ORIGINAL RESEARCH

Effects of Nonsurgical Periodontal Therapy on Blood Parameters and Periodontal Status-In Vivo Study

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ABSTRACT:
Background: Periodontitis is an inflammatory disease of the supporting tissues of the tooth caused by specific microorganisms in a susceptible host. Subgingival microflora plaque formation as a series of successive waves of colonization by increasingly periodontopathogenic clusters of bacteria. The microflora shifts from gram positive to gram negative microbes and rods. The most pathogenic microbial cluster is the red complex which consists of the P. gingivalis, T. Forsythia and T denticola species. The primary goal of periodontal therapy is to preserve the natural dentition by achieving and maintaining a healthy functional periodontium. It consists of patient motivation and oral hygiene instructions as well as mechanical removal of supra and subgingival plaque and calculus deposits, correction of plaque-retentive factors and risk factor modification. **Aim of the study:** To study effects of nonsurgical periodontal therapy on blood parameters and periodontal status. **Materials and methods:** This study was carried out in the department of periodontology, AMC Dental college and hospital, Ahmedabad. A randomized control trial was conducted on 75 patients which were systemically healthy and aged between 30-55 years. Periodontal parameters included in the study were recorded with following indices: Plaque Index (PI), Gingival Index (GI), Probing Pocket Depth (PPD), and Clinical Attachment Level (CAL). Blood investigations include measurement of: Hemoglobin (Hb), Red Blood Cell (RBC) Count, White Blood Cell (WBC) Count, Erythrocyte Sedimentation Rate (ESR), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Haemoglobin Concentration (MCHC), Pack Cell Volume (PCV). **Results:** The analysis of demographic variables shows that 37 (49.3 %) were females and 38 (50.7%) were males. All hematological parameters showed improvement from baseline to 3 months in all three groups in the present study. A statistically significant increase in Hb levels from 12.32 to 12.67 gm/dl in healthy control group, from 12.70 to 13.02 gm/dl in generalized chronic gingivitis group and from 11.48 to 11.93 gm /dl in generalized chronic periodontitis from base line to 3 months. Thus a mean increase of 0.35 gm/dl in healthy control group ,0.32 gm/dl in generalized chronic gingivitis group, 0.45 gm/dl in generalized chronic periodontitis from baseline to 3 months. Thus, slight more improvement was seen in generalized chronic periodontitis. **Conclusion**: Future long – term studies with a large sample size should be carried out to further explore of the study. The results have been shown that increase in blood parameters after nonsurgical periodontal therapy , will improve physical status of patients in some degree.
Keywords: Periodontitis, Gingivitis, Plaque, Blood parameters

INTRODUCTION

Periodontitis is an inflammatory disease of the supporting tissues of the tooth caused by specific microorganisms in a susceptible host. Subgingival microflora plaque formation as a series of successive waves of colonization by increasingly periodontopathogenic clusters of bacteria. The microflora shifts from gram positive to gram negative microbes and rods. The most pathogenic microbial cluster is the red complex which consists of the P. gingivalis, T. Forsythia and T denticola species. The microbial- inflammatory response interface plays a major role in the occurrence of the disease. Localized infections which are characteristic of periodontitis can have a significant effect on the systemic health of humans and animals. [1] Just as the periodontal tissues mount an immune inflammatory response to bacteria and their products, systemic challenges with these agents also induce a major vascular response. [2] The sulcular epithelium acts as a protective barrier and prevents entry of microorganisms and other irritants into the systemic

circulation. The host-microbial interaction in periodontitis leads to ulceration of sulcular epithelium. The ulcerated pocket epithelium acts as a portal of entry for the bacteria to enter the connective tissue and thus into the systemic circulation and cause bacteremia. Bacteremia has been observed in patients with periodontitis and has been directly related to the severity of the inflammation. [3] The primary goal of periodontal therapy is to preserve the natural dentition by achieving and maintaining a healthy functional periodontium. It consists of patient motivation and oral hygiene instructions as well as mechanical removal of supra and subgingival plaque and calculus deposits, correction of plaque-retentive factors and risk factor modification.[4, 5, 6] Hence, the present study was conducted to study effects of nonsurgical periodontal therapy on blood parameters and periodontal status.

MATERIALS AND METHODS
This study was carried out in the department of periodontology, AMC Dental college and hospital, Ahmedabad. The nature of the study was explained to the patients following which a verbal and written consent was obtained. Prior permission was obtained from NABL approved green cross laboratory for investigations of blood samples during study. The study was approved by the institutional ethics committee. A randomized control trial was conducted on 75 patients which were systemically healthy and aged between 30-55 years.
- Group 1 (Healthy controls)
- Group 2 (Generalized chronic gingivitis)
- Group 3 (Generalized chronic periodontitis)

Prior permission was obtained from NABL approved green cross laboratory and from patients. Each patient who included in the study was examined thoroughly before commencing with non-surgical periodontal therapy procedure (SRP). In study proforma, patient's detailed case history was recorded including the general information of the patient, past periodontal therapy if any, medical history, any systemic diseases and periodontal parameters. Periodontal parameters included in the study were recorded with following indices:
Plaque Index (PI), Gingival Index (GI), Probing Pocket Depth (PPD), and Clinical Attachment Level (CAL).
Blood investigations include measurement of:
Hemoglobin (Hb), Red Blood Cell (RBC) Count, White Blood Cell (WBC) Count, Erythrocyte Sedimentation Rate (ESR), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Haemoglobin Concentration (MCHC), Pack Cell Volume (PCV).

