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ORIGINAL ARTICLE

Case Control Study To Assess Association Between Periodontal Infection And Coronary Heart Disease

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Abstract:

Background: Coronary heart disease is the leading cause of adult mortality and morbidity throughout the world. Well known risk factors independently or combined are involved in both atherosclerosis and myocardial infarction. Recent data have shown that viral and bacterial infections may also contribute to acute thromboembolic events, hence a case control study was carried out. Aims and Objective : To investigate the possible association between periodontal health and coronary artery disease, in patients with Acute Myocardial Infarction (AMI) and Coronary Heart Disease (CHD). Material and Methods: 150 patients, 75 with AMI and 75 with CHD were included in the study. Data on hypertension, diabetes, smoking status and alcohol consumption were recorded. AMI patients were clinically examined 3-4 days after admission to the coronary care unit. Clinical examination of CHD patients was carried out during the hospital stay. All teeth excluding third molars were studied and clinical data were recorded regarding Plaque Index, Simplified Oral Hygiene Index, Gingival Index, Gingival Bleeding Index, Probing Depth and Clinical Attachment Loss. Results: Percentage of sites exhibiting bleeding on probing and the number of sites with more probing depth were significantly higher among AMI patients than those with CHD (P=0.05 and p=0.001 respectively).There was abundant plaque and debris around all tooth surfaces in AMI patients (p=0.001). Conclusion: Overall result of this case control study showed an association between periodontitis and acute myocardial infarction.

Key Words: Acute Myocardial Infarction, Chronic Heart Disease, Periodontitis.

Introduction:

Coronary artery disease is a leading cause of adult mortality and morbidity throughout the world. The development of coronary artery disease can result from genetic and several environmental risk factors such as age, abnormal serum lipids, diabetes, smoking and hypertension [1-3]. These well known risk factors independently or combined are involved in both atherosclerosis and myocardial infarction. Recent data have shown that viral and bacterial infections may also contribute to acute thromboembolic events in susceptible people [4]. Periodontal diseases are a group of inflammatory diseases in which bacteria and their byproducts are the principle etiologic agents. There is growing evidence that poor dental health, especially the presence of periodontal disease increases the risk of occurrence of coronary heart disease. The objective of the study was to investigate the possible association between

periodontal health and coronary artery disease, in patients with Acute Myocardial Infarction (AMI) and Coronary Heart Disease (CHD).

Material and Methods:

Inclusion criteria:

Patient selection: 150 patients, 75 with AMI (60 male, 15 female) and 75 with CHD (69 male, 6 female) were included in the study.

Case selection:

The cases selected in the AMI group, were patients admitted to the Intensive Cardiac Care Unit in the Government Medical College and Hospital, Nagpur. AMI was verified by typical changes in the electrocardiogram and elevation of serum enzymes [serum glutamic-oxaloacetic transaminase, SGOT, creatinine phosphokinase (CPK) and CPK MB-isoenzyme] together with or without chest discomfort consistent with AMI.

Control group selection:

The patients in CHD group admitted in the Superspeciality Hospital, Government Medical College and Hospital, Nagpur, with no history of acute coronary events.

Exclusion criteria: Edentulous patients were excluded from this study.

Medical history: Patients from both groups were interviewed about their medical status and common habits. Data on hypertension, diabetes, smoking status and alcohol consumption were recorded.

Measurement of periodontal status: AMI patients were clinically examined 3-4 days after admission to the coronary care unit. Clinical examination of CHD patients was carried out during the hospital stay. All teeth excluding third molars were studied and clinical data were recorded regarding,

- Plaque Index (Sillness and Loe) [5]
- Simplified Oral Hygiene Index (Greene and Vermillion) [6]
- Gingival Index (Loe and Sillness) [7]
- Gingival Bleeding Index (Ainamo and Bay) [8]
- Probing Depth (Distance between the gingival margin and base of the pocket) in millimeter [9]
- Clinical Attachment Loss (Distance between the cemento-enamel junction and base of the pocket) in millimeter [9]

Probing depth and bleeding on probing were checked at 6 sites per tooth (mesiobuccal, direct buccal, distobuccal, mesiolingual, direct lingual, and distolingual). Bleeding on probing was expressed as percentages. (Number of places with a positive finding/ all the places studied in a subject's mouth x 100).

Statistical analysis: Means and proportion for major risk factors and clinical parameters were calculated. Student ´t´test gave the significance of any difference in means. Odds ratio and 95% confidence intervals were calculated from collected data.

Results:

Table 1 and 2 show the means (±SD) and proportions of the clinical parameters and major risk factors of both study groups. There was no significant difference in gender distribution between AMI and CHD groups. The patients in AMI group were younger than those in CHD group. Percentage of sites exhibiting bleeding on probing and the number of sites with more probing depth were significantly higher among AMI patients than those with CHD (P=0.05 and p=0.001 respectively).There was abundant plaque and debris around all tooth surfaces in AMI patients (p=0.001).

