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ORIGINAL ARTICLE

A comparative evaluation of salivary albumin levels in periodontally healthy and chronic periodontitis patients: A clinicobiochemical study

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Abstract

Aim: This study aims to compare and evaluate the salivary albumin levels in periodontally healthy and chronic periodontitis patients.

Materials and Methods: A total of 90 subjects were divided into two groups consisting of periodontally healthy patients (n=45) and chronic periodontitis patients (n=45) for the study. Periodontal disease was determined based on clinical parameters, probing depth, and clinical attachment loss. Human whole unstimulated saliva was collected in sterile test containers, with the subject seated in an upright position between 9 am and 10 am in the morning after they had refrained from oral intake, toothbrushing. Approximately 5 ml of saliva was collected and analyzed using fully automated analyzer (BS-220). Salivary albumin level was estimated using bromocresol green method.

Statistical Analysis: The unpaired *t*-test statistical analysis was applied to make comparison among periodontally healthy and chronic periodontitis patients.

Results: Mean salivary albumin level in the patients of normal group was 310.33 ± 37.75 and in periodontitis group was 822.91 ± 277.91 ($t = 12.26$, $P < 0.0001$).

Conclusion: A significant rise in salivary albumin levels has been found in chronic periodontitis patients as compared to periodontally healthy individuals. Hence, salivary albumin can be used as a diagnostic biomarker to assess the periodontal disease.

Introduction

Periodontitis is a multifactorial disease affecting the supporting structures of dentition. The local, genetic, and environmental factors can modify the severity of disease activity as well as disease progression.[1]

The routine methods of diagnosis, namely, probing pocket depth, clinical attachment loss, bleeding on probing, and the assessment of alveolar bone loss (on intraoral periapical radiographs) have been considered inefficient to distinguish the disease activity with accuracy.[2]

Saliva is considered as a direct assessing tool for the diagnosis of oral and general health. It is an essential media containing biomarkers specific for the changes pertaining to the oral and periodontal disease. The whole saliva is represented by an overall oral sample representing from all gingival and periodontal sites, the analysis of which provides overall insight into disease status.[1]

Saliva provides an easily available, non-invasive diagnostic medium for a rapidly widening range of diseases and clinical situations.[3]

Albumin is body's predominant serum-binding protein which controls 75–80% of normal plasma colloid oncotic pressure and also transports various substances including anions, cations, dyes, enzymes, bilirubin, fatty acids, metals, ions, hormones, and exogenous drugs.[3]

Salivary albumin is considered as a serum ultrafiltrate to the mouth. Saliva's albumin content is a reported as a marker for the inflammatory process.[4]

The current study was aimed to compare the salivary albumin levels in periodontally healthy and chronic periodontitis patients as a biomarker of periodontal disease. The chef objective is to measure and compare the salivary albumin in periodontally healthy and chronic periodontitis patients.

Materials and Methods

A case–control study with a total of 90 subjects were selected from the outpatient department of the Department of Periodontology of Aditya Dental College, Beed, was performed from June 2017 to June 2018. The study was approved by the Ethics Committee of Aditya Dental College, Beed, India.

Inclusion criteria

- Case group: Age 25–60 years (male/female); patients with chronic periodontitis based on probing pocket depth ≥5 mm
- Control group: The healthy group included patient with clinically healthy gingiva with probing pocket depth <3 mm.

Exclusion criteria

1. Patients having any systemic illness such as chronic nephrotic syndrome (end-stage renal disease), hepatic cirrhosis, heart disease, and malnutrition
2. Patients who had taken antibiotics and anti-inflammatory and steroids drugs from the past 6 months were excluded from the study
3. Patients have undergone periodontal treatment within 6 months
4. Smokers
5. Pregnant or lactating mothers.

Methodology

The screening and diagnosis of patients with chronic periodontitis were made by performing intraoral and radiographic examination. Chronic periodontitis is classified according to the American Academy Periodontology Classification 1999.

All selected 90 subjects were divided into two groups as follows;

- Group I: Periodontally healthy individuals – 45 subjects
- Group II: Patients with chronic periodontitis – 45 subjects.

Collection of saliva

Saliva was collected from both the healthy and chronic periodontitis patients between 11 am and 12 noon, after they had refrained from oral intake or toothbrushing. The subjects were seated in an upright position unstimulated whole saliva (5 ml) was collected by spitting method.

Albumin colorimetric test

Salivary albumin was estimated using the bromocresol green (BCG) method (albumin colorimetric test). Biochemical value of salivary albumin level will be measured by BCG albumin method. Estimation was done using albumin test kit (Liquid Gold®, ARKRAY Healthcare Pvt. Ltd.). The reaction between albumin (of saliva) and the dye BCG produces change in color, photoelectric colorimeter at a wavelength of 630 nm. The dye was prepared by mixing 8.85 g succinic acid, 108 mg of BCG agent, 100 mg sodium hydroxide, and 4.0 mL Brij-35 in 900 mL of distilled water. A standard solution of 6 g of bovine albumin dissolved in 100 mL of normal saline containing 0.1 g/dL sodium hydroxide was used. The analysis was carried out using fully automated biochemical analyzer (Mindray BS-220), Figure 1.

