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ELEVATED PLASMA HOMOCYSTEINE LEVELS IN CHRONIC PERIODONTITIS: A PILOT STUDY

Periodontology

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ABSTRACT

Plasma homocysteine (Hcy), a novel risk factor for cardiovascular disease, has been found to be increased in inflammatory diseases, such as rheumatoid arthritis(RA). Periodontitis, a chronic inflammatory disease shares a common immunoinflammatory profile with RA. AIM: This study aims to assess the level of plasma Hcy in subjects with chronic periodontitis and to assess the relationship between severity of periodontitis and plasma Hcy levels. Materials and methods: Ten subjects with clinical evidence of chronic periodontitis were selected. Mean probing depth and clinical attachment levels were recorded. Enzyme immunoassay was used for the determination of Hcy in plasma. Results: There was no significant association between age,gender with chronic periodontitis, whereas a significant positive correlation was seen with homocysteine levels and mean probing depth. Conclusion: Elevated levels of plasma Hcy were observed in patients with chronic periodontitis and could be marker for systemic inflammation. Further research should be directed on the effect of periodontal therapy and plasma Hcy levels.

KEYWORDS

Homocysteine, Inflammation, Periodontitis.

INTRODUCTION

Homocysteine (Hcy) is a sulphur containing amino acid derived from methionine during its metabolism[1]. Elevated levels of plasma Hcy /Hyperhomocystenimia (HHcy) have been linked to the oxidative damage of the vascular endothelium , proliferation of vascular smooth muscle , and lipid peroxidation, which could result in athero thrombosis and peripheral arterial disease[2]. Plasma Hcy has a role in systemic inflammatory pathway. A positive relation exist between the concentration of Hcy and some biohumoral parameters of inflammation, such as circulating levels of soluble receptors for cytokine and C-reactive protein[3]. Periodontitis, a chronic inflammatory disease characterised by the destruction of supporting structures of teeth, shares a common immunoinflammatory profile with RA[4]. The current era of evidence-based medicine suggest that periodontitis affect the systemic health of individual and may contribute to CVD, diabetes mellitus, and preterm low-birth-weight infants[5]. This periodontal-systemic disease relationship is believed to be mediated through systemic inflammatory reactants, such as acute-phase protein and immune effectors[6]. Because periodontitis shares a common immunoinflammatory profile with RA, a similar association could exist between chronic periodontitis and plasma Homocysteine levels.

MATERIALS AND METHODS

Ten subjects with clinical evidence of chronic periodontitis were selected.The patients were grouped into moderate and severe periodontitis using center for disease control and preventive criteria[7]. Patients aged >15 years and <45 years, those with<10 permanent teeth remaining were selected. History of periodontal therapy within 6months, or a history of antibiotic intake within 3weeks and smokers are excluded from the study. Subjects with known systemic diseases and conditions such as CVD, renal disease, RA, diabetes mellitus, nutritional deficiencies, pregnant and lactating females were also excluded from the study. Enzyme immunoassay was used for the determination of Hcy in plasma.The enzyme immunoassay is based on principle that protein-bound Hcy is reduced to free Hcy and enzymatically converted into S-adenosyl-L-homocysteine.

RESULTS

A total sample of 10 participants comprising of 7 male(70%) and 3 female (30%) were included for the study .Among the study population,6 (60%) were in the age group of 40 – 47 years and 4 (40%) were in the age group of 48-55 years. The mean age of the group was 47.2 ± 4.13yrs, whereas the mean homocysteine levels, probing depth and clinical attachment loss were 28.7 ± 11.3, 4.8±1.1, 5.13 ±1.15 respectively. There was no significant association between age, gender with chronic periodontitis, whereas a significant positive correlation was seen with homocysteine levels and mean probing depth (r= 0.755, p= 0.12).

