

Comparative Evaluation of Blood Parameters in Periodontal Healthy and Chronic Periodontitis Patients

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ABSTRACT

Background: Chronic periodontitis is a inflammatory condition that has been associated with various systemic conditions. Certain inflammatory cytokines produced during periodontal inflammation can depress erythropoietin production leading to development of anemia.

Aim: Comparative evaluation of blood parameters among periodontal healthy individuals and chronic periodontitis patients.

Materials and Methods: A total of 60 subjects aged 30 to 50 years participated in the study, out of which 30 male patients with chronic periodontitis as a Test Group and 30 male individuals with clinically healthy gingiva as a Control Group selected for the study. Periodontal parameters were recorded for both the groups and then 5ml venous blood sample collected and sent for hematological investigations for all patients. The blood parameter data was collected and subjected to statistical analysis.

Results: Data analysis showed that patients with chronic periodontitis have lower values of hemoglobin and hematocrit as compare to periodontal healthy individuals.

Conclusion: The present study show that patients suffering from chronic periodontitis have lower values of hematocrit and hemoglobin compared to healthy controls. This strengthens the hypothesis that chronic periodontitis may lead to anemia.

Keywords: Chronic periodontitis, Anemia, Blood, Hemoglobin, Hematocrit.

INTRODUCTION

Chronic periodontitis is an inflammatory disease of the supporting tissues of the tooth caused specifically by gram-negative anaerobic bacteria which are associated with the initiation and progression of periodontitis. This bacterias can evoke an immuno-inflammatory reaction in the host periodontal tissue by releasing various toxins. It

leads to damage to the host periodontal tissue in order to remove pathogenic bacteria. The healthy sulcular epithelium serves as a protective barrier to the bacteria. It prevents their entry into systemic circulation. In periodontitis, this host microbial interaction causes ulceration in the sulcular epithelium which can become a way for bacteria to enter into gingival connective tissue and further into systemic circulation.¹

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The bacteremia has been found to be directly related to the severity of inflammation and it is seen in patients with periodontitis.² The activation of immune system takes place due to auto-immune dysregulation, which leads to the production of inflammatory cytokines such as interleukins (IL-1, IL-6) and tumor necrosis factor-alpha (TNF- α). This leads to development of anemia due to depression of erythropoietin production.³

The anemia of chronic disease (ACD) is a cytokine mediated anemia which is a frequent complication of chronic inflammatory conditions. It can occur despite of adequate reticuloendothelial iron stores and normal to elevated ferritin concentrations.⁴ Thus, it is hypothesized that there are possible influence of periodontitis on systemic health of individual.

Hence, the aim of the study was to estimate various blood parameters in periodontal healthy and chronic periodontitis patients.

MATERIAL AND METHODS

Study Population

This study was conducted in Department of Periodontology, Aditya Dental College, Beed. A total of 60 systemically healthy subjects, aged 30 to 50 years participated in the study. The test group included 30 male patients with chronic periodontitis and a control group of 30 male patients with clinically healthy gingiva. Ethical clearance was obtained from the institutional ethical committee. The informed consent was taken from the patients who participated in this study.

The inclusion criteria for the study were as follows: 1) the test group included patients with chronic periodontitis as evidenced by a probing depth of ≥ 5 mm, 2) the Control group included with clinically healthy gingiva with a probing depth of ≤ 3 mm. The exclusion criteria for the study were as follows: 1) female patients, 2) patients with history of diabetes, kidney disease, cancer, or fungal or respiratory infections, 3) patients with hospitalization or intake of medications in the last 6 months, 4) patients with current or past habit of tobacco smoking or chewing, 5) patients with previous history of periodontal therapy.

Clinical measurements: For all the subjects, the periodontal status was recorded by measuring probing pocket depth using University of North Carolina- 15 probe.

