

Assessment of Impact of Nonsurgical Periodontal Therapy on Serum Homocysteine Levels in Patients with Chronic Periodontitis

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Abstract

Background: Periodontal diseases have a significant impact on oral health-related quality of life, especially with the worsening and extension of the disease in which it presents higher destructive consequences. Chronic inflammatory diseases enhance the systemic inflammatory load, which leads to inflammation-dependent vitamin depletion, thereby decreasing the availability of the essential nutritional cofactors responsible for the homocysteine conversion. Hence, the present study was conducted for assessing the impact of nonsurgical periodontal therapy on plasma homocysteine levels in patients with chronic periodontitis.

Materials and Methods: A total of 25 patients with a confirmed clinical and radiographic diagnosis of chronic periodontitis and 25 age and gender-matched healthy controls were enrolled. All the patients were recalled in the morning and blood samples were obtained. All the samples were sent to a laboratory where AutoAnalyzer was used for the assessment of serum homocysteine levels. Afterward, nonsurgical periodontal therapy was carried out in all the patients of the chronic periodontitis group. After finishing of nonsurgical periodontal therapy, again blood samples were taken and serum homocysteine levels were recorded.

Results: Mean serum homocysteine among the patients of the control group and the chronic periodontitis group (pre-treatment) was found to be 12.12 $\mu\text{mol/L}$ and 21.76 $\mu\text{mol/L}$, respectively. While comparing statistically, significant results were obtained. Mean serum homocysteine among the patients of the chronic periodontitis group before and after nonsurgical periodontal therapy was found to be 21.76 $\mu\text{mol/L}$ and 14.76 $\mu\text{mol/L}$, respectively. While comparing statistically, significant results were obtained.

Conclusion: Serum homocysteine levels are significantly raised in patients with chronic periodontitis. Furthermore, nonsurgical periodontal therapy leads to a significant reduction in serum homocysteine levels.

Key words: Impact, Nonsurgical, Serum

INTRODUCTION

Periodontal disease is an inflammatory process that affects the protective and supportive tissues around the tooth. Bacterial plaque accumulation on the tooth surface leads to marginal tissue inflammation, known as gingivitis. Gingivitis is a fairly common pathology. If left untreated, gingivitis may progress to periodontitis, which is characterized by

loss of periodontal attachment support (clinical attachment loss, [CAL]) and bone resorption, eventually resulting in tooth mobility and loss. Chronic periodontitis is a common disease characterized by a painless and slow progression.^[1-3]

Periodontal diseases have a significant impact on oral health-related quality of life, especially with the worsening and extension of the disease in which it presents higher destructive consequences. There are important risk factors/indicators for periodontal disease such as alcohol, overweight and obesity, smoking, and diabetes.^[4]

Homocysteine (Hcy) is a sulfur-containing, non-protein, thiol amino acid that is biosynthesized as an intermediate product during the metabolism of essential amino acid, methionine (Met). Physiologically, the re-conversion of

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Hcy to Met essentially requires certain co-enzymes such as Vitamin-B12 and folate, whose deficiency or systemic over-utilization may cause a disruption in the Hcy-Met cycle leading to a rise in plasma Hcy concentrations. Chronic inflammatory diseases enhance the systemic inflammatory load, which lead to inflammation-dependent vitamin depletion, thereby decreasing the availability of the essential nutritional cofactors responsible for the Hcy conversion.^[5-7] Hence, the present study was conducted for assessing the impact of nonsurgical periodontal therapy on serum homocysteine levels in patients with chronic periodontitis.