Treatment Protocol
- All the patients were given oral hygiene instructions and educated and motivated for optimal plaque control. A meticulous phase-I therapy was performed which included thorough scaling and root planning, restoration of any carious teeth and extraction of tooth with any hopeless prognosis.
- Subjects were recalled at 3 months from baseline for supportive periodontal therapy and to reinforce oral hygiene.
- All the patients were instructed to inform immediately for any changes in their medical status, or any severe injuries resulting in excess blood loss during the 3 months of treatment period.
- All the periodontal clinical parameters as well as blood parameters were again assessed at the end of 3 months from baseline.

The data derived for each of the groups was analyzed by independent sample student's t-test. For all tests, p value of <0.001 was considered statistically significant.

RESULTS
The analysis of demographic variables shows that 37 (49.3 %) were females and 38 (50.7%) were males. (Table 1). Table 2 shows the mean and standard deviation of clinical parameters like plaque index and gingival index at baseline in healthy control group, generalized chronic gingivitis group, generalized chronic periodontitis group. Table 3 shows the mean and standard deviation of various hematological parameters like Hb, RBC, WBC, ESR, MCV, MCH, MCHC, PCV at 3 months in healthy control group, generalized chronic gingivitis group, generalized chronic periodontitis group. Table 4 shows the mean and standard deviation of clinical parameters like plaque index and gingival index at 3 months in healthy control group , generalized chronic gingivitis group , generalized chronic periodontitis group.

DISCUSSION:
Localized infections of periodontal tissues which result in periodontitis may affect the course and pathogenesis of a number of systemic diseases like cardiovascular disease, bacterial pneumonia, diabetes mellitus, and low birth weight. [7-10] As the periodontal tissues mount an immune inflammatory response to bacteria and their products, systemic challenges with these agents also induce a major vascular response.[11]

Table 1: Age and gender

Group	Males		Females		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
Healthy controls	12	48	13	52	25	100
Generalized chronic gingivitis	13	52	12	48	25	100
Generalized chronic periodontitis	13	52	12	48	25	100
Mean age (years)	40.47		39.84		40.16	

Table 2: Comparison of mean and SD values of clinical parameters between Group I , II ,III at base line

Clinical parameters	Groups	Mean	SD
Plaque index	Healthy controls	1.20	0.41
	Generalized chronic gingivitis	2.16	0.37
	Generalized chronic periodontitis	2.48	0.51
Gingival index	Healthy controls	1	0
	Generalized chronic gingivitis	2.20	0.41
	Generalized chronic periodontitis	2.68	0.42

Table 3: Comparison of mean and SD values of clinical parameters between group I, II, III at 3 months

Blood parameters	Groups	Mean	SD
Hb	Healthy controls	12.67	0.48
	Generalized chronic gingivitis	13.02	0.21
	Generalized chronic periodontitis	11.93	0.27
RBC	Healthy controls	4.39	0.04
	Generalized chronic gingivitis	4.60	0.03
	Generalized chronic periodontitis	4.26	0.03
WBC	Healthy controls	7540.88	82.44
	Generalized chronic gingivitis	8147.28	68.31
	Generalized chronic periodontitis	8375.84	81.58
ESR	Healthy controls	9.88	0.88
	Generalized chronic gingivitis	10.24	1.23
	Generalized chronic periodontitis	16.96	1.70
MCV	Healthy controls	29.09	0.97
	Generalized chronic gingivitis	27.66	0.67
	Generalized chronic periodontitis	24.90	0.51
MCH	Healthy controls	33.57	0.54
	Generalized chronic gingivitis	32.34	0.65
	Generalized chronic periodontitis	30.29	0.36
PCV	Healthy controls	13.16	0.52
	Generalized chronic gingivitis	11.97	0.43
	Generalized chronic periodontitis	11.20	0.48

Table 4: Comparison of mean and SD values of clinical parameters between group I, II, III at 3 months

Clinical parameters	Groups	Mean	SD
Plaque index	Healthy controls	0.2	0.41
	Generalized chronic gingivitis	1	0
	Generalized chronic periodontitis	1.08	0.28
Gingival index	Healthy controls	0	0
	Generalized chronic gingivitis	1.08	0.28
	Generalized chronic periodontitis	1.16	0.37

Infections, malignant cells, and autoimmune dysregulation all lead to the activation of the immune system and production of inflammatory cytokines (TNF-α, IL-1 and IL-6). [12] These cytokines are produced by various inflammatory cells such as neutrophils, macrophages, lymphocytes and periodontal cells like epithelial cells and fibroblasts. Cytokines can cause tissue destruction of connective tissues and alveolar bone. These pro inflammatory cytokines (IL 1, IL6, TNF alpha) also evoke a low grade systemic inflammation. [1-6]

The present study was conducted to evaluate effects of nonsurgical periodontal therapy on blood parameters and periodontal status. 75 patients (25 healthy controls, 25 generalized chronic gingivitis, 25 generalized chronic periodontitis) which were systemically healthy and aged between 30-55 years were selected in this study. All patients were reevaluated at 3 months. Prior permission was obtained from NABL approved green cross laboratory for blood investigations during surgery. Patients with known systemic diseases were excluded as certain systemic diseases alter and exaggerate the course and severity of periodontal disease. Patient more than 5-6 mm of pocket probing depth in generalized chronic periodontitis were excluded.