Table 1: Demographic characteristics and clinical parameters in patients with AMI and CHD

	Case (AMI group)	Control (CHD group)
Number of patients	75	75
Gender distribution(M:F)	60:15	69:6
% of sites exhibiting bleeding on probing	40.28±33.02	27.80±30.02*
Age	51.12±12.66	60.9±14.28
Clinical attachment loss	4.32±2.47	3.35±2.08***
Probing depth	2.13±0.69	1.47±0.5***
Gingival index	1.23±0.66	0.92±0.62**
Plaque index	1.5±0.5	1.02±0.5**
OHI-S	1.79±1.63	1.02±1.5**

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table 2 Percentage of patients with other risk factors.

	Case (AMI group)	Control (CHD group)
No. of hypertensives	48 (64%)	40(53.33%)
No. of diabetics	20 (26.67%)	10(13.33%)
No. of smokers	42 (56%)	19 (25.33%)

Table 3 Distribution of periodontal infection in cases & control

	Case (AMI group)	Control (CHD group)	Total
No. of patients with periodontitis	33	11	44
No. of patients without periodontitis	42	64	106
Total	75	75	150

Table 3 shows the distribution of periodontitis in both cases and controls. Periodontal disease was found in 45% of AMI patients and 15% of patients with CHD. (odds ratio 4.57) The 95% confidence interval was 2.08 to 10.03.

Discussion:

In the present study, an association between poor periodontal health and acute myocardial infarction was found. Patients with CHD who had comparable backgrounds to the AMI patients were selected as control group. Patients in AMI group had worse periodontal health than those in CHD group as seen by a significant difference between AMI (Cases) and CHD (Control) groups in number of cases of periodontitis, % sites exhibiting bleeding on probing, clinical attachments loos of teeth, probing depth , gingival index, plaque index and OHI-S. Gingival bleeding was more common among AMI patients than CHD patients and it was associated with AMI. Gingival bleeding , an indicator of gingival inflammation, can be clinically observed approximately 1 week after oral hygiene measures are stopped [4] . It is possible that presence of more gingival bleeding in AMI patients may be the result of poor oral hygiene and gingival inflammation in those patients before the infarct. Presence of plaque, although statistically significant, may be because of the poor oral hygiene of AMI patients after admission to the coronary care unit. Our results agree with the findings of Bergstrom et al [10] whose preliminary reports also found periodontal disease to be more common in AMI patients compared to control group in Swedish population.

The association of dental infections with coronary artery disease was investigated in several studies [11-14]. Some of these studies used the number of teeth and radiological data as measures of dental status and did not specifically evaluate periodontal disease. It is not clear to what extent, if any, a relationship is associated with periodontal disease. Therefore, periodontal status in both AMI and CHD patients was specifically evaluated in this study.

Periodontal diseases are bacterial infections in which certain bacteria play an important role in the development of the inflammatory process. Recent studies have shown that the infection and inflammation caused by periodontal disease increase the risk of CHD [15-17]. Increasing evidence suggests that inflammation in the vessel wall plays an essential role in the development of atherosclerosis [18-19]. Many possible mechanisms have been reported to explain the link between periodontal disease and coronary artery disease. The relationship between periodontal disease and coronary artery disease can be dependent on the risk factors both the diseases have in common. Periodontal infections may directly cause vascular events via lipopolysaccharides and inflammatory cytokines, contributing to the pathogenesis of cardiovascular disease [20].

Periodontal pathogens themselves have been shown to increase platelet aggregation and thromboembolic events [21-22]. In a recent study, periodontal pathogens associated with periodontal disease were identified on atheromas, which support the etiological role of these pathogens in cardiovascular disease [21-22].

Destefano et al [17] showed that subjects with periodontitis had a 25% increased risk of developing heart disease compared to those with little or no periodontal disease. In a 7 year prospective study, Mattila et al [14] observed dental infections to be a significant risk factor for CHD and also for further coronary events. Beck et al [15] also reported that subjects with the

most severe probing depths and bone loss at baseline had higher risk for developing CHD than those with minimal periodontal disease. The present study also supports the findings of earlier studies by Mattila et al [11-12] that showed an association between dental health and AMI and atherosclerosis.

In the present study, 56% of AMI patients were smokers, but only 25.33% of the CHD patients. Since the patients in the CHD group were intensely educated about the hazardous effects of smoking, most of them were former smokers. Our results have shown that smoking was significantly associated with AMI. These data were supported by Mattila et al [11] who also found smoking to be more common among AMI patients than the control group.

In the present study, the prevalence of other risk factors such as diabetes and hypertension was similar between groups and no association was observed with AMI. In a preliminary study, Genco et al [23] found a combination of male gender; periodontitis and diabetes provided the best model to predict future cardiovascular disease. Our results agree with others, who did not find any relationship between coronary artery disease and any of these risk factors.

Conclusion:

The association of oral infection with systemic disease is receiving increased interest in the research world. Case control study such as this cannot be generalized to an entire population. Prospective randomized studies with large number of patients are needed to determine whether periodontal disease is a risk factor in the occurrence of AMI. If these studies are successful, they will provide very compelling scientific evidence coupled with improved health outcomes which can catalyze much needed reforms in dental & medical education & practice.

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