± 8.16 years and cases were 42.92 ± 10.11 years. Among 25 subjects in healthy group, 28% (7) were male and 72 % (18) were female. Out of 25 subjects in cases, 20% were female and 80% were male. Among all subjects participated in the study, 12 subjects were male and 38 subjects were females. The mean CRP levels of the subjects in healthy group were 0.812 ± 0.52 mg / dl and cases were 2.35 ± 1.93 mg/ dl. CRP levels were significantly increased in cases when compared to healthy group (P = 0.000).

**Discussion**

A cross sectional study was conducted to evaluate the association between chronic periodontal disease and cardiovascular risk factor C-reactive protein levels in blood. In the present study, CRP levels in serum were measured for subjects with chronic periodontitis and without chronic periodontitis. Cardiovascular diseases are the leading cause of adult mortality and morbidity throughout the world. The development of cardiovascular diseases can result from genetic and several environmental risk factors such as age, abnormal serum lipids, diabetes, smoking and hypertension. These well known risk factors independently or
combined are involved in atherosclerosis which is responsible for cardiovascular diseases. Not only these risk factors, viral and bacterial infections may also contribute to acute thromboembolic events in susceptible persons.

Periodontal diseases are a group of inflammatory diseases in which bacteria and their byproducts are the principal etiologic agents. There is growing evidence that poor dental health especially the presence of local host inflammatory mediators, the initiation of a localized specific host response leads to serum antibody response to the bacteria is observed. Consequently these findings would support some ability of the localized inflammation or infection to be manifest systematically within the affected host.

Bacterial infections frequently provide a strong stimulus for a systematic acute phase response manifest by the increased production of some 25 plasma proteins. Although most acute phase reactants are synthesized by hepatocytes, some are synthesized by other cells including monocytes, endothelial cells, fibroblasts and adipocytes. The strong acute phase proteins include C-reactive protein, αα macroglobulin and serum amyloid A, which respond rapidly to inflammatory stimuli and serum levels may increase several 100 fold.

Among all acute phase proteins, CRP is the most important acute phase protein which is now used as a systemic inflammatory marker. In healthy young individuals, the median concentration of CRP is 0.3 mg/l, but values may increase up to more than 500 mg/l, that is, 10,000-fold. Earlier work suggested a prognostic association between increased CRP production and outcome after acute myocardial infarction. The mechanisms responsible for the low-grade up regulation of CRP production that predicts cardiovascular events in general populations are unknown.

In the present study, all the factors which could alter the CRP levels like diabetes, cancer, burns, trauma, recent tooth extractions, pregnancy, use of oral contraceptives or hormone replacement therapy, and other infections like tuberculosis, smoking, alcohol consumption and obesity were excluded from the study to eliminate the bias due to confounding factors.

In the present study, there was no association between chronic periodontal disease and CRP levels related to age. This finding in the present study was in contrast to a study conducted by W.C Cutler et al in 1999. It might be due to the fact that both chronic periodontitis subjects and healthy subjects were matched for age and gender.

There was no association between chronic periodontal disease and CRP levels related to gender in this study which was comparable to a study conducted by Sargolzai et al in 2008 in which they have evaluated the relationship between periodontal diseases and CRP levels and there was no association between the periodontal disease and CRP levels related to age and gender.

There were increased levels of CRP concentration in the subjects with chronic periodontitis than subjects without chronic periodontitis group (p = 0.000) which may predict the risk of cardiovascular diseases among the chronic periodontitis patients as increased levels of CRP is the systemic inflammatory marker for cardiovascular diseases. This finding in the present study was in agreement with a study conducted by Barbara Noack et al in 2001 and Persson et al in 2005, in which CRP levels were increased in subjects with periodontal diseases when compared to healthy controls (p = 0.036). This finding in the present study might be because of the fact that the elevated inflammatory factor (CRP levels) may increase inflammatory activity in chronic periodontitis patients and potentially increasing the risk for cardiovascular events.

There was no correlation between CRP levels and BMI in both chronic periodontitis subjects and healthy subjects which was in contrast to a study conducted by Marjolein Visser et al, in which CRP levels were increased in obese persons with BMI above 25 kg/m². This finding in the present study might be because of the fact that all the present study subjects were under 25 BMI and in the present study, obese persons were not included.

The present study was a cross sectional investigation and did not allow to interpret the results in a causal context. Chronic periodontitis might be a risk indicator for cardiovascular diseases.

In the present study, history regarding physical activity and diet history of protein intake, coffee consumption were not taken which could alter the CRP levels. However, in the present investigation, obese subjects were excluded from the study and BMI of the subjects were recorded to eliminate the bias because of physical activity and diet.

However, while the evidence continues to accumulate, it still does not establish periodontal disease as a proven risk factor for CVD. Additional interventional and follow up studies will be required with larger sample to further define this relationship.

**SUGGESTIONS AND RECOMMENDATIONS**

1. Health Education programs should be conducted to
educate the people regarding prevention of periodontal diseases.

2. There is a need to conduct studies to evaluate which periodontal bacteria are more responsible to cause systemic inflammation which in turn may be responsible for cardiovascular diseases.

Conclusion(s)

In the present study, there was an association between chronic periodontitis and cardiovascular risk factor CRP levels in serum. CRP levels were significantly increased in subjects with chronic periodontitis than healthy subjects which are risk factors for cardiovascular diseases. Hence, chronic periodontitis patients may have high risk of getting cardiovascular diseases like atherosclerosis and angina pectoris which can lead to high morbidity and mortality among periodontitis patients. It was observed that there is an association between periodontal disease and CVD.

Acknowledgement(s)

We would like thank all the participants in the study

Reference(s)

5. Salzberg TN, Overstreet BT, Rogers JD, Califano JV, Best AM and Schenkein HA. C - reactive protein levels in patients with Aggressive Periodontitis. J Periodontol 2006; 77:933-939.
23. Noack B, Genco RJ, Trevisan M, Grossi S,


Illustrations

Illustration 1

Illustration 1: Distribution of study subjects according to age

<table>
<thead>
<tr>
<th>Age group</th>
<th>Controls</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td><strong>30-40</strong></td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td><strong>41-50</strong></td>
<td>14</td>
<td>56</td>
</tr>
<tr>
<td><strong>51-60</strong></td>
<td>01</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>25</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Illustration 2

Illustration 2: Distribution of study subjects according to gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Controls</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>Male</td>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td>Female</td>
<td>18</td>
<td>72</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Illustration 3

Illustration 3: Comparison of CRP levels between the groups