# Salivary pH: A Diagnostic Biomarker of Gingivitis and Periodontitis Status

**Madhvi Gupta[1], Nimisha Singh[2], Nandita Dhali[3], Nisha Agrahari[4], Nimisha Chaubey[5]**

[1]Professor, Department of Biochemistry, ITS Dental College Hospital and Research Center, Gr Noida. Students of BDS 2018

**Abstract:** *Background: Early detection of disease plays an important role in successful therapy. Early diagnosis and management reduces the severity and possible complications of the disease. To overcome this challenge, medical researchers are devoted to find biomarkers that reveal a hidden lethal threat before the disease becomes complicated. Saliva , an important physiologic fluid ,containing a highly complex mixture of substances ,is rapidly gaining popularity as a diagnostic tool. Materials and methods: 3 groups consisting of healthy gingiva, generalized chronic gingivitis and generalized chronic periodontitis were studied. Results: It was observed that salivary pH of the patients suffering from chronic generalized gingivitis was alkaline in nature than those suffering from generalized chronic periodontitis which was acidic when compared with the healthy group of individuals. Conclusion: Salivary pH acts a biomarker for various periodontal diseases.*

**Keywords:** Alkaline Ph, Acidic Ph,Chronic Gingivitis

## 1. Introduction

Salivaa watery secretion in the mouth produced by the salivary glands that aids in the digestion of food. Saliva also serves to moisten and cleanse the mouth, including the tongue and teeth, and contains substances that can play a role in the prevention of infection. Saliva aids digestion by moistening food and contains enzymes that begin the digestion process.

Saliva acts as a major determinant of oral environment and serves as an easily available diagnostic and monitoring method. Saliva is a bodily fluid secreted by major and many minor salivary glands. It plays and important role not only in plague formation but also has lubricating effect. Thereby maintaining themucosal integrity of oral and upper gastrointestinal surface.

Saliva also acts as a medium for the removal of food debris and bacteria is another important action which helps in prevention of tooth decay. [6]

Collection of saliva is safer compared to serum collection, as the risk of transmission of diseases can be minimized, this mostly helpful in cases like viral and bacterial infection. The collection is simpler in obese individuals and children compared to serum. It is also cost effective, does not require much skill and is also non time consuming.

Currently three major limitations have prevented people from recognizing the full potential of disease detection, and have seriously hampered the development of clinical diagnostics, namely-

1) Lack of definitive Molecular biomarkers for specific diseases.
2) Lack of an easy and inexpensive sampling method with minimal discomfort.
3) Lack of an accurate, easy-to-use, a portable platform to facilitate early disease detection.

Saliva, an oral fluid that contains an abundance of proteins and genetic molecules and is readily accessible *via* a totally non-invasive approach, has long been recognized as the potential solution to these limitations.[3]

Saliva provides an easily available, non-invasive diagnostic medium for a rapidly widening range of diseases and clinical situations.[2]

In the field of periodontology, traditional clinical criteria are often insufficient for determining sites of active disease, for monitoring the response to therapy or for measuring the degree of susceptibility to future disease progression. [4]

Saliva as a mirror of oral and systemic health is a valuable source for clinically relevant information because it contains biomarkers specific for the unique physiological aspects of periodontal diseases.

Periodontal disease progression, as defined by pocket depth, gingival bleeding and suppuration is linked with increased levels of salivary aspartate aminotransferase.

Inflammation of the gingival tissue results in gingivitis, which if not resolved leads to inflammation of the periodontium called as periodontitis.[5]

Gingivitis and periodontitis are chronic inflammatory conditions that may affect as much as 80% of the adult population, making them one of the most prevalent diseases in humankind.

Gingivitis is a reversible condition that can usually be treated with professional bio film removal and improvement in oral hygiene. Most, but not all, cases of long standing gingivitis progress into periodontitis.

Saliva has a pH normal range of 6.2-7.6 with 6.7 being the average pH. Resting pH of mouth does not fall below 6.3. In the oral cavity, the pH is maintained near neutrality (6.7-7.3) by saliva [1].

## 2. Materials and Methods

The present study was analytical in nature using case control design. It was conducted at our patient Department of

Periodontology, ITS Dental College, Greater Noida. The study population comprised of patients reporting to OPD in 3 groups.