MATERIALS AND METHODS

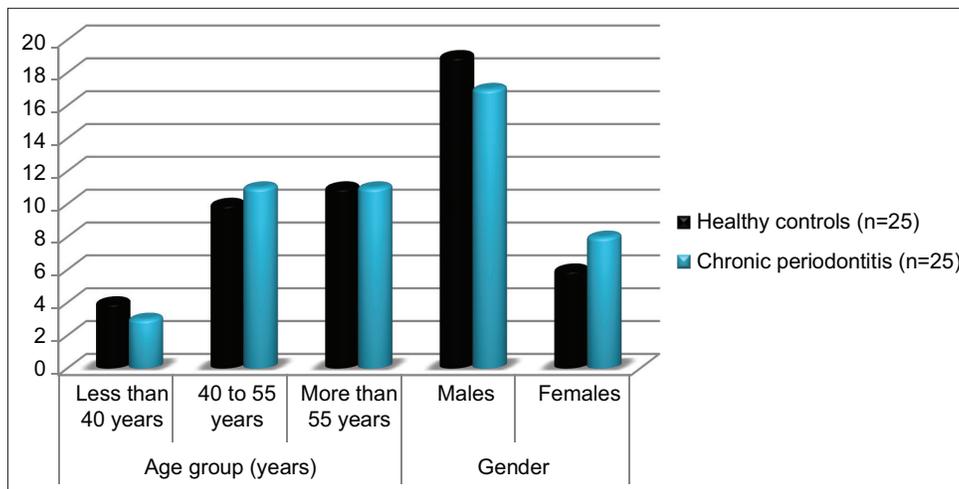
The present study was conducted for assessing the impact of nonsurgical periodontal therapy on serum homocysteine levels in patients with chronic periodontitis. A total of 25 patients with a confirmed clinical and radiographic diagnosis of chronic periodontitis and 25 age and gender-matched healthy controls were enrolled. All the patients <25 years and more than 65 years were excluded from the present study. Furthermore, patients with the presence of any systemic pathology were excluded from the study. Complete demographic details and clinical data of all the patients were recorded separately. All the patients were recalled in the morning and blood samples were obtained. All the samples were sent to a laboratory where AutoAnalyzer was used for the assessment of serum homocysteine levels. Afterward, nonsurgical periodontal therapy was carried out in all the patients of the chronic periodontitis group. After finishing of nonsurgical periodontal therapy, again, blood samples were taken and serum homocysteine levels were recorded. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Student's *t*-test was used for evaluation of the level of significance.

RESULTS

In the present study, 25 chronic periodontitis patients and 25 healthy controls were enrolled. Mean age of chronic periodontitis patients and healthy controls was found to be 56.8 years and 55.1 years, respectively. Majority of the patients of both the study groups belonged to the age group of more than 55 years. There were 19 males and six females in the control group and 17 males and eight females in the chronic periodontitis group. Mean serum homocysteine among the patients of the control group and the chronic periodontitis group (pre-treatment) was found to be 12.12 $\mu\text{mol/L}$ and 21.76 $\mu\text{mol/L}$, respectively. While comparing statistically, significant results were obtained. Mean serum homocysteine among the patients of the chronic periodontitis group before and after nonsurgical periodontal therapy was found to be 21.76 $\mu\text{mol/L}$ and 14.76 $\mu\text{mol/L}$, respectively. While comparing statistically, significant results were obtained [Tables 1,2 and Graph 1].

DISCUSSION

Periodontal disease and dental caries are the most common diseases in the oral cavity. Chronic periodontitis is one of the periodontal diseases. It is a long-lasting inflammatory disease affecting the soft and hard tissues around the teeth and it is common worldwide. This disease is related to common and preventable biological risk factors (e.g., high blood pressure, high blood cholesterol, diabetes, genetic factors, and obesity) and behavioral risk factors (e.g., an unhealthy diet, physical inactivity, and tobacco use). Chronic periodontitis is ideally diagnosed at the beginning of the disease.^[7,8] Thus, the conceivable etiologic mechanism linking periodontal disease and CVDs are the presence of chronic low-grade inflammation. Inflammation and CVD both are associated with elevated serum levels of CRP and



