www.jmscr.igmpublication.org
Impact Factor 5.84
Index Copernicus Value: 71.58
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v6i1.91

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Plasma Fibrinogen Levels in Chronic Periodontitis Subjects: A Pilot Study

Authors
Dr Aarti Lakshman Dhawle, Dr Vishakha Patil, Dr Pooja Darakh
Bharati Vidyapeeth Deemed University Dental College and Hospital, Pune, India

Abstract
Periodontitis is a chronic inflammatory condition of tooth supporting structures that may lead to tooth loss. Periodontitis has been considered as a risk factor for various systemic diseases that affect the human health. Cardiovascular Diseases is one of them. The various systemic inflammatory markers associated with Cardiovascular Diseases, actually increase the inflammatory activity in atherosclerotic lesions, potentially increasing the risk for cardiac or cerebro vascular events. Amongst the different inflammatory markers, plasma Fibrinogen is a classical positive acute-phase reactant considered to be an independent predictor of coronary heart disease. Various studies have shown that periodontitis is responsible for increase in systemic inflammatory markers. Very few studies have mentioned about the increase in Plasma fibrinogen levels in chronic periodontitis subjects. This pilot study was therefore planned to assess plasma fibrinogen levels in chronic periodontitis subjects.
Keywords: *Plasma fibrinogen, Periodontitis, Inflammatory marker, Cardiovascular diseases.*

Introduction

Periodontitis is a chronic low grade inflammatory condition of tooth supporting structures that may lead to tooth loss. Chronic periodontitis, formerly known as "adult periodontitis"or "chronic adult periodontitis," is the most prevalent form of periodontitis. It is generally considered to be a slowly progressing disease. Chronic periodontitis has recently been defined as"an infectious disease resulting in inflammation within the supporting tissues of the teeth, progressive attachment loss, and bone loss."[1]

The role of periodontal disease in the etiology of cardiovascular disease (CVD) has recently received considerable attention. Epidemiological studies have shown that there is elevation of the systemic inflammatory markers related to cardiovascular diseases in the peripheral blood of periodontitis patients. The inflammatory markers increase the inflammatory activity in atherosclerotic lesions, potentially increasing the risk for cardiac or cerebro vascular events [2–6]. Amongst the different inflammatory markers, one of the marker which acts as a risk factor for cardiovascular diseases is plasma Fibrinogen. Fibrinogen is a soluble plasma glycoprotein, synthesized by the liver that is converted by thrombin into fibrin during blood coagulation. Besides its role in blood coagulation, fibrinogen can also increase inflammatory response. It is increased in three different ways; i) by providing a framework for the accumulation of inflammatory cells, ii) promoting the immuneresponse, and iii) aiding in bacterial colonization, adhesion and

invasion. Higher levels of plasma Fibrinogen is associated with cardiovascular disease (>3.43 g/L). Fibrinogen levels may be elevated in any form of inflammation, as it is an acute phase protein. An elevated fibrinogen level may predispose to thrombosis and is an indicator of risk for coronary heart disease.

Many studies have mentioned about the increase of various inflammatory markers.

The purpose of the present study was to investigate, plasma fibrinogen in Generalised Chronic Periodontitis subjects.

Materials and Methods

Study design and experimental population

Participants were selected from the patients referred for the treatment of periodontitis in the Department of Periodontics in Bharati Vidyapeeth Deemed University Dental College and Hospital, Pune, India. The adult patients having generalized moderate to severe chronic periodontitis, with 5–8 mm probing pocket depth and less than 6 teeth missing were included in the study. Patients with known history of smoking, systemic diseases like Cardiovascular and Respiratory diseases, inflammatory conditions like Rheumatoid arthritis, acute infections like common cold, Sinusitis, patients taking systemic antibiotics, NSAIDS or statins and pregnant or lactating mothers were excluded.

Study outline

A total of 25 subjects were enrolled into this study. Subjects who satisfied the inclusion criteria of the study were selected. On the day of first visit recording of age, gender, Body Mass Index (BMI), Plaque Index (PI) by Silness P. and Loe H. (1964), Gingival Index (GI) by Loe H. and Silness J. (1963) and Probing Pocket Depth (PPD) were completed. 4 ml of blood was collected from antecubital fossa, centrifuged and analysed for Fibrinogen with the lowest detection limit of 15 mg/dL. The blood was withdrawn without undue venousstasis and frothing, into a plastic syringe fitted with a short needle of 22 gauges. It was then emptied and stored into the plain and EDTA bulbs (2 ml in each). Plasma was obtained by centrifugation of blood for 15 mins at 2000 rpm on a laboratory centrifuge. If a delay in testing occurred, the samples were stored at 2–8^{o}C for up to a week.

Statistical Analysis

Plasma fibrinogen level were found to be statistically significant in patients with chronic periodontitis.96% subjects have increased levels of plasma fibrinogen levels.