Blood parameters: The blood samples were obtained by venipuncture in the antecubital fossa. Further, the blood samples were transferred in EDTA bulb and processed within 4 hours of collection in an automated hematology analyzer (Nihon Kohden Mek 6410 K, Japan). The values of complete blood count (CBC), Hb, hematocrit concentration (HCT), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), Mean corpuscular hemoglobin concentration (MCHC) were measured.

STATISTICAL ANALYSIS

It was done by using descriptive and inferential statistics. To illustrate difference between two groups, Student unpaired t test was used. The collected data were subjected to statistical analysis through softwares such as SPSS 17.0 version and EPI-INFO. The p value was considered statistically significant if $p < 0.05$.

RESULTS

The hematological parameters of 30 healthy subjects and 30 chronic periodontitis patients were statistically compared (Table 1, Graph 1). There was statistical significant difference found in mean Hb (g/dl) between the healthy individuals (15.08 ± 1.08) and chronic periodontitis patients (12.62 ± 0.60). (Table 2, Graph 2)

There was statistical significant difference found in mean HCT(%) between healthy individuals (37.28 ± 3.17) and chronic periodontitis patients (34.88 ± 4.01). (Table 3, Graph 3)

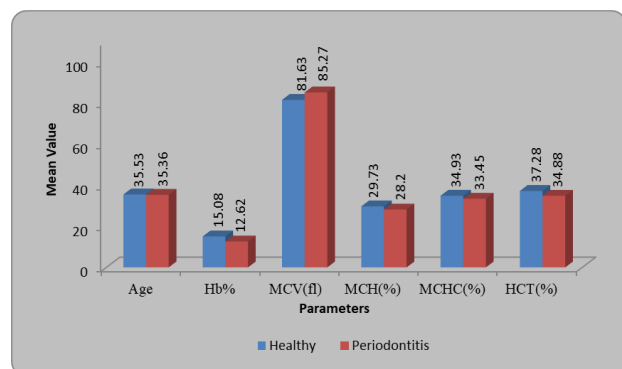
There were no statistically significant differences found in the values of MCV, MCH and MCHC between healthy individuals and chronic periodontitis patients.

DISCUSSION

In developed and developing countries, anemia is considered as one of the most common health problems in society. It affects 24.8% of the total population of world. The etiology of anemia

Table 1: Baseline Characteristics.

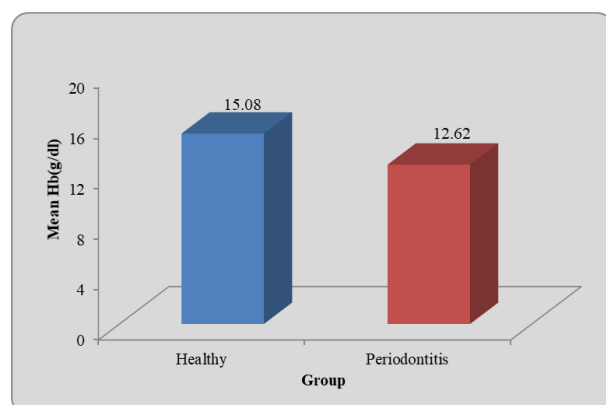
Group	Age	Hb %	MCV(fl)	MCH(%)	MCHC(%)	HCT(%)
Healthy	35.53	15.08	81.63	29.73	34.93	37.28
Periodontitis	35.36	12.62	85.27	28.2	33.45	34.88



Graph 1: Baseline Characteristics.

Table 2: Comparison of Hb (g/dl) in control and test groups.

