A comparative evaluation of serum and salivary albumin in normal, gingivitis and periodontitis patients- A clinico biochemical study

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Abstract

Aim: This study was designed to compare the salivary and serum albumin levels in healthy subjects, patients with gingivitis and chronic periodontitis.

Materials and Methods: A total of 60 patients were selected and were divided into three groups (20 subjects each) as healthy, gingivitis and chronic periodontitis. Serum and saliva albumin level were recorded. The unstimulated whole saliva and blood samples from antecubital fossa were collected from the subjects. Bromocresol green method (BCG) used for estimation of both serum and salivary albumin.

Results and Conclusion: The results of this study showed significant increase in serum albumin concentrations healthy and gingivitis subjects whereas salivary albumin was higher in gingivitis and periodontitis. Thus, serum albumin and salivaryalbumin concentration may aidin as an important biochemical indicator in assessing the severity of periodontitis.

Keywords: Saliva, Albumin, Serum, Periodontitis, Gingivitis.

Introduction

Periodontitis is one of the most common oral diseases and is characterized by gingival inflammation and graphically assessed byalveolar bone resorption.[1] Gram negative anaerobic bacteria are most commonly associated with the condition and evoke an immune inflammatory reaction in the host tissue.[2]

Albumin is the plasma protein with major functions of general binding and transporting proteins. In oral cavity, albumin is regarded as a serum ultrafiltrate of the mouth and it may diffuse into the mucosal secretions.[3] During inflammation, albumin decreases potentially to starve the microorganisms of iron required for growth and virulence expression. It appears that cytokines, including interleukin-1, interleukin-6, and tumor necrosis factor-α, are important down regulators of the synthesis of this acute-phase reactants.[4]

Salivary albumin can be used to assess the integrity of mucosal function in the mouth. In patients with periodontitis, increased or normal salivary albumin levels have been reported.[5] The increase in salivary protein found in patients with periodontal disease is caused by leakage of plasma proteins due to inflammation.[6]

Considering the importance of relationship between serum albumin and salivary albumin concentration in periodontal diseases the aim of this study isto quantitatively estimate the levels of salivary and serum albumin levels in healthy subjects, gingivitis and periodontitis patients.

Materials and Methods

Source of Data

This study was conducted in the among the outpatients visiting the department of Periodontics and Oral Implantology, Vyas Dental College and Hospital, Jodhpur, Rajasthan. An ethical clearance was obtained before conducting the study from the institutional ethical committee. A total number of 60 subjectsaged 18- 60 years were included in the study and were divided into 3 groups: Group I- 20 healthy subjectsGroup II- 20 subjects withgingivitis andGroup III- 20 with chronic periodontitis.The nature and purpose of the study was explained to the patients and an informed consent was obtained.

Inclusion Criteria

1. Subjects having minimum number of 18 natural teeth present were included.
2. Subjects with generalized severe chronic periodontitis with probing depth ≥5mm at atleast 8 sites were considered.

Exclusion Criteria

1. Subjects with any systemic disease.
2. Subjects with xerostomia and undergoing radiotherapy.
3. Any pregnant or lactating female.
4. Subjects taking any protein health supplements.
5. Subjects who had been on antibiotic therapy during the preceding 6 months.
6. Smokers / tobacco chewers.

Method of Collection of Blood

Blood samples were collected from antecubital fossa with the help of a disposable 22-gauge needle with syringe. It was then transferred to a test tube, and it was centrifuged for 10 min to get serum.

Method of Collection of Saliva

After case history was recorded a single mouth rinse with 15.0 ml of water was done to wash out exfoliated cells. 2 ml unstimulated saliva was collected by passive drool in a sterile container. The sample was stored in an ice box having ice packs. Biochemical assays of saliva samples were carried out to quantify the level of salivary albumin. Saliva albumin using fully automatic analysing system

which was originally designed for the quantitative determination of clinical–chemical parameters.

Principle of Technique used for Estimation

Albumin binds with Bromocresol Green (BCG) at pH 4.2 causing a shift in abundance of yellow BCG dye. The blue green Colour formed is proportional to concentration of albumin present, when measured photometrically between 580-630 nm with maximum absorbance at 625nm.

