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RESEARCH ARTICLE

ASSESSMENT OF PLASMA LIPID AND BLOOD GLUCOSE LEVELS IN PATIENTS WITH HEALTHY PERIODONTIUM, CHRONIC GENERALIZED GINGIVITIS AND CHRONIC GENERALIZED PERIODONTITIS BEFORE AND AFTER PHASE I THERAPY

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ABSTRACT

Introduction: Periodontal disease, a destructive inflammatory disease of supporting tissues of teeth, is caused by plaque bacteria. Periodontal infections manifest not only in periodontium but also cause systemic implications in otherwise healthy individuals as evidenced by raised levels of various serum inflammatory markers.

Aim: The aim of the present study is to compare the changes in lipid profile and fasting blood glucose levels of a group of patients with chronic generalized gingivitis, chronic generalized periodontitis following scaling and root planning to a control group with healthy periodontium not receiving periodontal therapy.

Materials and Methods: 45 subjects were included in the study. Subjects were assigned into three groups :- 15 subjects with healthy periodontium (Group A) in which only oral hygiene instructions were given, 15 Subjects in chronic generalized gingivitis(Group B) and 15 Subjects in chronic generalized periodontitis (Group C) in which scaling and root planing was performed. Data was analysed by Paired t-test. A P-value of less than 0.05 was considered statistically significant.

Results: In Group C a statistically significant decrease in levels of serum triglycerides, total cholesterol, LDL cholesterol and fasting blood glucose levels was seen after treatment. A statistically significant increase in HDL-cholesterol level was seen. No statistically significant changes were seen in Group A and Group B.

Conclusions: Chronic generalized periodontitis patients showed improvement in the metabolic parameters after the treatment. Thus chronic periodontitis in otherwise healthy individuals may be considered to increase systemic inflammatory burden thus adversely effecting serum lipid and glucose levels.

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INTRODUCTION

Periodontal disease is an infectious disease leading to gingival inflammation, destruction of periodontium and eventually exfoliation of teeth. A small group of predominantly anaerobic gram-negative bacteria present on the tooth surface as bio films gain access to the gingival tissues, initiate and perpetuate inflammation, resulting in production of high levels of proinflammatory cytokines. In contrast to the earlier belief of localisation of this process only to the marginal periodontium, recent studies indicate raised serum levels of various inflammatory markers (Kweider *et al*., 1993) which increased systemic inflammation thus contributing to derangement of various metabolic parameters in otherwise clinically healthy individuals. Monocyte-derived cytokines such as TNF α, IL-1β or interferon-γ produced in response to infection with gram-ve bacteria result in altered lipid metabolism, subsequent hyperlipidemia, insulin resistance and hence poor glyceamic control in periodontitis (Liu *et al*., 1998). TNF-α is known to suppress insulin-induced tyrosine phosphorylation of insulin receptor substrate-1 (IRS-1), hence impaired insulin action (Sara *et al*., 1998) and elevation of fasting glucose levels. The primary objective of non surgical therapy (scaling and root planing) is to remove biofilm, and other contributing factors in the etiology of gingival inflammation thus restoring gingival health. A shift in the composition of sub gingival biofilm occurs. Gram negative bacteria are replaced by gram positive facultative bacteria compatible with periodontal health thus decreasing serum inflammatory markers and improving hyperlipidemia and fasting blood glucose level (Lei Chen *et al*., 2012). With this background knowledge this clinical study is sought to compare the changes in lipid profile and fasting blood glucose levels of

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a group of patients with chronic generalized gingivitis, chronic generalized periodontitis following scaling and root planning to a control group with healthy periodontium not receiving periodontal therapy.

