EVALUATION OF SYSTEMIC MARKERS RELATED TO ANEMIA IN PERIPHERAL BLOOD OF PATIENTS WITH CHRONIC GENERALISED SEVERE PERIODONTITIS A COMPARATIVE STUDY

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ABSTRACT

Background: The purpose of this study was to evaluate systemic markers related to anemia in peripheral blood of patients with chronic generalized severe periodontitis and compare them with healthy controls.

Materials and Methods: A total of 60 systemically healthy males, aged 18 to 50 years were selected from the out patients department of periodontology, Meenakshi Ammal Dental College and Hospital. They were divided into two groups; Controls (group A) 30 male volunteers with healthy gingiva and Test Group (group B) 30 male patients with chronic generalized severe periodontitis. Periodontal clinical parameters and hematological parameters were recorded in both the groups.

Results: Blood parameters of patients with chronic generalized severe periodontitis especially Red Blood Cell (RBC) count, Haemoglobin (Hb) and Packed Cell Volume (PCV) values were reduced in group B indicating that chronic generalized severe periodontitis has a definite systemic effect.

Conclusion: RBC count, Haemoglobin (Hb) and PCV values of chronic generalized severe periodontitis patients were low compared to healthy individuals.

Key Words: Anemia of chronic disease, Chronic generalized severe periodontitis, RBC Count, Packed cell volume, Haemogloblin

INTRODUCTION

Periodontitis is an inflammatory disease of the periodontium which is characterized by a progressive destruction of the tissues supporting the tooth fundamentally initiated by chronic bacterial infection.[1,2] Its primary etiology is of microbial infections which may be composed of bacteria currently recognized in the oral cavity.

Several reports have indicated that bacterial cells can be found in the pocket wall of periodontitis lesions. Substantial scientific data indicate that the localized infections characteristic of periodontitis can have a significant effect on the systemic health of humans.[3-6] This host response may offer illustrative mechanisms for the interactions between periodontal infection and a variety of systemic disorders,[7] infections, malignant cells, and autoimmune dysregulation all lead to the activation of the immune system and production of cytokines, most notably tumor necrosis factor- alpha and IL-1 and IL-6.[8] Such inflammatory cytokines can depress erythropoietin production leading to the development of anemia.[9-10]

The anemia of chronic disease (ACD) can be defined as the anemia seen in chronic infections, inflammatory conditions, or neoplastic disorders that is not due to marrow deficiencies

or other diseases and occurs despite the presence of adequate iron stores and vitamins.

The aim of this study was to evaluate systemic markers related to anemia in peripheral blood of male patients with chronic generalized severe periodontitis and compare it with males having healthy periodontium.

MATERIALS AND METHODS

Materials

A total of 60 systemically healthy males, aged 18 to 50 years were selected from the out patients Department of periodontology, Meenakshi Ammal Dental College and Hospital from June 2014 to July 2015. The "Institutional Ethics Committee" approved this study and written informed consent was obtained from all participants of the study.

The study comprised of Group A which includes 30 male volunteers with healthy gingiva with no attachment loss and Group B which includes 30 male patients with chronic generalized severe periodontitis were recruited.

INCLUSION CRITERIA

Patients with a clinical attachment loss of ≥5 mm in >30% of sites classified as chronic generalized severe periodontitis were included.

EXCLUSION CRITERIA

Females patients, subjects with history of diabetes, kidney disease, cancer and infectious diseases, patients with a history of hospitalization or intake of medications in the last 6 months, patients with a current or past habit of tobacco smoking or chewing and with a previous history of periodontal therapy, and patients with iron deficiency were excluded.

Methods

Periodontal parameters such as bleeding on probing, probing depth, clinical attachment loss and plaque index and heamotological parameters like total no of erythrocytes (RBC), Haemoglobin concentration (Hb), Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Haemoglobin Concentration (MCHC), Mean Corpuscular Volume (MCV), Packed cell volume (PCV), Serum Ferritin were examined

Blood parameters assessment

Blood samples (5 ml) were collected by vene puncture of the cubital vein in the antecubital fossa by using a 5 ml disposable syringe. A component of the blood sample was then transferred to sterile vacuum tubes containing an anticoagulant ethylene diamine tetraaceticacid (EDTA), for whole blood analysis. The left over blood was collected in sterile vacuum tubes with no added anticoagulant this was designated for serum separation for serum ferritin

The hematological parameters like RBC count, PCV, Hb, MCV, MCH and MCHC were estimated in an automated blood counting machine.

