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AN ANALYSIS OF RED BLOOD CELL PARAMETERS IN SMOKERS AS COMPARED TO HEALTHY CONTROLS

Dental Science

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ABSTRACT

Background: Smoking is one factor which can alter the blood cell parameters. The aim of this study was to compare the levels of blood cell parameters in smokers as compared to healthy controls.

Materials and methods: Totally 50 patients between the age group 25 – 65 years were recruited for the present study. They were grouped as group I - healthy subjects, and group II – subjects who smoke. A single examiner collected the necessary periodontal recordings. Five millilitres of venous blood was collected from all the subjects and submitted for haematological analyses.

Results: Significant lower levels of rbc count attributed to folic acid and vitamin B12 levels in smokers. ESR was higher in smokers as compared to healthy individuals.

Conclusion: The result of the present study signifies that smoking has an impact on blood cells parameters.

KEYWORDS

smoking, folic acid, periodontitis.

INTRODUCTION

Periodontitis, an infectious disease leads to inflammation of the supporting structures of the teeth along with progressive loss in clinical attachment and bone. It is the bacterial plaque which initiates and sustains periodontitis, but it is the host defense mechanisms which plays a crucial role in the etiopathogenesis. [1] Periodontitis being a multifactorial disease is proved to be associated with a wide variety of factors, namely social, behavioral, systemic, environmental and genetic risk factors.[2]

Cigarette smoking is one among the environmental factors which is the most prevalent risk factor for chronic periodontitis.[3] A large number of epidemiological evidences have established the fact that cigarette smoking is the environmental risk factor in the initiation and progression of periodontal disease. It's association with an increased diseased rate in periodontal bone loss, attachment loss is noticed. Smoking is associated with 2 to 7 fold increase in risk for having periodontitis when compared to non-smokers. It affects innate and immune host responses.[4] Smoking has a negative impact on the neutrophil functions like phagocytosis, superoxide and hydrogen peroxide liberation, integrin expression along with protease inhibitor production. Protease from neutrophil leads to periodontal tissue destruction.[5]

Production of healthy red blood cells and prevention of anemia require folate.[8] They act as carbon donors or acceptors, Hence, folic acid plays an important and a crucial role in the human body systems.[3]

The organic nitrites, nitrous oxide, cyanates and isocyanates present in cigarette smoke are proved to interact with folic acid and vitamin B12 co – enzymes, transforming them to biologically inactive forms. (Khaled et al. 1985).

Cigarette smoke initiates endothelial cell damage by liberation of free radicals like nitric oxide and hydrogen peroxide which leads to oxidative stress. This oxidative stress leads to a systemic acute phase reaction and leads to increase in CRP, fibrinogen, cytokines, blood cell count, viscosity and eventually rouleaux formation. So a increase ESR level is seen.[5]

In cigarette smoking, carbon monoxide is produced by incomplete combustion of carbon containing compounds. CO has great affinity for haemoglobin than oxygen, about 200 fold. CO displaces oxygen from haemoglobin in red blood cells to produce COHb, which decreases release of oxygen to tissues. As a compensatory mechanism higher levels of hematocrit and haemoglobin are seen in smokers which contribute to hypercoagulable state.[10]

Therefore the aim of this present study was :

1) To evaluate and compare the red blood cell parameters viz; haemoglobin concentration, RBC count, packed cell volume, mean corpuscular volume, mean corpuscular haemoglobin concentration and ESR among chronic periodontitis patients, smokers with chronic periodontitis and healthy volunteers.

MATERIALS AND METHODS:

Study population

The study population included 50 patients, 25 healthy, 25 smokers , 25 smokers within the range of 30 -65 years with informed consent about the nature of the study at PVR Dental care &: Implant centrer, Bangalore. The study was conducted in accordance with the Helsinki Declaration of 1975, as revised in 2000

The smokers were classified as current smokers, former smokers and never smokers based on CDC classification and only current smokers were considered for the study. The smoking habits of all the smokers were recorded. All the smokers were cigarette smokers. Only the subjects who did not receive any kind of periodontal therapy were included for the study. A detailed case history was recorded to exclude any medical condition which would affect their participation in the study. A part from the above mentioned the subjects who had a history of recent vitamin and iron supplements, anti-inflammatory drugs, antibiotics, diabetes, pregnancy, lactation were excluded from the study. BMI of all the subjects was considered.Alcohol consumers and obese people were excluded.

