**ASSOCIATION OF SERUM ALBUMIN CONCENTRATION AND PERIODONTITIS**

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**ABSTRACT**

Periodontal disease is a complex, multi-factorial, chronic inflammatory disease that involves degradation of periodontal structures, including alveolar bone. Many systemic diseases and disorders have been implicated as risk indicators or risk factors in periodontal disease. Clinical and basic science research over the past several decades have led to an improved understanding and appreciation for the complexity and pathogenesis of periodontal diseases. It has been indicated that there might be an inverse relationship between periodontal disease and serum albumin concentration in elderly subjects. The present study adopted serum albumin concentration as a criterion which indicates the general health condition. The purpose of this study was to investigate the influence of periodontal disease condition on serum albumin concentration in the adult population.

Our study showed a significant inverse association between the loss of attachment and the serum albumin concentration and this association was more pronounced in periodontitis group. The level of serum albumin was comparatively less in periodontitis patients when compared to the healthy controls which were of no much statistical significance. As the loss of attachment increased the serum albumin concentration decreased in the test group. But the cause to effect relationship of periodontal disease and serum albumin concentration is still unknown. This relationship might be explained by two conceivable possibilities, namely the influence of nutritional aspect or chronic disease aspect.

**Keywords:** Periodontal disease, Loss of attachment, Hypoalbuminaemia

**INTRODUCTION**

Periodontitis is a term used to describe an inflammatory process, initiated by the plaque biofilm, that leads to the loss of periodontal attachment to the root surface and adjacent alveolar bone and which ultimately results in tooth loss.¹ Periodontal Disease affects 10% to 15% of the world’s population, representing the greatest cause of tooth loss.² Although mild and moderate forms of chronic periodontitis are rather common, severe form of periodontitis with advanced tissue destruction are rare worldwide.³ Advances in science and technology over the last century have greatly expanded the knowledge of the pathogenesis of periodontal diseases. Although the potential impact of many systemic disorders on the periodontium is well documented, recent evidence suggests that periodontal infection may significantly enhance the risk for certain systemic diseases or alter the natural course of systemic conditions.⁴ Serum albumin is the most abundant plasma protein in mammals. Albumin is an important binding protein for various substances in plasma. Albumin is synthesized in the liver as pro-albumin which has an N-terminal peptide that is removed before the nascent protein is released from the rough endoplasmic reticulum. The product, proalbumin, is in turn cleaved in the Golgi vesicles to produce the secreted albumin.⁵

Hypoalbuminemia can be caused by several conditions like cirrhosis of the liver, nephrotic syndrome, burns, hemodialysis, increased vascular permeability or decreased lymphatic clearance, and acute disease states. Serum albumin concentration might be a practical marker of general health status as they describe an underlying disease.⁶ It may be suggested that lower albumin levels have a complex etiology rather than reduced protein intake alone contributing to hypoalbuminemia.⁷

It has been suggested that impaired dentition status such as tooth loss owing to periodontal infection may affect individuals by causing dietary restriction, possibly compromising their nutritional status and well-being.⁸ In terms of association between oral disease and serum albumin concentration, it has been recently reported that the number of untreated teeth was a significant factor associated with serum albumin concentration in elderly. Therefore it is apparent that the oral disease burden might be indicated and monitored by the levels of serum albumin. However, few studies have been performed or reported to assess the relationship between periodontal disease status and serum albumin concentration. The purpose of this study was to investigate the influence of periodontal disease condition on serum albumin concentration in the adult population.

**MATERIALS AND METHODS**

A total of 60 patients reported to Department of Periodontics, our institution were selected. The sample consisted of subjects of either sex aged between 30-40 years. The samples were selected from the patients reported to the department of Periodontics, out of which 60 patients fulfilled the inclusion criteria. Medical history and dental history of the subjects were determined prior to inclusion into the study and control groups. Subjects were informed and assured about the confidentiality of the research findings and of the report. After obtaining ethical clearance from institutions ethics committee, informed consent was taken from the subjects. The subjects were randomly divided into 2 groups: Group A- 30 subjects with healthy periodontium aged between 30-40 years and Group B- 30 subjects with chronic periodontitis with clinical attachment loss of > 4 mm in greater than 30% of the sites examined, aged between 30-40 years.

