Estimation of Serum Triglycerides, Serum Cholesterol, Total Protein, IgG Levels in Chronic Periodontitis Affected Elderly Patients: A Cross-Sectional Study

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Aim: The present study was conducted to evaluate the serum triglycerides, serum cholesterol, total protein, and IgG levels in elderly patients who were affected by periodontal disease.

Materials and Methods: This study was conducted at the Rajah Muthiah Dental College and Hospital in the periodontics division. The study was conducted for a period of 3 months. This study is a prospective analytical study. Sixty individuals who were systemically healthy in the age group of 50 and above were included in this study. Control and experimental groups of 30 participants each were included. Plaque index, gingival index, probing pocket depth, and clinical attachment loss were recorded. Biochemical parameters such as serum cholesterol, serum triglycerides, total protein, and IgG levels were also evaluated and correlated with the periodontal parameters. Data was analyzed using SPSS version 16.0 (IBM Corp., Armonk, NY). The relationship between periodontal status and the biochemical parameters such as serum cholesterol, serum triglycerides, total protein, and IgG levels were evaluated by Student’s t-test.

Results: There was no significant difference in the plaque and gingival scores between the experimental and control group. It was observed that serum cholesterol level and total protein level was lower in participants suffering from chronic periodontitis. Triglycerides level was significantly elevated in the experimental group. IgG, a level which is not significant, concluded that there is no difference in control and experimental group.

Conclusion: It was concluded from the results obtained from the study that there is an association between serum triglycerides, serum cholesterol, total protein, and periodontal disease. However, further longitudinal and well-controlled studies are required to evaluate the relationship between these biochemical parameters and periodontal disease.

Keywords: Chronic periodontitis, IgG, serum cholesterol, serum triglycerides, total protein

INTRODUCTION

Periodontitis is defined as an inflammatory disease of the supporting tissues of the teeth caused by specific microorganism resulting in the progressive destruction of the periodontal ligament and alveolar bone with pocket formation, recession, or both. It is more likely that the cumulative effects of the disease occur over a lifetime. Deposits of plaque and calculus, increased number of sites capable of harboring such deposits, and attachment and bone loss experienced explain the increased prevalence of the disease in older people.
Evidence has also shed light on the converse side of the relationship between systemic health and oral health, i.e., the potential effect of periodontal disease on a wide range of organ systems. However, the impact of these conditions extends beyond the oral cavity affecting nutrition and causing chronic systemic inflammation and periodontitis that can occur due to preexisting gingivitis.\(^5\)

Recent studies have shown that periodontal disease causes numerous changes in systemic health, which change the blood chemistry with increase in inflammatory mediators, proteins, and lipids in the serum.\(^6\)

Protein deficiency also accumulates the destructive effects of local irritants and occlusal trauma.\(^7\) Hence, the present study was undertaken to evaluate the relationship between serum triglycerides, serum cholesterol, total protein, and IgG levels and periodontal disease.

**MATERIALS AND METHODS**

This was a prospective analytical study. This study was conducted at the Rajah Muthiah Dental College and Hospital in the periodontics division. The study was conducted for a period of 3 months between June and August in 2012. Randomization was done by simple random sampling. Sample size for the study was scientifically determined based on the data obtained from an already published article.\(^8\) Adjusting for anticipated nonresponse, the final sample size was estimated to be 60. Thirty patients were included in the experimental group and 30 patients were included in the control group. All the patients were systemically healthy and were informed about the study. None of the patients were hospitalized or institutionalized. Ethical clearance was obtained from the local review board. Informed consent was obtained from the participants. From each patient, 5 ml of blood was collected by venipuncture. Intraoral examination was carried out under sufficient illumination.

**INCLUSION CRITERIA**

**Control group**

- Both male and female patients of age 50 years and above
- Free from systemic diseases that might influence the periodontal conditions
- Did not receive any treatment or medication for the past 6 months
- Free from periodontal diseases.

**Experimental group**

- Patients with chronic periodontitis of both sexes
- Patients aged 50 years and above.