Biochemical parameters like serum ferritin were analyzed by using an automated analyzer.

STATISTICAL ANALYSIS

Statistical analysis was performed with SPSS Software for means ± SD of all the parameters were calculated for both the groups. And to illustrate differences between groups, independent sample t test and mann whitney u test formula *p* value were used, and was considered statistically significant if *p* value was <0.05.

RESULTS

In group A mean Plaque index score was 0.50.08 and in group B mean plaque index score was 0.6±0.09.In group A the percentage of bleeding sites on probing was found to be 31% and for group B it was found to be 73%.In group A mean probing depth and CAL was found to be 2.8±0.23mm and in group B mean Probing depth and CAL was found to be 5.8±0.67mm and 6.0±0.7mm respectively. (Table/fig- 1)

The hematological parameters RBC count, Haemoglobin, PCV, MCV, MCH, MCHC and serum ferritin were evaluated in both the groups and compared.

The mean RBC count (in million/mm3) in group A was 4.7±0.44 and in group B it was 4.2±0.77 and the mean Haemoglobin (in gm%) was 14.7±0.87 and 13.5±1.20 in group A and group B respectively with *p* value 0.04.(Table/fig-2)

The mean PCV (in gm%) was 43.8±2.38 in group A and in group B it was 40.5±3.57 and difference was found to be statistically significant with *p* value 0.001.(Table/fig-2)

The mean values of MCH, MCHC, MCV and Serum ferritin group A and group B difference was found to be statistically not significant. (Table/fig-2)

Results showed that Mean, standard deviation and level of significance of the clinical parameters among the two groups were presented in Table /fig-1.

S.No	Clinical Parameters	GROUP A Mean ±SD	GROUP B Mean ±SD	P- Value
1	Plaque Index	0.5± 0.08	0.6± 0.09	0.04*
2	Bleeding on probing (%)	31.0±5.89	72.97±9.2	0.001*
3	Probing Depth (mm)	2.8± 0.23	5.8± 0.67	0.001*
4.	Clinical Attachment level (mm)	2.8± 0.23	6.0± 0.7	0.001*

* - significant if <0.05

Mean, standard deviation and level of significance of the blood parameters

S. No	Hematological Parameters	GROUP A Mean ±SD in mm	GROUP B Mean ±SD in mm	P- Value
1	RBC (millions/mm3)	4.7 ± 0.44	4.2 ± 0.77	0.04*
2	HAEMOGLOBIN (gm%)	14.7 ± 0.87	13.5 ± 1.20	0.001*
3	PCV (gm%)	43.8 ± 2.38	40.5 ± 3.57	0.001*
4	MCV(fl)	93.7± 7.55	93.6± 17.09	0.973**
5	MCH (pg)	31.0± 2.49	30.9± 4.39	0.363**
6	MCHC (gm%)	33.1± 1.11	33.0±1.15	0.534**
7	FERRITIN (ng/ml)	109.9±42.13	106.2±66.34	0.802**

* is significant if <0.05   ** is not significant if >0.05

DISCUSSION

Anemia of chronic diseases is the second common type of anemia (next to iron deficiency anemia). It is characterized by short lifespan of RBCs, caused by disorder in iron metabolism or resistance to erythropoietin action.

A characteristic finding of the disorders associated with ACD was the increased production of the cytokines that mediate the immune or inflammatory response. All the processes involved in the development of ACD can be recognized to these cytokines and these cytokines are also released by periodontal tissues in response to bacterial infection. It has been guessed that periodontitis results in a low grade systemic inflammation. By tradition, an elevation in the number of peripheral leukocytes and a variation in the levels of serum proteins identified, as acute-phase proteins are characteristic of infectious conditions. **Cartwright (1966)**[11] stated that the pathologic processes such as shortened erythrocyte survival, failure of the bone marrow to increase red blood cell (RBC) production to compensate for this increased demand, and impaired release of iron from the reticuloendothelial system are involved in ACD. The pro-inflammatory cytokines are thought to act as mediators in suppressing erythropoeisis from the bone marrow leading to anemia. The cytokines like interleukin (IL)-1 , IL- 6, and tumor necrosis factor–alpha (TNF α) have been related to suppression of erythropoiesis. Cartwright also suggested that the supply of erythropoietin (EPO) to the marrow might be the rate-limiting factor in the impaired marrow response to ACD.