**Periodontal Examination**

Full mouth periodontal examination of the 60 study participants were performed by a single examiner. Clinical measurements of periodontal disease were done for all the present teeth in which periodontal pocket depth on six sites per tooth (mesiobuccal, midbuccal, distobuccal, mesiolingual, midlingual, distolingual) were recorded and Clinical attachment loss and Gingival index (Loe and Silness, 1963)
were calculated. The present study focused the analysis on clinical attachment loss, which is a measure of periodontal tissue lost because of the disease process. Clinical attachment was taken as the distance from the cementoenamel junction to the base of the sulcus measured using Williams graduated periodontal probe. This distance was calculated by subtracting the distance from the gingival margin to the cementoenamel junction from the pocket depth. Attachment loss of >4 mm in greater than 30% of the sites examined were used as a case definition of periodontitis.

**Biochemical Analysis**
Serum albumin level was detected by the bromocresol green albumin (BCG) method. Serum albumin in the presence of bromocresol green (BCG) at a slightly acidic pH produce a color change of the indicator from yellow-green to green-blue complex. 8,9,10

**Reagents Composition** (Aspen laboratories, 7A, HPSIDC Ind Area, Baddi)
Citrate buffer (pH:4.2) : 30 mmol/L
Bromocresol green : 0.26 mmol/L
Albumin Standard : 4 g/dl

**Calculation**
Albumin [g/dl] = \( \frac{\text{Absorbance of test}}{\text{Absorbance of standard}} \times \text{Concentration of Standard} \)

**Statistical Analysis**
The results obtained to be tabulated and subjected to statistical analysis using Karl Pearson’s correlation.

### Table 1: Parameters between test and control

<table>
<thead>
<tr>
<th></th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>t</th>
<th>Df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Controls</td>
<td>30</td>
<td>35.3</td>
<td>3.164</td>
<td>-1.213</td>
<td>58</td>
<td>0.23</td>
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<tr>
<td></td>
<td>Periodontitis</td>
<td>30</td>
<td>36.33</td>
<td>3.427</td>
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<tr>
<td>Serum Albumin</td>
<td>Controls</td>
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<td>5.377867</td>
<td>0.815444</td>
<td>0.682</td>
<td>58</td>
<td>0.498</td>
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<tr>
<td></td>
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<td>0.715425</td>
<td>-18.518</td>
<td>36.538</td>
<td>&lt;0.001</td>
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<tr>
<td>Loss Of Attachment (mm)</td>
<td>Controls</td>
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<td>1.67</td>
<td>0.606</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Periodontitis</td>
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<td>7.67</td>
<td>1.668</td>
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<td></td>
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<td>Gingival Index Score</td>
<td>Controls</td>
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<td>0.313333</td>
<td>0.175643</td>
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<td>0.458245</td>
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</table>

### Table 2: Correlation between gingival index and albumin in cases and controls

<table>
<thead>
<tr>
<th></th>
<th>Group</th>
<th>Serum Albumin</th>
<th>Pearson Correlation</th>
<th>Sig. (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controls</td>
<td>Serum Albumin</td>
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<td>-.114</td>
<td>.548</td>
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<tr>
<td>Periodontitis</td>
<td>Serum Albumin</td>
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<td>-.184</td>
<td>.330</td>
<td>30</td>
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</tbody>
</table>

### Table 3: Correlation between Albumin and loss of attachment separately for both groups

<table>
<thead>
<tr>
<th></th>
<th>Group</th>
<th>Loss Of Attachment (mm)</th>
<th>Pearson Correlation</th>
<th>Sig. (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controls</td>
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<td>30</td>
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<tr>
<td>Periodontitis</td>
<td>Loss Of Attachment (mm)</td>
<td></td>
<td>-.503</td>
<td>.005</td>
<td>30</td>
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</table>

**Graph 1: Parameters between test and control**
RESULTS
The objective of this study was to determine the correlation between serum albumin concentration and periodontitis. The values obtained were statistically analyzed using Karl Pearson’s Correlation. The parameters between test and control group are shown in Table 1 and Graph 1. Serum albumin concentrations in healthy and periodontitis patients are shown in Graph 2. In the present study there was a reduction in serum albumin concentration in periodontitis patients when compared to the healthy controls. The result shows that there was no statistically significant difference in serum albumin concentration in controls and chronic periodontitis patients with a mean value 5.37 and 5.24 respectively. Correlation between gingival index and serum albumin concentration was calculated in the test group and control group which is described in Table 2. The inverse correlation between these two parameters was seen in both the group which was statistically insignificant. The correlation between loss of attachment and serum albumin concentration was calculated separately in the test group and control group [Table 3]. The inverse correlation between serum albumin concentration and loss of attachment in periodontitis group is shown by Graph 3. The results of this study showed a significant inverse association between the loss of attachment and the serum albumin concentration in periodontitis group when compared to the healthy controls.