**EXCLUSION CRITERIA**

- Patients having less than 20 teeth (both upper and lower arches) were excluded.

The following parameters were recorded
1. Plaque index [Silness and Loe 1964]
2. Gingival index [Loe and Silness 1963]
3. Clinical attachment level
4. Probing pocket depth.

The biochemical parameters included in the study were total protein level, serum cholesterol level, triglycerides, and IgG. Biochemical parameters were measured using the following methods: total protein – biuret method;\(^9\) total cholesterol – phoshotungstic acid method;\(^10\) triglycerides – GPO-Trinder method; IgG – Triguetry method.

**Statistical analysis**

Data was analyzed using SPSS version 16.0 (IBM Corp., Armonk, NY). Standard descriptive statistics were generated. The relationship between periodontal status and the biochemical parameters such as serum cholesterol, serum triglycerides, and total protein and IgG levels was evaluated by Student’s \(t\)-test. Confidence interval was set at 95% and the significance of \(P\) value was set at < 0.05.

**Results**

The mean of plaque score in the experimental group was 1.43 with a standard deviation of 0.22 and in the control group it was 1.79 with a standard deviation of 3.49 [Figure 1]. It was concluded that in plaque index there was no significant difference between the control and experimental groups.

Figure 2 shows that the mean of gingival index score in the experimental group was 1.13 with a standard deviation of 0.41 and in the control group it was 1.05 with a standard deviation of 0.18. The calculated \(P\) value is greater than the 0.5 level. Hence, there was no significant difference between the control and experimental group.

Figure 3 shows the mean pocket depth score. In the experimental group, it was 8.03 with a standard deviation of 1.45 and in the control group it was 3.50 with a standard deviation of 1.31. Further, the results show that the calculated \(P\) value (<0.001) was significant. This proved that there was a significant difference between the control and experimental group.

Figure 4 shows that the mean of clinical attachment level in the experimental group was 7.83 with a standard deviation of 1.29 and in the control group it was 3.00 with a standard deviation of 1.44. This shows that there was a significant difference between the experimental and control groups regarding clinical attachment level.
Table 1 shows that the serum cholesterol level in the experimental group was 137.40 with a standard deviation of 10.83 and in the control group it was 192.43 with a standard deviation of 33.49. The calculated $t$-value is less than the table value. It is evident from the table that the obtained $P$ value (0.000) is less than 0.05. This showed that regarding total cholesterol level there was a significant difference between the control and experimental groups.

Table 2 shows the mean of triglycerides levels. In the experimental group it was 241.57 with a standard deviation of 89.54 and in the control group it was 155.40 with a standard deviation of 19.59. Further, the result inferred that the calculated $P$ value 0.001 was significant. Thus, it is clear that there was a significant difference between the control and experimental groups regarding triglycerides.

Table 3 shows that the mean total protein level in the experimental group was 4.59 and with a standard deviation of 0.77 and in the control group it was 7.07 with a standard deviation of 0.48. The calculated $t$-value (14.191) is greater than the table value. The results revealed that there is a significant difference between the experimental and control groups regarding total protein level.

Table 4 shows that the mean total IgG levels in the experimental group was 1328.33 with standard deviation of 588.49 and in the control group it was 1266.43 with a standard deviation of 627.50. It is concluded that there was no significant difference in the IgG levels between the control and experimental groups.

**Discussion**

The purpose of the study was to evaluate the association between periodontal disease and general health status in the elderly using serum total cholesterol, total protein, triglycerides, and IgG as a criterion index of the severity of the underlying disease and nutritional status. The current study also supports the association between oral health status particularly periodontal disease and level of serum total cholesterol, total protein, triglycerides.

An association between serum albumin level and mortality rate has already been assessed. In the present study, the results showed that the participants with loss of attachment of more than 6 mm had serum cholesterol and total protein when compared with those having less...
In the present study, it was concluded that percentage of >6 mm loss of attachment (2 mm). However, the triglycerides levels were slightly increased in chronic periodontitis patients.