All hematological parameters showed improvement from baseline to 3 months in all three groups in the present study. A statistically significant increase in Hb levels from 12.32 to 12.67 gm/dl in healthy control group, from 12.70 to 13.02 gm/dl in generalized chronic gingivitis group and from 11.48 to 11.93 gm /dl in generalized chronic periodontitis from base line to 3 months. Thus a mean increase of 0.35 gm/dl in healthy control group ,0.32 gm/dl in generalized chronic gingivitis group, 0.45 gm/dl in generalized chronic periodontitis from baseline to 3 months. Thus, slight more improvement was seen in

generalized chronic periodontitis. The Hb concentration increased post SRP in chronic periodontitis patients due to resolution of inflammation and increase in erythrocyte count.[11] These results are in accordance with results of studies by Hutter[13,] Kharb[14,] Agrawal[15], Shetty[16.] The study done by Kharb et al 2008 showed a statistically significant (p<0.05) increase in mean Hb from 14.5 at baseline to 15 gm/dl at 10 weeks after SRP[14]. Agrawal et al 2009 found a significant increase in mean Hb of 0.95 gm/dl 1 year post SRP (p<0.001)[15].

Pradeep et al 2011 noted a significant mean increase of 1.05 gm/dl in males and 1.4 gm/dl in females 6 months (p<0.001). [11] On the other hand the present study differed from studies by Wakai et al .1999, Aljohani et al. 2009, Kolte et al 2014 as they found no association between Hb levels and periodontal status in their studies. [17, 18, 19] A statistically significant increase in RBC count from 4.34 to 4.37 million/mm^3 in healthy control group , from 4.56 to 4.60 million/mm^3 in generalized chronic gingivitis group and from 4.23 to 4.29 million/mm^3 in generalized chronic periodontitis from base line to 3 months. Thus a mean increase of 0.03 million/mm^3 in healthy control group ,0.04 million/mm^3 in generalized chronic gingivitis group , 0.06 million/mm^3 in generalized chronic periodontitis from baseline to 3 months. Thus slight more improvement was seen in generalized chronic periodontitis. According to Gokhale et al. [1],Naik et al . [20] and Pradeep et al [11] periodontitis patients have elevated levels of acute phase proteins, IL-1 ,IL-6 and TNF. These inflammatory mediaters are shown to suppress mature erythroid progenitors and inhibit in vivo colony formation by erythroid burst – forming units and erythroid colony forming units from normal human marrow . Inhibition of erythropoietin , the hormone responsible for erythropoiesis , was also seen that leads to decrease in RBC count. [21, 22, 23] Pocket depth decreases with removal of plaque and calculus after SRP. The results of the present study were in accordance with the study done by Cugini and Haffajee in 1997 where there was a significant decrease (p<0.05) in mean pocket depth from baseline to 3 months (3.3±0.06 to 3.1 ±0.05 mm)[24]. Another study by Cugini and Haffejee in 2000 resulted in reduction of mean pocket depth from 3.2±0.3 at baseline to 2.9±0.3 at 12 months (*p*<0.01). [25] The results of the present study were also in accordance with the study done by Pradeep et al in 2011 where he found a significant pocket depth reduction of 1.4 mm (males) and 1.26 mm (females) 6 months post SRP (p<0.001)[11]

Probing pocket depth is not necessarily a reliable measure of extent of detachment of periodontal tissues from the root surface since there are wide fluctuations in the position of gingival margin. So Clinical Attachment Level (CAL) is measured which is a clinical approximation of loss of connective tissue attachment from the root surface. This measurement is important as it provides the clinician an objective assessment of the amount of periodontal damage. In present study , mean decrease in clinical attachment loss from 4.00 to 2.44 in generalized chronic periodontitis from baseline to 3 months. The result was significant in generalized chronic periodontitis group. The results of this study were similar to the study done by Cugini and Haffejee 1997 in which there was a mean gain in attachment level of 0.11±0.23 mm 3 months post SRP (p<0.05).[24] These results were also similar to the results obtained in a study by Pradeep 2011 in which he got significant gain in Clinical attachment level of 1.12 mm in males and 1.17 mm in females (p<0.001).[11]

CONCLUSION

Within limit of the study, it can be concluded that future long – term studies with a large sample size should be carried out to further explore of the study. The results have been shown that increase in blood parameters after nonsurgical periodontal therapy, will improve physical status of patients in some degree.

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