Statistical analysis

Statistical Package for the Social Sciences version 17 was used for statistical analysis (SPSS, Inc., Chicago, Illinois, USA). Student's unpaired *t*-test was applied to determine the difference in salivary albumin level of the periodontal healthy patients and chronic periodontitis patients. The level of statistical significance was set at $P < 0.05$.

Results

A total of 90 subjects were divided into two groups consisting of periodontally healthy patients (n=45) and chronic periodontitis patients (n=45) for the study. The study population included 44.44% of the patients in normal group were male and 55.56% were female in normal group and 53.33% in periodontitis group were female and 46.67% in periodontitis group were male. Mean age of the patients of normal group was 42.35 ± 8.46 and that of periodontitis group was 44.37 ± 9.10.

Mean salivary albumin level in the patients of normal group was 310.33 ± 37.75 and in periodontitis group, it was 822.91 ± 277.91. Using Student's unpaired *t*-test, statistically significant

Figure 1: Automatic biochemical analyzer (Mindray BS-220)

difference was found in mean salivary albumin level of the patients of both the groups ($t = 12.26$, $P = 0.0001$), Figure 2 and Table 1.

Discussion

Diagnostic tests should demonstrate high specificity and sensitivity. Saliva and blood contain valuable proteins and diagnostic markers acting as mirror to the body. Saliva collection being a non-invasive method compared to blood is more an acceptable to patients and more conducive to a stress-free appointment.

Protein concentration in saliva is considered as diagnostic biomarker for periodontal disease, as plasma protein leakage occurs due to inflammatory process, which increases salivary protein concentration. Albumin is considered as a marker of periodontal disease, as it originates at the sulcus level.[5]

The flow rate of saliva, added protein contents of all salivary glands and crevicular fluid additives are the prime factors affecting the overall protein concentration of whole saliva. The increase in salivary albumin indicates a rise of total proteins. Albumin is a minor component of whole saliva noted from secretions of all major glands. There exists a hypothesis that periodontal organisms trigger inflammatory response and cause a rise in levels of salivary albumin and, thus, act as a marker for plasma protein leakage.[6] *Porphyromonas gingivalis, Prevotella intermedia,* and *Treponema denticola* were noted in subjects with periodontitis. *T. denticola* was reported to cause a detectable increase in the levels of salivary albumin. And also, it is isolated from the subgingival plaque.[7] The bacteria in subgingival plaque have a strong proteolytic nature. Thus, controlling the microbes or the inflammatory response evoked by their presence in the pockets has an effect in decreasing the protein leakage in the saliva through gingival crevicular fluid (GCF).

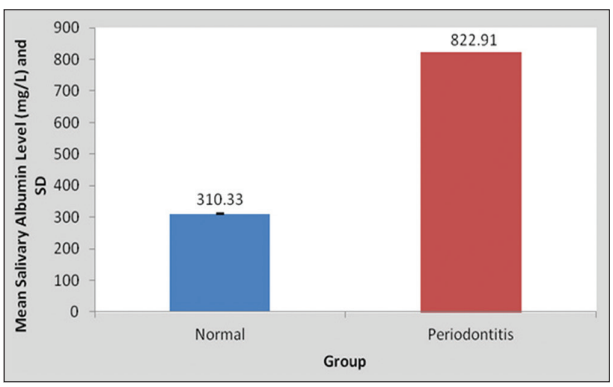

Figure 2: Comparison of salivary albumin level in two groups

Table 1: Comparison of salivary albumin level in two groups

Group	*n*	Mean	Standard deviation	Standard error mean	*t*-value	*P*-value
Normal	45	310.33	37.75	5.62	12.26	0.0001
Periodontitis	45	822.91	277.91	41.42		

Basu *et al.*[8] and Henskens *et al.*[9] evaluated the increased salivary albumin concentrations during inflammation and periodontal breakdown. They concluded that increased albumin concentrations during inflammation and periodontal breakdown were found in saliva and GCF. The present study is in accordance with the above findings.

Mulki *et al.*[3] have suggested that the albumin present in saliva is a consequence of contamination by traces of blood or gingival fluid, considering albumin as an infiltration of serum into the mouth. Its presence has also been reported in patients with periodontitis. In this present study, the presence of increased level of albumin is associated with periodontitis.

Terrapon *et al.*[10] have reported a positive correlation between albumin concentration and the severity of periodontitis and that the disease of periodontal destruction caused an increase in the salivary albumin.

In the present study, there was rise in total salivary albumin levels in periodontitis group. In total, mean salivary albumin for controls and periodontitis group was 310 mg/l (standard deviation [SD] = 37.75) and 822 mg/l (SD = 277.91). The rise in these values was statistically significant ($P = 0.001$).

This indicates that the quantitative changes in salivary albumin of patients with periodontal disease could prompt on nature and progression of periodontal disease and thus the importance of periodontal therapy.

Conclusion

A significant rise in salivary albumin levels has been found in chronic periodontitis patients as compared to healthy individuals. Thus, salivary albumin detected by BCG method, could be adopted as a diagnostic method to assess the periodontal disease. This approach of salivary protein-based prediction of prognosis should accelerate clinical decision-making and treatment planning of chronic episodic disease, namely, periodontitis.

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