Similar changes in blood components may also be noticed in patients with periodontitis. A study done by **Hutter et al (2001)**[12] shown lower erythrocyte numbers and lower haemoglobin (Hb) levels were reported in periodontitis patients.

Down regulation of the erythropoiesis in bone marrow by pro-inflammatory cytokines may be responsible for decreased blood count.[13] Systemic circulation of cytokines originating from local inflammation destroys erythropoiesis.

Currently, two significant theories are available to explain the relationship between severe anemia and periodontitis. Some studies have provided evidence for improved periodontal health after correction of some anemia types.[14] However, others have reported improved anemia with the control of periodontal disturbances.[15-17].

To rule out anemia caused due to iron deficiency, we also evaluated serum ferritin levels and included it as one more parameter in our study. Females were excluded in our study as they more prone to anemia due to increased blood loss during menstruation, hormonal imbalance during puberty, during reproductive phase and during menopausal stage. Smokers were also excluded since various studies [18] had shown that smoking also affects erythrocytes and other blood parameters. Patients with other systemic diseases and infectious diseases were also excluded as these diseases have shown reduction in RBCs in these patients.[19]

The difference in plaque index score between the groups was less, the difference in bleeding sites, probing depth and CAL is significantly higher in group B compared to that of group A. This may be due to presence of virulent subgingival microbiota in patients with chronic generalized severe periodontitis which provide a significant and persistant gram negative bacterial challenge to the host.

The sulcular epithelium which is normally ulcerated and irregular in chronic periodontitis patients may be the reason for the increased bleeding sites in group B.[20]

On comparing the mean values of the mean RBC count (in million/mm3) and and the mean Haemoglobin (in gm%) between group A and group B the difference was statistically significant. The reduction in RBC and haemoglobin in group B patient may be caused by periodontal inflammation upregulating the proinflammatory cytokine. In chronic diseases, bone marrow activity is less due to cytokines produced at the inflammatory site.[21]

The difference of the mean PCV (in gm%) was found to be statistically significant, this may be because of reduction of RBCs in group B as PCV varies with RBC counts, increase in RBC count causes increase in PCV and with decrease in RBC count PCV also decreases.[22]

In our study the MCV value of group B was within the normal range which is usually seen in anemia of chronic disease.[23]

In our study group B MCH was within the normal range indicating that patients did not suffer from megaloblastic anemia or iron deficiency anemia.[23]

In our study in group B MCHC value was within normal range which shows that patients were not suffering from iron deficiency anemia.[23]

In our study group B had serum ferritin level within normal range and MCV, MCH, MCHC values were also within normal range indicating patients were not suffering from iron deficiency anemia.

In our study blood parameters of patients with chronic generalized severe periodontitis especially RBC count, Haemoglobin and PCV values are affected indicating that chronic periodontitis has a definite systemic effect.

Further longitudinal and interventional study with more number of sample size has to be done to confirm that chronic generalized severe periodontitis can also lead to haematological signs of anemia. The signs might not be as severe as seen in other systemic conditions but they definitely cannot be disregarded.

CONCLUSION

In our study we found that there is reduction of some of the hematological parameters like RBCs, Haemoglobin, PCV of patients with chronic generalised severe periodontitis comparing with periodontally healthy individuals.

This is the first study where serum ferritin levels has been evaluated and the patients with iron deficiency anemia were excluded from the present investigation. Since Chronic periodontitis is an inflammatory disease, the systemic conditions such as anemia may not have a direct effect on the progression of periodontitis, but indirectly it may effect the course of the disease through the production of proinflammatory cytokines. However this relationship needs to be explored further, in order to establish the association between the two ailments.

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