Results

25 subjects completed the study .Patients with generalized mild to moderate chronic periodontitis in the age group of 24–55 (38.97 ± 8.3) years which included 15 females and 10 males were analyzed in the study with the mean B.M.I of21.75 ± 2.9 kg/m^2. Out of 25 subjects 24 subjects showed that subjects with periodontitis has increased plasma fibrinogen levels.

Discussion

Cross-sectional and prospective studies have established that elevated peripheral blood levels of several systemic inflammatory markers including; fibrinogen; CRP and the cytokines IL-1 beta, IL-6, and tumor necrosis factor-alpha are associated with the risk of cardiovascular diseases and the severity of atherosclerosis[7,8,9,10,11]. In addition, numbers of leukocytes are positively correlated with cardiovascular diseases[10,11]. It has been proposed that these markers could be elevated due to undiagnosed chronic infectious processes; subsequently their pro inflammatory properties may increase the existing inflammatory activity in plaque-associated lesions in coronary arteries and thus predispose for cardiac events[12,13]. With the present study we observed a significant association for periodontitis with fibrinogen. Therefore we propose that periodontitis may be one such an undiagnosed chronic infectious process and the observed elevation of markers may explain at least in part the epidemiological

association of periodontitis with cardiovascular diseases.

The observed associations are supported by a number of potential pathophysiologic links. Periodontal disease could result in repeated systematic exposures to bacteria, endotoxin lipo polysaccharide, and other bacterial products that may influence lipid metabolism and homeostasis. The loss of epithelial integrity within the periodontal pocket also creates an opportunity for direct bacterial translocation and bacteremia. Oral bacteria have been found circulating in the blood following tooth brushing, dental extraction, and periodontal surgery. The more severe the periodontal inflammation, the greater the hematogenous bacterial exposure in terms of bacterial counts and duration. In addition, the lipopolysaccharide of dental plaque can penetrate the gingiva and elicit a systemic lipopolysaccharide- specific antibody response, Monocyte-derived cytokines, such as tumor necrosis factor and interleukins 1, 6, and 8, have powerful effects on hepatic protein synthesis (e.g., in upregulating fibrinogen synthesis), tissue catabolism, and lipid metabolism.

Sahingur[14] has reported that periodontitis patients have significantly higher fibrinogen levels than healthy individuals. This is because a higher percentage of chronic periodontitis patients exhibit H1H2 or H2H2 genotypes associated with higher plasma fibrinogen levels than healthy individuals. The fibrinogen level was significantly higher in our study population and supported the above study.

Studies have shown that elevated levels of cytokines, C-reactive protein, and fibrinogen are associated with periodontal disease. The atherothrombogenesis caused by these factors may suggest the possible link between periodontal disease and CHD. In addition, periodontal pathogens themselves can cause platelet aggregation and thromboembolic events by expressing platelet aggregation–associated protein.[15]

The observation that cardiovascular risk factors might be influenced by periodontitis may have important clinical consequences. First, as inflammation plays an important role in the pathophysiology of various conditions (metabolic syndrome, BP, vascular health), [16] the association of mild chronic inflammation with future serious events in observational studies[17]may be influenced by an underlying severe periodontal infection. Second, periodontitis may increase the risk of future cardiovascular events because of the proatherogenic changes (increased cholesterol) and increased systolic BP induced in affected individuals. Cigarette smoking represents the major influential factor with regard to the association between periodontal infections and systemic inflammation, and this preliminary investigation raises the hypothesis of a possible interaction of smoking, periodontal infection, and systolic BP on systemic health. Third, if periodontitis were the major inflammatory stimulus in at least some patients with periodontitis, severe periodontal infections may represent a major etiologic factor for atherosclerosis, metabolic syndrome, and their sequelae. The significance of periodontitis as a cause of systemic inflammation and, potentially, disease has to be discussed in the context of the high prevalence of chronic periodontitis which affects in mild forms upto 40% and in more severe forms a good 10% of the adult population.

Periodontal diseases are bacterial infections in which certain bacteria play an important role in the development of the inflammatory process [18]. Increasing evidence suggests that inflammation in the vessel wall plays an essential role in the development of atherosclerosis.[19] Periodontal infections may cause vascular events via lipo polysaccharides and inflammatory cytokines, contributing to the pathogenesis of cardiovascular disease[20].Periodontalpathogens themselves have been shown to increase platelet aggregation and thromboembolic events[21]. De Stefano et al. [22] 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 CHD and also for further coronary events. The study by Beck et al[23]confirmed the findings of these investigators, [24] indicating that periodontal disease may be a risk factor for CHD. Beck et al[23]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.

