

Original Article

# Ascorbic Acid Levels in Systemically Healthy Patients with and Without Periodontitis

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Abstract :

**Introduction :** Periodontitis is a multifactorial disease initiated by plaque. This slowly progressing disease affects the supporting structures of the teeth leading to attachment and bone loss. Nutrition plays an important role in the inflammation and this could be related to effect of nutrition on periodontal disease prevalence. Vitamin C also known as ascorbic acid is abundantly found in fruits and vegetables play a role in the periodontal disease. It can scavenge free oxygen radicals and protect lipid from peroxidation and is a potent antioxidant.

**Materials and methods :** A total of 50 systemically healthy subjects were selected and divided into control group A (25 subjects without chronic periodontitis) and test group B (25 subjects with chronic periodontitis) and blood samples were collected to assess ascorbic acid levels. The data obtained were subjected to statistical analysis.

**Results :** showed statistical significance ( $p$  value 0.004) in the ascorbic acid levels between the two groups.

**Conclusion :** The plasma ascorbic acid level was significantly reduced in systemically healthy individuals with chronic periodontitis when compared to systemically healthy without periodontitis which could be attributed to the protective nature of this vitamin in chronic disease like periodontitis.

## Introduction

Periodontitis is a multifactorial disease initiated by plaque. This slowly progressing disease affects the supporting structures of the teeth leading to attachment and bone loss. Periodontal inflammation results in gingival bleeding, pocket formation, destruction of alveolar bone, and eventually loss of teeth.<sup>1</sup>

Nutrition plays an important role in the inflammation and this could be related to effect of nutrition on periodontal disease prevalence. Vitamin C also known as ascorbic acid is abundantly found in fruits and vegetables play a role in the periodontal disease.<sup>2</sup> Vitamin C is a powerful water soluble antioxidant. It can scavenge free oxygen radicals and protect lipid from peroxidation. It is also shown to be useful in regeneration of  $\alpha$ -tocopherol.<sup>3</sup>

Even though low vitamin C intake does not cause

periodontitis, an inverse association exists between plasma/serum vitamin C concentration and periodontitis<sup>4</sup>. Worsening of periodontal disease with development of scurvy has been reported. But epidemiological surveys have failed to establish a causal relationship between severity of periodontal disease and vitamin C levels.<sup>5,6</sup>

Free radicals play an important role in the pathogenesis of periodontal disease. Vitamin C can scavenge free radicals mainly hydroxyl radicals. Vitamin C can prevent activation of neutrophils and gingival crevicular fluid derived collagenase by oxidative agent.<sup>7</sup>

Collagen plays an important role in wound healing by collagen synthesis. This function of vitamin C helps in maintaining periodontal tissues, formation of bone matrix and also helps maintaining the blood vessel wall integrity.<sup>8</sup> Ascorbic acid play a role in decreasing the gingival epithelial

permeability and thus prevents the penetration of toxic substances into the periodontal tissues.

Hence the present study was done to assess and compare the serum ascorbic acid in systemically healthy subjects with and without periodontitis.

#### Materials and Methods

The present study included 50 individuals visiting the department of Periodontics, A.B Shetty Memorial Institute of Dental Sciences, Mangalore, India.

The study was approved by the ethical committee of the institution. Written informed consent was obtained from all the patients after a detailed explanation of the procedures and objectives of the study. Data regarding the personal history, medical, dental, habit was recorded.

Clinical evaluation to determine the periodontal status of patients included assessment of plaque index by Silness and Loe (PI), gingival index (GI) and mean pocket probing depth (PPD). Periodontal examination was done by a trained examiner and one calibrated examiner obtained all the measurements to reduce intra-examiner variability.

Patients were divided into two groups:

- Group A (Control): 25 systemically healthy Subjects without chronic periodontitis
- Group B (Test group): 25 systemically healthy Subjects with chronic periodontitis.

Selection criteria for the test and control groups were as follows.

#### Inclusion Criteria

- Patients between 35-55 yrs of age
- Patients with minimum complement of 20 teeth
- Patients with gingival index score (Loe and Silness, 1963) of <1 for Group I
- Patients with Gingival Index score between 1-2 (Loe and Silness, 1967) and probing depth of  $\geq 4$ mm in more than 30% of the sites for Group II.

#### Exclusion Criteria

- History of any antibiotic or anti-inflammatory therapy in the past 6 months

- History of any systemic disease
- Pregnant or lactating women
- Subjects with any prior history of periodontal therapy in the last 6 months
- Smokers and tobacco use.

Collection of samples: Blood samples were collected from the participants into 5ml vacuum tubes. The collected samples were centrifuged with a low speed centrifuge at 4000 rpm for 5 minutes, to separate plasma from blood cells. The supernatants were immediately stored in 4° Celsius to be used later to determine the plasma vitamin C levels by spectrophotometry.