Group 1 consisted of people with healthy gingiva.

Group 2 comprised of patients with generalized chronic gingivitis.

Group 3 consisted of patients with generalized chronic periodontitis.

Gingivitis was diagnosed if there was inflammation of gingiva without the loss of attachment. Periodontitis was diagnosed if there was loss of attachment.

The purpose of the study was explained to the subjects and the consents were taken.

## 3. Salivary Analysis

Salivary pH was measured with the help of single electrode digital pH meter. The pH meter was calibrated every day. After analysing the pH, the electrode tip was again washed with a gentle stream of distilled water and then dipped in the double distilled water.

## 4. Statistical Analysis

The mean and standard pH for all the three groups was calculated. The P values were calculated by *ONE-WAY ANOVA* and Tukey's correlation for multiple group comparisons and was considered statistically significant if $P < 0.05$

## 5. Result and Discussion

The present analytical study was conducted to find the association between salivary pH and periodontal disease. Three groups, each including 20 subjects taken for the study.

The average pH for the population with clinically healthy gingiva was $7.35 \pm 0.30$ (Group A). The average pH of the group having chronic generalized gingivitis was $8.15 \pm 1.93$ (Group B), while the average pH of those having chronic generalized periodontitis was $6.82 \pm 5.8$ (Group C) Table.1

| Group | Salivary pH |
|---|---|
| A(healthy) (n=20) | 7.35±0.3 |
| B(Gingivitis) (n=20) | 8.15±1.93 |
| C(Periodontitis) (n=20) | 6.82±5.8 |

Above table-1 shows the average salivary pH in three groups. It was observed that the saliva of patients suffering from the chronic generalized gingivitis was alkaline in nature while that of patients with chronic generalized periodontitis was acidic when compared with healthy individuals. The difference among the groups was statistically significant (p=0.00).

**Table 2**

| showing average salivary pH in three groups (n=20 in each group) | | | |
|---|---|---|---|
| Group | Salivary pH | 95% CI | Significance |
| A(healthy) | 7.35±0.3 | 7.21-7.49 | **One way Anova** |
| B(gingivitis) | 8.15±1.93 | 8.07-8.91 | F=31.72 |
| C(periodontitis) | 6.82±5.8 | 6.48-7.13 | P=0.00 |

**Table 3**

| Comparison between groups | P values | F values |
|---|---|---|
| A vs. B | 0.00 | 43.58 |
| A vs. C | 0.00 | 8.747 |
| B vs. C | 0.00 | 47.29 |

## 6. Conclusion

Saliva is a fluid that can be easily collected, contains locally-derived and systemically derived markers of periodontal disease and hence may offer the basis for a patient specific diagnostic test for periodontitis.

Saliva can be used as an indicator of prognosis during periodontal treatment. Within the limitations of this study, it has been observed that there is a correlation between pH of saliva and periodontal diseases when compared with healthy groups. Salivary pH in patients with chronic generalized gingivitis was more alkaline than that in patients with clinically healthy gingiva. In patients with chronic generalized periodontitis, the salivary pH was more acidic than the control group. This may be of diagnostic value in the future, but further elaborate studies with larger sample size, microbiological analysis and ions in the salivary sample are needed to draw definite conclusions.

## References

[1] Takahashi N. Microbial ecosystem in the oral cavity: Metabolic diversity in an ecological niche and its relationship with oral diseases. Int Congr Ser. 2005;1284:103–12.
[2] Mandel ID. The diagnostic uses of saliva ,J Oral Pathol Med. 1990 Mar;19(3):119-25.
[3] Lee Y, Wong DT. Saliva: An emerging biofluid for early detection of disease. Am J Dent. 2009;22:241–8.
[4] Priti Basgauda Patil and Basgauda Ramesh Patil ,Saliva: A diagnostic biomarker of periodontal diseases ,J Indian Soc Periodontol. 2011 Oct-Dec; 15(4): 310–317.
[5] Carranza FA, Jr. Sthed. Philadelphia: W.B. Saunders Company; 1998; Textbook of Clinical Periodontology.
[6] M.Abdelrazik, H. Baghdadi and Khalil Alali, *Functional biochemistry and microbiology of human Saliva* ;November-December 2013), PP 52-59, IJASR International Journal of Academic and Scientific Research