MATERIALS AND METHODS

Subjects visiting outpatient Department of Periodontology, Govt. Dental College and Hospital Srinagar, were considered for the present clinical study after meeting inclusion and exclusion criteria. Subjects were assigned into three groups :- 15 subjects with healthy periodontium that is control group (Group A).15 Subjects in chronic generalized gingivitis Group (Group B) and 15 Subjects in chronic generalized periodontitis Group (Group C) with pocket depth 5-7mm. The criteria for inclusion in the study was subjects age between 40-60 years, at least 8 teeth should be present, pockets with depths ranging from 5-7mm in chronic generalised periodontitis and subjects should not have received periodontal treatment for the past 6 months. The criterion for exclusion was any dental treatment during the past 6 months, diabetes mellitus or any other endocrine disease, myocardial infarction, smokers and subjects taking any drug for hypercholesterolemia. Only the subjects who gave written consent and fulfilled all the qualifying criteria were taken up for the study. After fulfilment of inclusion criteria for the study, the metabolic parameters that is serum levels of lipids (Total cholesterol, low density lipoprotein cholesterol, high density lipoprotein cholesterol and triglycerides) and Fasting blood sugar (FBS) of all groups were recorded at baseline and at 3 months. Full mouth scaling using ultra-sonics followed by root planing (using Gracey curettes) which was performed under local anesthesia, if needed. For glucose and serum lipid level assessment, venous blood sample was taken after 12 hours of fasting from antecubital vein of each subject and measured by Biochemistry analyser - Erba Mamnheim CHEM 5-Plus V_2. Cut-off points were used according to the laboratory's recommendation: Total cholesterol .230 mg/dl, LDL-cholesterol .160 mg/dl, HDL-cholesterol, 45 mg/dl, Triglycerides .200 mg/dl, Blood glucose .120 mg/dl (Wood, 1998).

Statistical analysis

Statistical software SPSS (version 20.0) and Graph pad Prim (version 5.00) were used to carry out the statistical analysis of data. Data was analyzed by means of descriptive statistics viz, means, standard deviations and percentages. Analysis of variance (ANOVA) test was employed for inter group analysis and for multiple comparisons least significant difference (LSD) test was used. For intra group analysis Paired t-test was applied. Graphically the data was presented by bar diagrams. A P-value of less than 0.05 was considered statistically significant. All P-values were two tailed.

RESULTS

Table 1 shows changes in metabolic parameters at baseline and at 3 months in Group A (subjects with healthy periodontium). No statistically significant change was seen in any parameter from baseline to 3rd month. Table 2 shows changes in metabolic parameters from baseline to 3rd month in Group B (subjects with chronic generalized gingivitis). Although a decrease in all the metabolic parameters except for HDL level (which increased with treatment) was seen, the changes were statistically insignificant. Table 3 shows changes in metabolic parameters from baseline to 3rd months in Group C (subjects with chronic generalized periodontitis). A statistically significant decrease in levels of total cholesterol, low density lipoprotein cholesterol, triglycerides and fasting blood sugar is seen and a statistically significant increase in level of high density lipoprotein cholesterol is seen from baseline to 3rd month in Group C.

Table 1. Intra group comparison of changes in metabolic parameters before and after treatment in group A

Metabolic Parameters	Baseline		3 Months		P-value$
	Mean	SD	Mean	SD	
TC	167.7	12.50	164.3	15.51	0.243
TG	124.7	20.97	123.8	19.16	0.321
LDL	116.3	9.04	114.8	8.77	0.308
FBG	85.3	6.43	88.0	10.90	0.261
HDL	35.3	2.97	36.1	2.28	0.068

Table 2. Intra group comparison of changes in metabolic parameters before and after treatment in group B

Metabolic Parameters	Baseline		3 Months		P-value
	Mean	SD	Mean	SD	
TC	171.1	15.77	169.5	14.23	0.082
TG	133.5	26.67	131.6	24.19	0.201
LDL	120.4	22.33	118.4	23.47	0.115
FBG	90.1	10.73	89.3	8.75	0.698
HDL	34.1	2.47	34.8	1.42	0.096

Table 3. Intra group comparison of changes in metabolic parameters before and after treatment in group C

Metabolic Parameters	Baseline		3 Months		P-value$
	Mean	SD	Mean	SD	
TC	207.8	47.61	189.3	39.39	0.005*
TG	172.5	26.17	153.3	23.25	<0.001*
LDL	142.5	10.13	132.9	11.08	<0.001*
FBG	114.3	15.77	99.1	9.68	0.012*
HDL	27.1	2.34	32.7	2.40	<0.001*

