



## Elevated plasma homocysteine levels in chronic periodontitis

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### Abstract

**Background:** To assess the levels of plasma homocysteine in chronic periodontitis.

**Materials & methods:** A total of 80 subjects were enrolled. Out of which 40 were the case group and 40 were periodontally healthy individuals. In case group, 30 were female and 10 were male whereas in control group 28 were female and 12 were male. Subjects with moderate or severe chronic periodontitis were considered for inclusion into the study.

**Results:** A total number of case group individuals 30 were female and 10 were male. Out of 40 cases, 11 had moderate periodontitis and 29 had severe periodontitis. The mean plasma Hcy was found to be 24.63 and 11.48 mmol/L, respectively, for cases and controls. The difference was statistically significant ( $P = 0.001$ ).

**Conclusion:** Elevated levels of plasma homocysteine were seen in subjects with chronic periodontitis.

**Keywords:** chronic periodontitis, homocysteine, cardiovascular disease.

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### Introduction

Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels including coronary heart disease, cerebrovascular disease, peripheral arterial disease, rheumatic and congenital heart disease, deep vein thrombosis, and pulmonary embolism. According to the World Health Organization, CVDs are the number one cause of death globally, representing 31% of all global deaths in 2015. <sup>(1)</sup>

Periodontal disease is a chronic inflammatory infectious disease affecting the supporting tissues of teeth including gingiva, periodontal ligament, cementum, and alveolar bone. <sup>(2)</sup> Periodontitis, which is a constant potential source of infection, has been considered as a separate risk factor for diabetes,

cardiovascular diseases, cerebrovascular diseases, respiratory diseases, and low birthweight rheumatoid arthritis through common pathophysiological pathways. <sup>(3,4)</sup>

Hcy, a sulfur-containing amino acid, which in the recent past has become a biomolecule of great importance for biochemists and clinicians alike. Hcy is exported into plasma where it circulates, mostly in its oxidized form, bound to plasma proteins as a protein-Hcy mixed disulfide with albumin (protein-SS-Hcy). <sup>(5)</sup> Under normal circumstances, most but not all of the Hcy formed in transmethylation reactions is remethylated back to methionine or is converted into cysteine in transsulfuration reactions. The B-complex vitamins play an essential role in the transformation and the excretion of the Hcy



metabolism pathway, the elevated levels of Hcy that is, hyper-Hcy (HHcy) has been associated with pathologic alteration in the vasculature, which is recognized as an independent cardiovascular disease risk factor. <sup>(6,7)</sup> Hence, this study was to assess the levels of plasma homocysteine in chronic periodontitis.

**Materials & methods**

A total of 80 subjects were enrolled. Out of which 40 were the case group and 40 were periodontally healthy individuals. In case group, 30 were female and 10 were male whereas in control group 28 were female and 12 were male. Subjects with moderate or severe chronic periodontitis were considered

for inclusion into the study. Laboratory investigations were done. All the data was collected and results were analyzed.

**Results**

A total number of case group individuals 30 were female and 10 were male. Out of 40 cases, 11 had moderate periodontitis and 29 had severe periodontitis. The mean gingival index (P = 0.001) and mean simplified oral hygiene index (P = 0.001) for cases and controls showed significant differences. The mean plasma Hcy was found to be 24.63 and 11.48 mmol/L, respectively, for cases and controls. The difference was statistically significant (P = 0.001).

Table 1: periodontal parameters and plasma homocysteine

| Parameters                           | Cases (40)<br>Mean | Controls (40)<br>Mean | p- value |
|--------------------------------------|--------------------|-----------------------|----------|
| Gingival index                       | 1.48               | 0.005                 | 0.001*   |
| Oral hygiene index                   | 1.32               | 0.05                  | 0.001*   |
| Plasma homocysteine<br>(micro mol/L) | 24.63              | 11.48                 | 0.001*   |

\* : significant

Table 2: comparison between plasma homocysteine levels and chronic periodontitis

| Group                  | Number | Mean  | p- value |
|------------------------|--------|-------|----------|
| Moderate periodontitis | 11     | 25.36 | 0.63     |
| Severe periodontitis   | 29     | 24.06 | -        |

**Discussion**

Periodontitis , a chronic inflammatory disease characterized by the destruction of supporting structures of teeth, shares a common immunoinflammatory profile with RA. <sup>(8)</sup> Moreover, periodontal pathogens, such as Porphyromonas gingivalis, are able to invade gingival tissues and gain access to the systemic circulation. <sup>(9)</sup> The current era of evidence-based medicine suggests that periodontitis affects the systemic health of an individual, and may contribute to CVD, diabetes mellitus, and preterm low-birth-weight infants. <sup>(10)</sup> Hcy is a sulfur-containing amino acid derived from methionine during its

metabolism. The amino acid methionine is the only known source of Hcy in the human body. The average daily intake of methionine is about 2 g. <sup>(11)</sup> In our study, a total number of case group individuals 30 were female and 10 were male. Out of 40 cases, 11 had moderate periodontitis and 29 had severe periodontitis. The mean gingival index (P = 0.001) and mean simplified oral hygiene index (P = 0.001) for cases and controls showed significant differences.

One of the study was done to assess the effect of nonsurgical periodontal therapy on circulating serum high-sensitivity capsule reactive protein (hs-CRP) and homocysteine



(Hcy) levels in patients with chronic periodontitis. Study involved fifty participants. Mean serum hs-CRP and Hcy concentration in patients with chronic periodontitis were  $3.37 \pm 0.54$  mg/L and  $21.47 \pm 7.93$   $\mu$ mol/L, respectively, and was significantly higher than the controls ( $1.68 \pm 0.71$  mg/L and  $13.93 \pm 8.30$   $\mu$ mol/L, respectively) ( $P < 0.05$ ). Post treatment, the mean serum hs-CRP and Hcy concentration reduced significantly in both test and control groups ( $P < 0.05$ ). Chronic periodontitis leads to an increase in circulating levels of hs-CRP and Hcy in plasma and nonsurgical periodontal therapy decreases periodontal inflammation, which in turn reduces systemic inflammation and consequently decreases serum levels of hs-CRP and Hcy.<sup>(12,13)</sup> The mean plasma Hcy was found to be 24.63 and 11.48 mmol/L, respectively, for cases and controls. The difference was statistically significant ( $P = 0.001$ ).

Another case-control clinical study included a total of 60 patients who were divided into two groups. Periodontal parameters including Plaque Index, Gingival Index, Sulcus Bleeding Index, probing depth, and clinical attachment level were recorded at baseline and 12 weeks after periodontal therapy. Correlation between the plasma-Hcy levels with other clinical parameters in all groups was done by Spearman's rank correlation method. At baseline, the mean levels of plasma Hcy were found to be low in the control group, whereas in the test group, it is found to be higher. These plasma-Hcy levels and all periodontal parameters were reduced significantly after nonsurgical periodontal therapy. The results demonstrated that plasma-Hcy levels are reduced after nonsurgical periodontal therapy but not to the levels comparable with those found in healthy individuals. Therefore, nonsurgical periodontal therapy may be used as an adjunctive Hcy-lowering therapy, contributing toward primary prevention against cardiovascular diseases.<sup>(14,15)</sup>

## Conclusion

Elevated levels of plasma homocysteine were seen in subjects with chronic periodontitis.

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