#### Statistical analysis

The data was analysed using statistical software package version. Chi square tests, Student's t-tests and Fisher's exact tests were used to assess the statistical significance of the study. Clinical parameters of the test group were calculated in mean scores. Student's t-test was used to compare the differences between mean values.

P values of <0.05 were accepted as statistically significant.

#### Results

The sample size of this study was 50, which were divided into two equal groups, group A, being the control (n=25) and group B- systemically healthy subjects with chronic periodontitis (n=25). The ascorbic acid levels were calculated for all the subjects. The ascorbic acid level of the test group was compared with each clinical parameter. (Table 2)

The comparison of ascorbic acid levels between group A and group B showed statistical significance ( $p$  value 0.004) as shown in table 1 and figure 1. The comparison of levels of ascorbic acid of group B with GI was found statistically significant ( $p$  value =0.035) whereas between PI ( $p$  value=0.6) and PPD ( $p$  value=1) were not statistically significant (table 2).

Table 1 : Vitamin C levels in Group A and B

GROUPS	MEAN	STANDARD DEVIATION	t value	p value
A	0.672	0.232	3.009	0.004*
B	0.500	0.16		

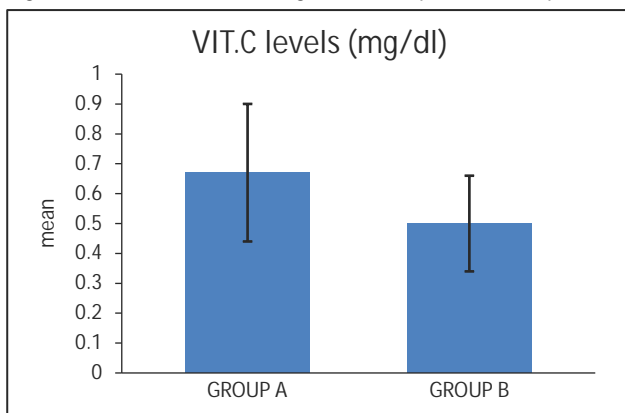
Statistically significant with p<0.05

Table 2 : Independent sample test showing comparison of Vitamin C in Test group (Group B) with PI (Plaque Index), GI (Gingival Index) and PPD (Probing Pocket Depth)

	PI	GI	PPD
Vitamin C	0.667	0.035*	1.0

Statistically significant p<0.05

Figure 1 : Vitamin C levels (mg/dl) in Group A and Group B



Mean ± Standard deviation of Vitamin C in Group A Group B were 0.672±0.23 and 0.5±0.16 respectively.

### Discussion

Free radicals induce lipid peroxidation which leads to various pathological changes in the periodontium leading to periodontitis. Reactive oxygen species (ROS) are continuously produced by our body during metabolism.<sup>9</sup> if produced in excess can lead to harmful damage to the periodontium. Our body produces an array of antioxidants to fight against this harmful free radicals.<sup>10</sup> Vitamin C is a non enzymatic antioxidant. Vitamin C is a powerful water soluble antioxidant. It can scavenge free oxygen radicals and protect lipid from peroxidation. It is also shown to be useful in regeneration of a-tocopherol.<sup>3</sup>

There exists a synergy between antioxidants. It is shown

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that dietary supplementation of vitamin C increased plasma Vitamin E levels.<sup>11</sup> Therefore reduction in the levels of vitamin C causes increased peroxidation in chronic periodontitis. The present study showed a statistically significant reduction in the plasma vitamin C levels in subjects with chronic periodontitis. This could be attributed to the protective role of vitamin C in an attempt to reduce the increasing reactive oxygen stress in chronic periodontitis patients. This observation is similar to various studies done.<sup>12,13</sup> But several studies have failed to prove an association between prevalence or severity of the periodontitis diseases with low levels of vitamin C.<sup>14,15</sup> Only a weak association was found in the third National Health and Nutrition Examination Survey between low intake of vitamin C and periodontal diseases.<sup>16</sup> Vitamin C deficiency does not cause periodontitis but it is essential in wound healing and tissue regeneration. Collagen regeneration is very essential for the maintenance of periodontal health. Vitamin C plays a role in immune modulation and synthesis of various intercellular substances like collagen.

A study showed association between Porphyromonas gingivalis is infection and low levels of plasma vitamin C which may lead to increase in colonization of this perio pathogen or disturb healing process.<sup>13</sup>

Neutrophils have the ability to concentrate ascorbic acid. It helps in bactericidal activity and enhances chemotaxis and also provides structural framework of polymorphonuclear cells. In mononuclear cells it helps in decreasing the oxidative damage to DNA.<sup>4</sup>

### Conclusion

The plasma ascorbic acid level was significantly reduced in systemically healthy individuals with chronic periodontitis when compared to systemically healthy without periodontitis which could be attributed to the protective nature of this vitamin in chronic disease like periodontitis.

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