Graph 1: Demographic data

Table 1: Comparison of mean serum homocysteine ($\mu\text{mol/L}$) among the subjects of the control group and chronic periodontitis group (pre-treatment)

Number of patients	Healthy controls	Chronic periodontitis (Pre-treatment)	P-value
Mean	12.12	21.76	0.000 (Significant)
SD	2.86	4.12	

Table 2: Comparison of mean serum homocysteine ($\mu\text{mol/L}$) among chronic periodontitis patients before and after nonsurgical periodontal therapy

Number of patients	Chronic periodontitis (pre-treatment)	Chronic periodontitis (post-treatment)	P-value
Mean	21.76	14.76	0.010 (Significant)
SD	4.12	2.39	

homocysteine (Hcy). Hcy is a sulfur-containing amino acid that is a product of the methionine metabolic pathway and can get accumulated as a result of a deficiency or systemic overutilization of folate, Vitamin B12, or Vitamin B6. Elevated levels of plasma Hcy has been detected in patients with chronic periodontitis. Possible mechanisms include the sustained production of pro-inflammatory cytokines such as ILs and TNF- α from inflamed periodontal tissues. These mediators can initiate an inflammatory cascade that has the potential to disturb the Hcy homeostasis, thereby elevating plasma Hcy concentrations.^[7-9] Hence, the present study was conducted for assessing the impact of nonsurgical periodontal therapy on serum homocysteine levels in patients with chronic periodontitis.

In the present study, mean serum homocysteine among the patients of the control group and the chronic periodontitis group (pre-treatment) was found to be 12.12 $\mu\text{mol/L}$ and 21.76 $\mu\text{mol/L}$, respectively. While comparing statistically, significant results were obtained. Mallapragada *et al.* assessed 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. The study involved 50 participants. The test group included 25 systemically healthy controls (mean age 38.44 ± 3.27 years) with severe chronic periodontitis and the control group ($n = 25$) included age- and sex-matched systemically and periodontally healthy controls. Mean serum hs-CRP and Hcy concentration in patients with chronic periodontitis were 3.37 ± 0.54 mg/L and 21.47 ± 7.93 $\mu\text{mol/L}$, respectively, and was significantly higher than the controls (1.68 ± 0.71 mg/L and 13.93 ± 8.30 $\mu\text{mol/L}$, 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.^[10]

In the present study, mean serum homocysteine among the patients of the chronic periodontitis group before and after nonsurgical periodontal therapy was found to be 21.76 $\mu\text{mol/L}$ and 14.76 $\mu\text{mol/L}$, respectively. While comparing statistically, significant results were obtained. Dillon MC *et al.* investigated that if CRP and homocysteine could be routinely detected in the saliva of healthy adults and the relationship between salivary and blood levels. CRP and homocysteine concentrations were determined using ELISA and enzymatic assays, respectively. Homocysteine was detected in only two saliva samples. CRP was measurable in all saliva samples and plasma samples. Regression analysis demonstrated no relationship between CRP concentration in saliva and plasma. Generalized linear models, including variables such as saliva flow rate and time since eating or drinking, also did not pass a lack of fit testing. Therefore, a relationship between CRP concentration in saliva and blood could not be established in this group of subjects. More sensitive detection methods are needed to determine if a correlation between salivary and serum homocysteine levels exists.^[6] Agnihotram *et al.* 2010 and Joseph *et al.* 2011 demonstrated higher plasma Hcy concentrations in chronic periodontitis participants over the controls. As recognized in the preceding studies and the present study, there could be a biologically conceivable association between chronic periodontitis and serum Hcy levels with several possible underlying mechanisms explaining this link.^[7,11]

CONCLUSION

From the above results, the authors concluded that serum homocysteine levels are significantly raised in patients with chronic periodontitis. Furthermore, nonsurgical periodontal therapy leads to a significant reduction in serum homocysteine levels.

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Kotwal, *et al.*: Impact of Nonsurgical Periodontal Therapy on Serum Homocysteine Levels

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