DISCUSSION

Periodontal diseases are primarily anaerobic Gram negative oral infections that lead to gingival inflammation, destruction of periodontal tissues, loss of alveolar bone, and eventual exfoliation of teeth in severe cases. Recent studies indicate that patients with periodontitis present with increased systemic inflammation as indicated by raised serum levels of various inflammatory markers, which put an individual at a higher risk for cardiovascular diseases. Periodontal instrumentation (scaling and root planning) results in a dramatic decrease in pathologic microbial load (Magnusson *et al*., 1984) thus decreasing serum inflammatory markers and improving hyperlipidemia and fasting blood glucose levels. The present study evaluated the effect of periodontal therapy on the serum lipid levels and found that periodontal therapy resulted in a significant decrease in the levels of serum total cholesterol, triglycerides and LDL-cholesterol and a statistically significant increase in levels of high density lipoprotein cholesterol. In subjects with healthy periodontium (Group A) no statistically significant change in any metabolic parameter was observed at baseline and 3 months following oral hygiene instructions (Table 1) These results were found to be consistent with the study of Pejcic *et al*. (2011) The results are due to the proper oral hygiene instructions followed by the patients which result in the maintenance of better periodontal health (Paul Lang *et al*., 1995). In Group B subjects (chronic generalized gingivitis) no statistically significant change in any metabolic parameter

was observed at baseline and 3 months following nonsurgical therapy (scaling and root planing Table 2). To the best of our knowledge, no study has been reported in the literature comparing the lipid profile and fasting blood glucose in Chronic Generalized Gingivitis patients before and after scaling and root planing. The results are due to the effect of scaling and root planing performed along with the oral hygiene instructions given to the subjects which reduced the severity of gingival inflammation (Schaffer *et al*., 1964). In Group C (chronic generalized periodontitis), mean serum levels of Total cholesterol (TC) decreased from a baseline value of 207.8 ±47.61 to a value of 189.3±39.39 at 3rd month with a p value of 0.005 which is statistically significant. Mean value of Low Density Lipoprotein Cholesterol (LDL) decreased from a baseline value of 142.5 ± 10.13 to a value of 132.9±11.08 at 3rd month with a p value of <0.001 which is statistically significant (Table 3) These results were found to be consistent with the studies of Oz SG *et al*. (2007). Mean value of Triglycerids (TG) decreased from a baseline value of 172.5 ± 26.17 to a value of 153.3±23.25 at 3rd month with a p value of <0.001 which is statistically significant and is consistent with the study of Shruti Tendon *et al*. (2010). The decrease was due to effect of scaling and root planing performed in the subjects which decreases the levels of proinflammatory Cytokines (2014). The pro inflammatory cytokines (IL-1, TNF- α) and their effects on other systemic mediators (IL-6) is known to induce alterations of lipid metabolism, leading to their increased concentrations in blood due to increased hepatic lipogenesis, lipolysis from adipose tissue, or reduced blood clearance. Mean value of High density Lipoprotein Cholesterol (HDL) increased from a baseline value of 27.1 ± 2.34 to a value of 32.7±2.40 at 3rd month with a p value of <0.001 which is statistically significant. These results were found to be consistent with the study of Pussinen *et al*. (2004). The increase in levels of HDL in group C at 3rd month was due to effect of scaling and root Planing performed which causes a dramatic decrease in pathologic microbial load thus reducing the concentration of bacterial toxins (LPS) which are known to induce a reduction in HDL concentrations (Pussinen *et al*., 2004). Mean value of Fasting Blood Glucose (FBG) decreased from a baseline value of 114.3 ± 15.77 to a value of 99.1±9.68 at 3rd month with a p value of 0.0012 which is statistically significant. These results were found to be consistent with the study of Torumtay *et al*. (2016).The decrease in levels of Fasting Blood Glucose (FBG) in group C at 3rd month was due to effect of Scaling and Root Planing (SRP) which causes a dramatic decrease in pathologic microbial load (Magnusson *et al*., 1984) thus reducing the bacterial toxins (LPS) induced insulin resistance (Fernandez-Real and Ricart, 2003).

Limitations

Small sample size was the main limitation of this study. The future scope of this study includes to increase sample size enough to analyse patients with moderate and severe periodontitis separately and to evaluate the long-term effect of periodontal therapy for at least 6 months.

Conclusion

Periodontal diseases increase the propensity of an individual for cardiovascular diseases and diabetes and non surgical periodontal therapy in form of scaling and root planning results in a significant reduction in the levels of plasma lipid and fasting blood glucose in these patients.

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