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Evaluation of salivary alkaline phosphatase and total protein levels in smoker subjects with chronic periodontitis before and after nonsurgical Periodontal Therapy

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ABSTRACT:

Background: Inflammation of the supporting tissues of teeth is known as periodontitis. Age, smoking, diabetes, poor dental hygiene, and hereditary factors are recognised risk factors for periodontitis. According to recent research, one of the biggest risk factors for the onset and advancement of periodontal diseases may be smoking and smokeless tobacco use.

Aim: assessed the level of salivary alkaline phosphatase (ALP) and total protein pre and post non-surgical periodontal therapy in smoker subjects with chronic periodontitis.

Materials and methods: Thirty current smokers who were categorised into three groups according on their age, pocket depth, and chronic periodontitis (depth ≥5 mm). Root planning and scaling were completed in two sessions. At baseline and one month later, clinical parameters and a saliva sample were examined.

Result: Following non-surgical periodontal therapy, smoking participants with chronic periodontitis showed a substantial improvement in all clinical measures as well as in their salivary levels of total protein and ALP.

Conclusion: salivary biomarkers are non-invasive and useful to detect periodontal disorders at early stages.

Keywords: chronic periodontitis, smokers, biomarkers

INTRODUCTION

A group of micro-organisms can induce periodontal inflammation, a disease of the periodontium that causes clinical attachment loss and alveolar bone deterioration, forming the periodontal pocket with decreased width of gingiva. [1] The most potent and well-known risk factor for periodontal disease is tobacco use. It alters the subgingival environment, which increases the number of anaerobic bacteria and negatively impacts the effectiveness of periodontal therapy and healing.[2]

Despite the complexity of the aetiology, bacterial species are the primary causative agents of periodontitis. It is commonly recognised that bacteria are a major factor in the development

of periodontal pockets.[3,4] Consequently, controlling the bacterial flora associated with the periodontium and tooth has to be the aim of therapy. Scaling and root planing (SRP) has been shown to be an effective non-surgical treatment for chronic periodontitis in several long-term trials of periodontal therapy. [5]

Saliva is used to monitor the effectiveness of non-surgical periodontal therapy and contains a variety of locally and systemic indicators for the detection of periodontal disease. Alkaline phosphatase (ALP), an intracellular enzyme found in saliva, is related to bone metabolism in alveolar bone-destructive events.[6] The concentration of salivary proteins, which arise as a culmination of the inflammatory process, can also be used as a diagnostic for plasma protein leakage.[7] Hence alkaline phosphatase and total protein can used as predictive marker of future periodontal disease and also access the efficiency of scaling and rootplaning.

AIM

To estimate the salivary alkaline phosphatase (ALP) and total protein levels in smoker subjects with chronic periodontitis before and after nonsurgical periodontal therapy

MATERIALS AND METHODS

This clinical research was carried out in the periodontology department at Rama Dental College, Kanpur, Uttar Pradesh, India.

Inclusion criteria:

- Study participants, aged 30 to 60.
- Current smoker patients, have at least 20 teeth
- PPD ≥5mm and Clinical attachment level ≥3mm.

Exclusion criteria:

- Patients with impaired immune systems and those using immunosuppressive medications over an extended period of time.
- Patients with any systemic disease.
- patients receiving radiation treatment or anticoagulant medicines.

Methodology

A total of thirty smokers with chronic periodontitis were included in the research. The Institutional Ethical Committee (IEC) at the Rama Dental College Hospital and Research Centre in Kanpur, Uttar Pradesh, granted ethical permission for the study. All subjects has been given written informed consent, and all procedures adhered to established protocol. Prior to therapy, salivary ALP and total protein were measured for every individual. clinical indicators Plaque Index (PI), Gingival Index (GI), Probing Pocket Depth (PPD), and Clinical Attachment Level (CAL) also taken before therapy, On the first day, all of the chosen patients had ultrasonic scaling, and on the second day, all of the teeth received root planing. oral hygiene instructions have been given to all patients without any chemical plaque control measures. Non-surgical periodontal therapy has been performed using ultrasonic and hand instruments. The patients were encouraged to maintain their oral hygiene and were called back for routine followup visits. Following a month of therapy, all parameters were also measured.