Conclusion

Taken together, our data provide evidence that periodontitis have plasma fibrinogen levels are elevated in the blood of moderate to severe periodontitis patients. We speculate that periodontitis, a common condition, may predispose affected patients to cardiovascular diseases by increasing levels of acute phase proteins and pro-inflammatory mediators, which may lead to increased inflammatory activity in atherosclerotic lesions and accelerated development of cardiovascular diseases. The current observations may explain the epidemiological links between periodontitis and cardiovascular diseases and fit the general hypothesis that obscure infectious processes contribute to the pathogenesis of cardiovascular diseases. Therefore periodontitis deserves serious consideration as a risk factor for cardiovascular diseases.

References

1. Flemmig TF: Periodontitis. Ann Periodontol 1999; 4:32.
2. Beck J., Garcia R., Heiss G., Vokanas P.S., Offenbecher S., Periodontal disease and cardiovascular disease, J Periodontol 1996; 67 (suppl): 1123–1137.
3. Danesh J., Collins R., Appleby P., Peto R., Fibrinogen, C-reactive protein, albumin or white blood cell count: metaanalysis of prospective studies of coronary heart disease. J Am Med Assoc 1998; 279: 1477–1482.
4. Loos B.G., Craandijk J., Hoek F.J., Wertheim-Van Dillen P.M., Van Der Velden U., Elevation of systemic markers related to cardiovascular diseases in the peripheral blood of periodontitis patients. J Periodontol 2000; 71: 1528–1534.
5. EMINGIL G., Budeneli E., Aliyev A., Akilli A., Atilla G., Association between periodontal disease and acute myocardial infarction. J Periodontol 2000; 71: 1882–1886.
6. SLADE G.D., OFFENBACHER S., BECH J.D., HEISS G., PANKOW J.S., Acute-phase inflammatory response to periodontal disease in the US population. J Dent Res 2000; 79: 49–57.
7. Berk B, Weintraub W, Alexander R. Elevation of C-reactive protein in “active” coronary artery disease. Am J Cardiol1990;65:168-172.
8. Biasucci L, Vitelli A, Liuzzo G, et al. Elevated levels of interleukin-6 in unstable angina. Circulation 1996;94: 874-877
9. Ridker PM, Cushman M, Stampfer MJ, Tracey RP, Hennekens CH. Plasma concentration of C-reactive protein and risk of developing peripheral vascular disease. Circulation 1998; 97:425-428.
10. Danesh J, Collins R, Appleby P, Peto R. Association offibrinogen, C-reactive protein, albumin, or leukocyte count with coronary heart disease. Meta-analyses of prospective studies. JAMA 1998;279: 1477-1482.
11. Kannel WB, Anderson K, Wilson PWF. White blood cell count and cardiovascular disease. Insights from the Framingham study. JAMA1992; 267:1253-1256.
12. Maseri A, Biasucci LM, Liuzzo G. Inflammation in ischaemic heart disease. Br Med J 1996;312:1049-1050.
13. Danesh J, Collins R, Peto R. Chronic infections and coronary heart disease: Is there a link? Lancet 1997;350:430-436.

14. Sahingur S.E., Sharma A., Genco R.J., De Nardin E., Association of increased levels of fibrinogen and the – 455G/AFibrinogen gene polymorphism with chronic period-ntitis. J Periodontol 2003; 74: 329–337.
15. Herzberg MC, Nobbs A, Tao L, et al. Oral streptococci and cardiovascular disease: searching for the platelet aggregation–associated protein gene and mechanisms of Streptococcus sanguis–induced thrombosis. J Periodontol 2005;76 (11Suppl):2101-5
16. Fernandez-Real JM, Ricart W. Insulin resistance and chronic cardiovascular inflammatory syndrome. Endocr Rev 2003; 24:278-301.
17. Ridker PM, Morrow DA. C-Reactive protein, inflammation, and coronary risk. CardiolClin 2003;21:315 - 25.
18. Genco RJ, Zambon JJ, Christersson LA. The origin of periodontal infections. Adv Dent Res 1988; 2:245-259
19. Koenig W. Atherosclerosis involves more than just lipids: focus on inflammation. Eur Heart J 1999;1(Suppl. T): T19-T26
20. Beck JD, Offenbacher S, Williams R, Gibbs P, Garcia R. Periodontitis: A risk factor for coronary heart disease? Ann Periodontol1998;3:127-141..
21. Herzberg MC, Meyer MW. Effects of oral flora on platelets: Possible consequences in cardiovascular disease. J Periodontol 1996;67:1138-1142.
22. DeStefano F, Anda RF, Kahn HS, Williamson DF, Russell CM. Dental disease and risk of coronary heart disease and mortality. Br Med J 1993;306:688-691
23. Beck J, Garcia R, Heiss G, Vokonas PS, Offenbacher S. Periodontal disease and cardiovascular disease. J Periodontol1996; 67:1123-1137.
24. Mattila KJ, Valtonen VV, Nieminen M, Huttunen JK. Dental infection and the risk of new coronary events:prospective study of patients with documented coronaryartery disease. Clin Infect Dis 1995;20:588-592.