Table 1 represents the distribution of age, gender and mean homocysteine level, probing depth and clinical attachment loss

Variables	N(%)	Mean ± SD
Age 40-47 yrs 48-55 yrs	6(60%) 4(40%)	47.2 ± 4.13
Gender Male Female	6(60%) 4(40%)	
Homocysteine level	-	28.7 ± 11.3
Probing depth	-	4.8 ± 1.1
Clinical attachment loss	-	5.13 ± 1.1.5

Table 2 shows the correlation between homocysteine levels and chronic periodontitis

	PROBING DEPTH r (p value)	CLINICAL ATTACHMENT LOSS r (p value)
HOMOCYSTINE LEVELS	0.755 (0.12)*	0.629 (0.051)

*- p value < 0.005 is statistically significant.

DISCUSSION

Hcy is a sulphur-containing amino acid derived from methionine during its metabolism. The amino acid methionine is the only known source of Hcy in the human body. Normal Hcy levels range between 5 and 15 mmol/L. However, Hcy levels of 16 to 30, 31 to 100, and >100 mmol/L have been classified as mild, moderate, and severe HHcy, respectively[8]. In the present study, patients with chronic periodontitis had elevated plasma Hcy levels. However no association was found between the severity of chronic periodontitis and increased plasma Hcy levels when subjected to statistical analysis. There could be several possible mechanisms underlying the link between chronic periodontitis and plasma Hcy[9]. Pro-inflammatory cytokines, such as IL6, may be released from inflamed periodontal pockets and may give rise to acute-phase reactants in the systemic circulation. McCarty has reported that IL-6 may interact with vitamin B6 metabolism and compromise cystathionine b-synthase activity, thereby elevating plasma Hcy concentrations[10]. This suggests that HHcy could be expected by the release of IL-6 from the inflamed pocket walls of periodontium. RANTES (regulated on activation, normal T cells expressed and secreted) is a chemokine that plays an important role in the inflammatory process. RANTES-induced leukocyte transendothelial migration is implicated in the initial stages of the inflammatory part of the atherosclerotic process. The lipopolysaccharide-induced secretion of RANTES in monocytes has been found to be increased in patients with HHcy[11].Further studies are needed to assess the effects of HHcy on the immunoinflammatory mechanisms of chronic periodontitis. In the present study there was no significant association between age and gender with chronic periodontitis. In a review based on the framingham heart study, cohorts has shown that total Hcy concentration is higher in men and in

postmenopausal women[12]. Chronic periodontitis is also found to be age associated. By narrowing the study to subjects aged 15 to 45 years, it is possible to partly eliminate the age related and female sex–related (menopause) confounding that can otherwise be difficult to control. Diabetes mellitus and obesity are potential confounders for plasma Hcy levels[13,14]. Subjects with diabetes were excluded from our study. Reports suggest that obesity as measured by BMI has been related to periodontitis[15,16]. The small sample size and the criteria used for defining periodontitis in the present study may have accounted for the variation observed. In the present study, patients with chronic periodontitis had elevated plasma Hcy levels. This demonstrates an association between periodontal disease and plasma Hcy. However, no association was found between the severity of chronic periodontitis and the increased plasma Hcy levels when subjected to statistical analysis. The elevated plasma Hcy in our group may be a consequence of the persistent immunoinflammatory activation by periodontal pathogens. There could be several possible mechanisms underlying the link between chronic periodontitis and plasma Hcy formation of reactive oxygen species by monocytes and macrophages. The present study design has certain limitations. This hospital-based study may not be a true representation of the entire population. Enzyme-linked immunosorbent assay method was used to estimate plasma Hcy levels, whereas high-performance liquid chromatography is a superior method. The novel association between periodontal disease and plasma Hcy could provide a mechanistic link between periodontal disease and CVD[18]. Because elevated plasma Hcy is a risk factor for CVD, interventions to reduce plasma levels of Hcy could prove beneficial.The Cochrane Review in assessed the clinical effectiveness of Hcylowering interventions in people with or without preexisting CVD and suggested that there is no evidence to support the use of Hcy-lowering interventions to prevent cardiovascular events[18].