Collection Of Saliva (figure I)

Prior to the oral prophylaxis technique, patients were advised to refrain from eating or drinking for two hours. Prior to initiating oral prophylaxis, human saliva was obtained by spitting while the subject was seated upright. Saliva samples around 5 ml are taken and immediately forwarded to the lab. Saliva sample was centrifuged in the lab for 15 minutes at 3000 rpm in order to separate the supernatant. Twenty microliters of the leftover sample are combined with the ALP reagent in the Erba Mannheim kit (London, UK), and the auto-analyzer is used to measure the ALP level. The values displayed on the analyzer's screen are noted. A total protein kit from Erba (biuret technique, end point) was utilised to estimate the total protein content in saliva samples.

The biuret technique is used to determine the total protein content of saliva after it has been estimated using the UV absorption method. In an alkaline media, protein and cupric ions combine to generate a coloured complex. unadulterated saliva is mixed with the biuret reagent and the colour changes are measured using a biowave spectrophotometer set to 546 nm. This allows for the estimation of salivary total protein. Saliva samples will be collected at baseline and one month later to evaluate alkaline phosphatase (ALP) and total protein in the saliva.

Data analysis has been done by using Statistical Package for Social Sciences (SPSS) software. Data are entered into Microsoft Excel spreadsheet. P- value less than 0.05 was taken as significant.

RESULTS

Table 1 & Graph 1 showed the comparison of baseline measurements and post-ttreatment measurements, that stated a significant reduction in plaque index, gingival index, ALP and total protein score from baseline to post test. Before treatment mean score for PI, GI, PPD and CAL were 2.10, 1.46, 5.10 and 4.40 respectively, after 1 month post treatment there were improvement in all clinical parameters i.e. 1.15, 0.80, 4.95 and 4.05. before non-surgical therapy, mean score for level of ALP and total protein were 40.96 and 3.58 that reduced after post treatment i.e. 29.75, 2.96. Results showed both salivary alp and total protein levels were improved after phase I therapy.

DISCUSSION

Chronic periodontitis leads to the resorption of alveolar bone, which eventually results in tooth loss and further degradation of the bone. Following resorption, products of breakdown are discharged into the periodontal tissues. These products then migrate in the direction of the gingival sulcus and congregate in whole saliva from the surrounding area, where few of them have been identified.[8,9]

ALP was one of the first host enzymes to be found among the few that were suggested as diagnostic indications of periodontal condition.[10] ALP is produced during inflammation by polymorphonuclear cells (PMNs), and during bone formation and periodontal regeneration by osteoblasts and periodontal ligament fibroblasts, respectively. After a significant amount of research was done on ALP activity in serum, it was proposed that ALP facilitates bone mineralization by releasing an organic phosphate that helps calcium phosphate complexes deposit into the osteoid matrix.[12,13] Additionally, by hydrolyzing inorganic pyrophosphate, a strong inhibitor of hydroxyapatite crystal formation and dissolution, inside extracellular calcifying matrix vesicles, ALP may facilitate mineralization.[14]

Results of the Present study showed showed a significant reduction in plaque index, gingival index, PPD, CAL and salivary ALP and total protein score from baseline to post-test

measurements in smokers with chronic periodontitis. Level of salivary ALP and total protein are elevated than normal values and decreased after scaling and root-planing.

The study by Randhir et al.[15] (2011) also showed that as periodontal tissue deterioration increases, salivary alkaline phosphatase levels rise. It revealed the potential usefulness of salivary ALP levels as indicators of the degree and course of periodontal disease. The current investigation demonstrated a favourable link between participants with chronic periodontitis and elevated levels of alkaline phosphatase. ALP levels in saliva and pocket depth were shown to be statistically significantly correlated in a Desai et al.[16] research. Our findings coinside with research by Yoshie H et al.[17] (2007), which found a statistically significant rise in GI as pocket depth increased. Salivary ALP levels may have increased due to PMNs during periodontal pocket inflammation. Based on the study's findings, it may be concluded that, in comparison to those in healthy individuals, periodontal disease patients' saliva had considerably higher ALP enzyme activity. Additionally, it shown that the gingival index value and enzyme activity were correlated.