DISCUSSION
Clinical and basic science research over the past several decades have led to an improved understanding and appreciation for the complexity and pathogenesis of periodontal diseases. There is an essential bacterial etiology and there are specific periodontal pathogens associated with destructive periodontal diseases. However, these pathogens do not invariably cause disease simply by their presence alone. Protein depletion results in hypoproteinemia with many pathologic changes, including muscular atrophy, weakness, weight loss, anemia, leucopenia, edema, decreased resistance to infection, slow wound healing, lymphoid depletion, and reduced ability to form certain hormones and enzymes. Protein deprivation has been shown to cause changes in the periodontium of experimental animals. Degeneration of the connective tissue of the gingival and periodontal ligament, osteoporosis of the alveolar bone, impaired deposition of the cementum, delayed wound healing, and atrophy of the tongue epithelium. These observations reveal a loss of alveolar bone resulting from the inhibition of normal bone forming activity rather than from the introduction of destructive factors. Protein deficiency also accentuates the destructive effects of bacterial plaque and occlusal trauma on periodontal tissues, but the initiation of gingival inflammation and its severity depends on the bacterial plaque. Several studies have shown an inverse independent relationship between serum albumin concentration and periodontal disease in individuals of older age group. A consistent association between the occurrence of periodontal disease and hypoalbuminemia in community-dwelling elderly individuals was recently reported by Ogawa et al in a cross sectional investigation. A study conducted by Mojon et al in institutionalized older adults with vertical tooth mobility and periodontal pockets greater than 6mm showed a significantly lower albumin concentration. A recently reported study showed that the number of untreated teeth was a significant factor associated with lower serum albumin concentration in an elderly population. In the present study, association between serum albumin concentration and periodontal disease status was evaluated in an adult population. Results of this study showed a statistically significant decrease in serum albumin concentration with an increase in loss of attachment in periodontitis patients. And when comparing the test group and the control group there was a reduction in serum albumin concentration in periodontitis patients when compared to healthy controls, but this difference was statistically insignificant.

Our study showed an inverse correlation between serum albumin concentration and loss of attachment in the study population. A significant negative association between the loss of attachment and the serum albumin concentration was found in periodontitis group when compared to the healthy controls. This negative correlation shows that when the loss of attachment increases there was a significant reduction in serum albumin concentration especially in periodontitis group. The precise mechanism underlying serum albumin-periodontal relationship is not well understood. This relationship might be explained by two conceivable possibilities, namely the influence of nutritional aspect or chronic disease aspect.
In this study there was a significant reduction in serum albumin concentration in patients with increased loss of attachment, which is an important measure of the severity of periodontal disease. It is suggested that the inflammatory reactants might be influenced by both serum albumin concentration and periodontal disease condition. C- reactive protein may be used to identify the presence of inflammation in individuals with a lower serum albumin concentration.\textsuperscript{18} The level of serum albumin may fall owing to a variety of infections with an increase in C - reactive protein and IgG concentration.\textsuperscript{19}

A negative correlation between gingival index and serum albumin concentration was also seen in the present study population. But this negative association was not of much statistical significance. It can be suggested that this negative association might be due to increased severity of inflammation in patients with high gingival index score which in turn might influence the serum albumin concentration as in the case of loss of attachment.\textsuperscript{18}

In view of these facts and because of the cross sectional design of the present study, a clear cause-effect relationship between serum albumin and periodontal disease cannot be confirmed. Larger and more randomized controlled clinical trials are required to substantiate the correlation between periodontal disease and serum albumin concentration.

CONCLUSION

The findings of the present study showed a statistically significant inverse association between serum albumin concentration and loss of attachment in periodontitis patients. There was a significant reduction in serum albumin concentration with an increase in loss of attachment. Another finding of this study was that there was an inverse correlation between gingival index and serum albumin concentration in both the test group and the controls which was statistically insignificant. Although there was a reduction in serum albumin concentration in the periodontitis group when compared to the healthy controls, this difference was not statistically significant. Longitudinal evaluations with a larger population may be an important step in revealing the cause to effect relationship between periodontal disease and serum albumin concentration.

REFERENCES


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