CONCLUSION

Elevated levels of plasma Hcy were observed in patients with chronic periodontitis and could be marker for systemic inflammation. Longitudinal assessment of the same is advocated for determining the association relation between plasma Hcy levels and periodontitis. Further research should be directed on the effect of periodontal therapy and plasma Hcy levels.

REFERENCES

1) Ramakrishnan S, Sulochana KN, Lakshmi S, Selvi R, Angayarkanni N.Biochemistry of homocysteine in health and disease.2006;43:275-283.
2) Welch GN, Loscalzo J. Homocysteine and atherothrombosis. N Engl J Med 1998;338:1042-1050.
3) Lazzerini PE, Capecchi PL, Selvi E, et al. Hyperhomocysteinemia: A cardiovascular risk factor in autoimmune diseases? Lupus 2007;16:852-862.
4) Lazzerini PE, Capecchi PL, Selvi E, et al. Hyperhomocysteinemia, inflammation and autoimmunity. Autoimmun Rev 2007;6:503-509.
5) Agueda A, Echeverria A, Manau C. Association between periodontitis in pregnancy and preterm or low birth weight: Review of the literature. Med Oral Patol Oral Cir Bucal 2008;13:E609-E615.
6) Schroecksnadel K, Frick B, Winkler C, Leblhuber F, Wirleitner B, Fuchs D. Hyperhomocysteinemia and immune activation. Clin Chem Lab Med 2003;41: 1438-1443
7) Page RC, Eke PI. Case definitions for use in population-based surveillance of periodontitis. J Periodontol 2007;78:1387-1399.
8) Lopez-Olivo MA, Gonzalez-Lopez L, Garcia-Gonzalez A, et al. Factors associated with hyperhomocysteinaemia in Mexican patients with rheumatoid arthritis. Scand J Rheumatol 2006;35:112-116
9) Machado AC, Quirino MR, Nascimento LF. Relation between chronic periodontal disease and plasmatic levels of triglycerides, total cholesterol and fractions. Braz Oral Res 2005;19:284-289.
10) McCarty MF. Increased homocysteine associated with smoking, chronic inflammation, and aging may reflect acute-phase induction of pyridoxal phosphatase activity. Med Hypotheses 2000;55:289-293.
11) Sun W, Wang G, Zhang ZM, Zeng XK, Wang X. Chemokine RANTES is upregulated in monocytes from patients with hyperhomocysteinemia. Acta Pharmacol Sin 2005;26:1317-1321
12) Selhub J. The many facets of hyperhomocysteinemia: Studies from the Framingham cohorts. J Nutr 2006; 136(Suppl. 6):1726S-1730S.
13) Giltay EJ, Hoogeveen EK, Elbers JM, Gooren LJ, Asscheman H, Stehouwer CD. Insulin resistance is associated with elevated plasma total homocysteine levels in healthy, non-obese subjects. Atherosclerosis 1998;139:197-198.
14) Hoogeveen EK, Kostense PJ, Beks PJ, et al. Hyperhomocysteinemia is associated with an increased risk of cardiovascular disease, especially in non-insulindependent diabetesmellitus:A population-basedstudy. Arterioscler Thromb Vasc Biol 1998;18:133-138.
15) Dalla Vecchia CF, Susin C, Ro¨sing CK, Oppermann RV, Albandar JM. Overweight and obesity as risk indicators for periodontitis in adults. J Periodontol 2005;76:1721-1728.
16) Saito T, Shimazaki Y, Sakamoto M. Obesity and periodontitis. N Engl J Med 1998;339:482-483.
17) Buhlin K, Hultin M, Norderyd O, et al. Periodontal treatment influences risk markers for atherosclerosis in patients with severe periodontitis. Atherosclerosis 2009;206:518-522.
18) Marti-Carvajal AJ, Sola I, Lathyris D, Salanti G. Homocysteine lowering interventions for preventing cardiovascular events. Cochrane Database Syst Rev 2009;(4):CD006612.