According to Kejriwal et al.[18], there was a statistically significant difference in total protein levels between patients with chronic gingivitis and chronic periodontitis and healthy controls. According to the Henskens et al.[19] study, the total protein concentration of the periodontal disease group was 1.8 times higher than that of the healthy group. According to Gonçalves et al.[20], gingival inflammation was linked to elevated levels of blood-derived proteins (haemoglobin and serum albumin), keratins, immunoglobulin peptides, and a greater frequency of alpha-amylase fragments in the gingivitis group. then, it was shown that the healthy group had higher salivary cystatin levels than the gingivitis group. The current study's results were consistent with those of Sánchez et al.[21], who hypothesised that there was a strong association ($r=0.13$) between protein content and PPD ($P<0.05$). Based on available data, salivary ALP and total protein levels may be helpful in determining the diagnosis and prognosis of periodontal disease as well as serving as a possible marker of bone turnover.

CONCLUSION

The current research indicates that a number of clinical indicators of chronic periodontitis are significantly correlated with salivary ALP and total protein levels. ALP and Salivary protein levels can also be a good indicator of periodontal disease severity, pocket development, and gingival inflammation. Further longitudinal research is needed to determine the association

between the discovered marker and the kind of periodontal disease. saliva-based diagnostic method show promising future, to detecting periodontal disorders at early stage and predicting treatment results at different stages.

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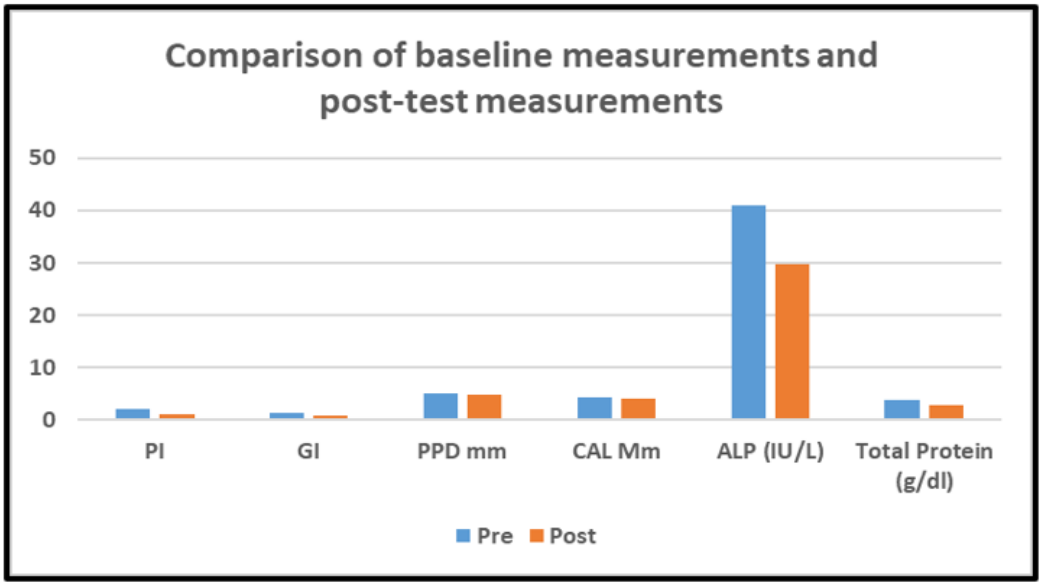
Variable	Pre		Post		Difference	p value
	Mean	SD	Mean	SD		
PI	2.10	0.64	1.15	0.75	0.95	0.001*
GI	1.46	0.52	0.80	0.70	0.65	0.004*
PPD mm	5.10	0.64	4.95	0.95	0.15	0.614
CAL Mm	4.40	0.60	4.05	0.76	0.35	0.090
ALP (IU/L)	40.96	3.58	29.75	1.30	11.19	<0.001*
Total Protein (g/dl)	3.87	0.54	2.96	0.48	0.81	<0.001*

Paired t test; * indicates significant difference at p≤0.05

Table 1: Comparison Of Base Line and Post Treatment Parameters



Graph1: Comparison Of Base Line and Post Treatment Parameters

Figure I: Alkaline Phosphates and Total Protein Kit; Collection of Saliva: Armantarium