Clinical recordings

Blood analysis

Five millilitres of venous blood was collected from the antecubital fossa of the subject after a fast of 12 hr. 3ml of blood was collected into the EDTA containing vaccum tubes for analyzing the blood cell parameters. 2ml of blood was collected into vaccum tube to analyze vitamin B12 and folic acid levels. The red blood cell parameters, WBC count, platelet count was determined by automated hematoanalyzer.

Statistical analysis

Data was expressed as means and SD. Statistical significance of differences between groups was tested by ANOVA test. Correlations between serum and clinical parameters were calculated according to the Pearson's coefficient correlation. The null hypothesis was rejected at $p < 0.05$. Multiple linear regression analysis was performed with smoking as a dependent variable..

RESULTS

Blood analysis

The table 1. Shows the mean values of the serum parameters . and platelet count levels increased significantly in smokers. Hb%, WBC count, MCV and ESR values decreased in smokers ($p<0.01$).

Table 1. Clinical parameters of 2 groups.

Parameters	Group I	Group II
Hb%	15.31±0.83	11.40±1.34
WBC count	5172±694.33	3436±1002.62
RBC count	5.24±026	4.86±0.25
PCV	43.46±1.80	41.36±1.79
MCV	86.82±2.37	81.68±1.92
MCH	31.30±1.23	29.19±1.44
MCHC	36.97±0.87	32.68±1.03
ESR	11.98±2.94	26.56±7.12

DISCUSSION

Periodontitis is a common oral disease,caused by many etiological factors with bacterial plaque as the main initiator. As mentioned earlier numerous other factors do play a role in presentation and progression of the periodontal disease like, social, environmental, genetic factors. Some of the recent studies have proved a plausible relation between oral health and nutritional status in humans.[11,12] Nutrition has a strong influence on the periodontal integrity. Due to the dynamicity of the periodontium, the maintenance depends on the adequate intake of nutrients.[13]

Folic acid deficiency is a common nutrient deficiency. It is one of the essential vitamin which is called as hemocytopoietic vitamin.[14] Folic acid is basically associated with raised oxidative stress, defective DNA, apoptosis and endothelial dysfunction. Studies have shown that vitamin supplementation reduced the gingival redness, bleeding, pus exudation.[15] It is proved that smoking is an environmental risk factor for causation of periodontitis which is more important and prevalent .[15] Smoking affects the periodontium by various ways. It affects the immune system, host response. It acts on the neutrophil functions like phagocytosis, free radical formation, integrin expression and protease inhibitor production. As reported earlier the organic nitrites, cyanates, nitrous oxide and isocyanates in cigarette smoke have shown to have an interaction with folic acid coenzymes and transfer them into biologically inactive metabolites.[2] However there are few studies which have shown the impact of folic acid on Red cell parameters of subjects with smoking habit.

There are numerous studies on the adverse effects of smoking on different diseases, but direct impact of smoking on nutrition concentrations is less.(Preston 1991). The present study was done to determine and compare the folic acid, vitamin B12 and some haematological parameters between smokers and non-smokers with chronic periodontitis. The serum parameters were compared with the periodontal parameters. The results suggested a decrease in the folic acid, vitamin B12 and platelet count, but an increase in Hb%, ESR and MCV in smokers when compared to other two groups. The result is in the way of many previous studies indicating lower serum folic acid levels in smokers (Erdemir EO 2006). A lowered folic acid concentration may be a reflection of the reduced intake of vitamin in smokers (O'Callaghan et al 2002). The reduced level of folic acid could be due to the interaction between cyanates and isocyanates with folic acid which make them biologically inactive and eventually lead to decrease in their levels.[6]

There was an increase in the WBC count in smokers than non-smokers. It is a well known fact that smoking is strongly associated with increased WBC count (Corre et al 1971, Bridges et al 1985).

Our present study showed a significant increase in the ESR values in smokers ($p < 0.05$). The increased ESR values could be due to the acute phase reaction caused due to the oxidative stress created by the cigarette smoke which leads to increased acute phase reactants like CRP, fibrinogen, blood cell count which increase blood viscosity and rouleaux formation.

A limitation of the present study is that it is a cross-sectional study. As red blood cell levels reflect the long term intake and tend to be more stable (Snow199) red blood cell folate levels would give the reliable results comparatively.

Eventhough cessation of smoking is an ideal objective, adequate intake of nutrition is important.

CONCLUSION

Based on the findings of the present study, the Red cell parameters of group II was significantly lower compared to the Healthy group. The serum ESR, WBC and Hb% levels of smokers was significantly higher in smokers.

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