Group	N	Mean	Std. Deviation	Std. Error Mean	t-value	p-value
Healthy	30	15.08	1.08	0.19	10.87	0.0001, S
Periodontitis	30	12.62	0.60	0.11		

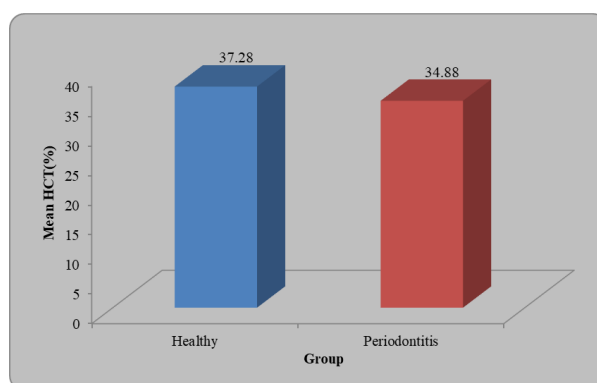


Graph 2: Comparison of Hb (g/dl) in control and test groups.

includes profuse blood loss due to trauma, nutritional deficiencies, bone marrow dyscrasias, hemoglobinopathies, acute and chronic infections such as malaria, tuberculosis and HIV.⁵

Table 3: Comparison of HCT (%) in control and test groups.

Group	N	Mean	Std. Deviation	Std. Error Mean	t-value	p-value
Healthy	30	37.28	3.17	0.58	2.56	0.013, S
Periodontitis	30	34.88	4.01	0.73		



Graph 3: Comparison of HCT (%) in control and test groups.

The previous studies have suggested anemia to be cause of destructive periodontitis and not its consequence.⁶ Recently authors concluded that patients with chronic periodontitis show signs of anemia by evaluating the blood parameters.⁷

Tobacco smokers and chewers present confounding factors, so we excluded them in the present study. Smoking affects the immune system as well as normal microflora of the patient.⁸ It leads to formation of deep periodontal pockets, greater loss of connective tissue attachment and bone loss.⁹ Due to the harmful effects of nicotine, functions of neutrophils such as phagocytosis, super-oxide production and protease inhibitor production are hampered.¹⁰ The production of cytokines can be modified by tobacco products. It has greater influence on the release of cytokines from neutrophils. They tend to affect erythrocytes and other parameters of blood.¹¹ Several authors revealed that smokers with chronic periodontitis has a lower value of hemoglobin, and lower hematocrit compared to non-smokers with chronic periodontitis.¹²

We also excluded females from our study because anemia is considered to be more prevalent in females. This can be due to poor nutrition,

increased menstrual bleeding, high incidence of tropical and intestinal infections and other miscellaneous conditions.¹³ During puberty period, reproductive phase of life and toward menopausal period, females are more prone to hormonal imbalance.¹⁴ Due to this, microflora and host immune response altered which leads to exaggerated response of the periodontal tissue to the dental plaque. So, to prevent bias in the present study, only male patients were included.

In the present study, the mean hematocrit value was found to be significantly lower in patients with chronic periodontitis compared to healthy subjects. Similarly mean hemoglobin value was significantly lower in test group as compared to control group while MCV, MCH and MCHC values were normal in both the groups.

The lower value of hematocrit and hemoglobin can be attributed to the significantly lower number of erythrocytes resulting into the anemic condition. The reduction in values of MCV, MCH and MCHC leads to microcytosis and elevated value of it leads to macrocytosis which can be caused by iron deficiency and vitamin deficiency respectively.^{15, 16} But in our study MCV, MCH and MCHC values were normal which signifies that the anemia in periodontitis patients was due to inflammation or bacterial infection.

One of the important postulated reason for anemia is suppression of erythropoiesis from the bone marrow. The possible mediators considered for this are the proinflammatory cytokines such as Interleukins (IL 1, IL6) and tumor necrosis factor α (TNF- α).^{17,18}

The group of author found that recombinant human IL 1 (α , β) inhibits colony formation from normal human marrow by erythroid burst and colony forming units while IL 1 α does not inhibit colony formation by marrow granulocyte and macrophage progenitors.¹⁹ The suppression of mature erythroid progenitors in mice within 6 hours after treating them with single or repeated intraperitoneal injections of recombinant human IL-1 α .²⁰

CONCLUSION

The present study shows statistically significant decrease in hemoglobin and hematocrit values in

chronic periodontitis patients. It may be concluded that chronic periodontitis is an inflammatory condition which is having influence on systemic health.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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