It was reported that periodontal disease might be a risk factor for oral health status as well as a risk factor for general health status. According to the Mojón et al., in participants who had teeth with pocket depth of more than 6 mm had significantly lower serum total protein level.[13]

In accordance with the above findings, in the present study, the participants having pocket depth of 6 mm had significantly lower serum total protein concentration. Yoshihara et al. concluded that percentage of >6 mm clinical attachment level was associated with renal dysfunction. In the present study, clinical attachment level greater than 6 mm had significantly lower serum total protein concentration.[14]

According to Davidovich et al., the plaque score measured was higher in participants who were suffering from renal diseases. In our study, there was no association between plaque scores and levels of serum protein. Davidovich et al. conducted a study on oral findings and periodontal status in adolescents suffering from renal failure in the age groups of 65 years and above and concluded that renal failure patients had higher gingival index.[15]

In the present study, there was no association between gingival index and the levels of serum total protein. Katz et al.[16] evaluated the association between periodontal pockets and elevated cholesterol levels and concluded that the presence of periodontal pockets was positively associated with higher cholesterol levels; they considered that age is positively associated with total cholesterol. This association decreases with increased age.

In contrast to the above findings, in the present study, it was concluded that periodontitis had a significant association with lower levels of total cholesterol. Katz et al. and Rane et al. concluded that a minor significance was found between triglycerides level and chronic periodontitis disease patients.[16,17] In the present study, it was concluded that chronic periodontitis patients was associated with elevated triglycerides level. In 2004, Sahinger and Cohen reported that there is elevated IgG levels were found in periodontal patients.[18] In the present study, in contrast to above findings patients with chronic periodontitis were not significantly associated with IgG levels.

**CONCLUSION AND LIMITATIONS**

Based on the results obtained from the study, it can be concluded that there is a significant difference between periodontal disease and plasmatic levels of total cholesterol, triglycerides, and total protein levels in the studied population. It was observed there was no difference in IgG levels with patients with chronic periodontitis.

To date, few longitudinal studies have been performed in this regard to better assess the relationship between biochemical parameters and periodontal disease, further well-controlled longitudinal studies and research are needed. Further research accompanied with true experimental design with large sample size is required to confirm the findings of the current study. Small sample size may have decreased the power to find associations. It is also important to find the other confounding factors which can affect the various parameters that were assessed in the study.

**RECOMMENDATIONS**

As health care providers dentists should contribute to their patients in making the following recommendations to their elderly patients:

- Emphasizing the patients on proper oral hygiene practices and scheduling frequent prophylactic dental appointment to remove plaque and calculus
- Recommending nutritional supplements
- Referring the patients with elevated biochemical parameters to their physicians for medical evaluation and treatment.

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**Table 1: Association between total cholesterol level in experimental and control group**

| Groups   | N  | Mean  | SD   | t-value | P    |
|----------|----|-------|------|---------|------|
| Control  | 30 | 192.43| 33.49| 9.581   | 0.000*|
| Experimental | 30 | 137.40| 10.83|         |      |

*P<0.05 statistically significant

**Table 2: Association between triglycerides in experimental and control group**

| Groups   | N  | Mean  | SD   | t-value | P    |
|----------|----|-------|------|---------|------|
| Control  | 30 | 155.40| 19.59| 5.482   | 0.000*|
| Experimental | 30 | 241.57| 89.54|         |      |

*P<0.05 statistically significant

**Table 3: Association between total protein in experimental and control group**

| Groups   | N  | Mean  | SD   | t-value | P    |
|----------|----|-------|------|---------|------|
| Control  | 30 | 7.07  | 0.48 | 14.191  | 0.000*|
| Experimental | 30 | 4.59  | 0.77 |         |      |

*P<0.05 statistically significant

**Table 4: Association between IgG levels in experimental group and control group**

| Groups   | N  | Mean  | SD   | t-value | P    |
|----------|----|-------|------|---------|------|
| Control  | 30 | 1266.43| 627.50| 1.004   | 0.324 (NS) |
| Experimental | 30 | 1328.33| 588.49|         |      |

P>0.05 and hence not significant (NS)
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Conflicts of interest
There are no conflicts of interest.

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