Serum Albumin Estimation

1 ml of blood is withdrawn from antecubital vein for serum albumin estimation. The collected blood sample was transferred into plain vacutainer and was allowed to clot for 5-7 minutes. After clotting the sample was centrifuged at 2500 rpm for 10 minutes for separation of serum which was then collected in a sterile test tube. The extracted serum was used for estimation of albumin levels in blood.

Salivary Albumin Estimation

5 ml stimulated salivary sample was collected. After case history was recorded a single mouth rinse with 15.0 ml of water was done by the subject to wash out exfoliated cells. Unstimulated saliva was collected in a sterile container. The saliva collected was used for estimation of salivary albumin.

Statistical Analysis

Data was statistically analysed using SPSS version 20. The comparison between the groups was carried out using ANOVA with Tukey post hoc test, keeping value of significance $p<0.05$.

Results

Table 1 shows the distribution of subjects according to gender out of 60 patients, 38(63.3) were male and 22(36.7) were female.

Table 1: Demographic characteristics of subjects

S. No.	Characteristics	N (%)
1.	**Age (years)** Mean (SD)	24.19(3.9)
2.	**Gender** Males Females	38 (63.3) 22(36.7)

SD- Standard deviation

Table 2: Mean serum albumin and saliva albumin of all the groups

Groups	n	Serum albumin Mean± SD	Saliva albumin Mean± SD
Healthy	20	4.66± 0.176	0.07± 0.176
Gingivitis	20	4.05± 0.247	0.20± 0.095
Periodontitis	20	3.24± 0.261	0.51± 0.162

The results represent that there was a difference in serum albumin scores were higher in healthy and gingivitis subjects compared to periodontitis group, the results were statistically significant ($p<=0.05$, Table 3). Table 4 shows the saliva albumin levels were higher in gingivitis and periodontitis patients and it was statistically significant.

Discussion

The present study was carried out to estimate the serum and salivary albumin levels in both normal subjects and in patients with gingivitis and periodontitis using simple biochemical methods.

In recent times, saliva and serum has been used as a diagnostic tool for detecting different biomarkers. Additionally, they have been used as useful diagnostic fluids during last few decades in motivated by their proven ability to monitor the general health, to discover the disease onset and to follow up the progression to be used in large scale screening and epidemiologic studies.[7,8]

In this study, there was a rise in the total salivary albumin concentration among healthy, gingivitis, periodontitis group i.e.0.7±0.176, 0.20±0.095, 0.51±0.162 g/dl respectively.The rise in these values was found to be highly statistically significant. Similar results were observed in the studies conducted by Henskens et al (1993) and Shaila M et al (2013) which showed the significant rise in the mean values in the healthy, gingivitis and periodontitis groups.[6,9] The increase in salivary albumin found among the subjects with gingivitis and periodontitis is caused by leakage of plasma proteins due to inflammation.[10,11] The study by Azizi A et al (2010) showed higher levels of salivary albumin in patient taking warfarin as compared with the control group as they had less favourable periodontal conditions owing to decreased tendencies to brush or floss.[12] Another study by Mallikarjuna (2017) showed the salivary albumin levels were raised to a significant levels in OSCC subjects.[13]

Table 3: Inter group comparison of serum albumin scores

Group comparisons		Mean Difference	95% CI of difference	p- value
Healthy	Gingivitis	0.60	0.42- 0.78	0.456
Healthy	Periodontitis	1.42	0.56- 2.53	0.001
Gingivitis	Periodontitis	1.20	1.24- 1.60	0.001

CI- Confidence interval

Table 4: Inter groupcomparison of saliva albumin scores

Group comparisons		Mean Difference	95% CI of difference	p- value
Gingivitis	Healthy	0.16	0.07- 0.23	0.001
Periodontitis	Healthy	0.47	0.39- 0.55	0.001
Periodontitis	Gingivitis	0.31	0.24- 0.40	0.001

The results of the study show that the serum albumin level decreases in periodontitis patients in comparison to healthy and gingivitis patients by 1.42 and 1.20 respectively, it was statistically significant. Navkirankaur (2015) also showed levels that serum albumin 4.815±0.127 in healthy group and 4.219±0.174 in periodontitis group.[14] The trends were similar to studies conducted to estimate serum and salivary albumin levels in cancer.[15]

Further studies with large sample size are required to validate these results. Oral fluid diagnostics can be aided by new technology which may become a powerful tool for oral and systemic diseases diagnosis in the future.[16]

Conflict of Interest: None.

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