An Evaluation of Role of Salivary Alpha Amylase in the Caries Activity among Young Individuals

Dr. Preetha K, Dr. Tejasri K, Dr. S. Vijaya Nirmala M.D.S, Dr. Sharada T Rajan

1, 2 Former BDS Student, 3 Senior Lecturer, 4 Associate professor

Department of Oral Pathology and Microbiology
Faculty of Dental Sciences, Tamilnadu, India

*Corresponding Author:
Dr. S. Vijaya Nirmala M.D.S
Senior Lecturer, Faculty of Dental Sciences
Department of Oral Pathology and Microbiology
Tamilnadu, India

ABSTRACT
Objective: Previous studies suggested a significant relationship between alpha-amylase and caries formation. This study was implemented in order to investigate the interrelation between level of salivary alpha amylase, and dental caries.

Method: Study was conducted among 30 volunteers within the age group of 18-23 years from the outpatient & oral pathology departments of faculty of dental sciences, Sri Ramachandra Institute of Higher Education and Research, Chennai. Whole unstimulated saliva was collected from the volunteers in sterile test tubes which was then diluted and subjected to biochemical analysis. Salivary alpha amylase levels, pH changes and dental caries were estimated and statistically analyzed. Data were analyzed using student’s t-tests and chi-square tests.

Results: The salivary alpha amylase levels were elevated in the dental caries samples along with the change in pH of saliva. The results of the study were statistically analyzed using parametric & nonparametric test. Mann Whitney test was found to be statistically significant (p=0.001).

Conclusion: A significant association was found between salivary alpha-amylase and dental caries in adolescents. More research to demonstrate the real relation between alpha amylase and dental caries is recommended.

Keywords: alpha amylase, caries susceptibility, diagnosis & biomarker.

INTRODUCTION
Dental caries is the most common oral disease worldwide, recognition and diagnosis at the earlier stages is a difficult task [1]. Saliva acts as noninvasive diagnostic tool for various local & systemic diseases, because it contains glycoproteins, essential electrolytes, immunoglobulins and numerous enzymes [2]. Salivary alpha amylase is the ubiquitous enzyme, catalyzing the dietary starch hydrolysis by binding in the surface of cariogenic bacteria. The salivary alpha amylase is a secretory multidomain protein, hydrolyses the insoluble form of starch into soluble form in carbohydrate digestion [3]. The important property of enzyme is the high affinity to bind tooth surface and oral streptococci. The study was undertaken to explore the useful of salivary alpha amylase as a biomarker, offering new perspectives for preventive dentistry. Hence the present study was taken to evaluate the level of
salivary alpha amylase and the incidence of caries which will contribute to the arrest of the disease process. The aim of this study is to evaluate the salivary alpha amylase level and incidence of dental caries among the young individuals.

**Materials and methods**

This study was conducted in Faculty of Dental Sciences, Sri Ramachandra Institute of Higher Education & Research Chennai, India. The study was approved by the Institutional ethical committee of the college. A total of 30 participants aged between 18-30 years were included in the study. An exclusion criterion of the study was volunteers who were under medications for any systemic diseases. The informed consent was obtained from the participating individuals. Oral screening for all participants was done, Decayed Missing Filling Tooth index was recorded. The volunteers were informed not to use any oral stimulation and asked to wash their mouth prior to collection of saliva.

Whole unstimulated saliva was collected over a time span of 5 minutes between 8 to 11 am from 30 healthy volunteers, using a sterile syringe after taking their informed consent. The collected saliva samples were stored at 4°C and transferred to the clinical laboratory, Department of Biochemistry for estimation of salivary alpha amylase levels and pH of saliva. The samples were bought into room temperature & then centrifuged at 3000 rpm for 5 mins. By using Liquipath alpha amylase kit reagent from pathozyme diagnostics with UV spectrophotometer, Alpha amylase enzyme activity was analyzed and means values (U/L) were recorded. PH test strips (Simplex Health) were used to measure the PH of Salivary samples. The Simplex Health pH strip was dipped into the salivary samples for about 3 seconds until both pads on the test strip were sufficiently covered with liquid. PH was recorded after 15 seconds. The readings were recorded based on the color on the indicator chart. The obtained data were statistically analyzed.

**Results**

Out of thirty volunteers, there were 15 boys (50%) and 15 girls (50%). The median value salivary amylase of caries present subjects was significantly higher than caries free subjects (p < 0.001). The median value-pH of saliva of caries present was significantly higher than caries free group. There were no significance difference between salivary amylase level & pH of saliva according to age and Gender. The statistical evaluation using Mann-Whitney test showed the distribution of mean median & interquartile range. A significant correlation was determined between the dental caries present individuals, pH of saliva, salivary amylase (p value <0.001) Fig 1.

**Discussion**

Dental caries is a communicable infectious disease characterized by demineralization and destruction of tooth surface by acid forming bacteria [4]. Dental caries is one of the most familiar children of aged above 5 to 15 [5] Saliva contains inorganic ions, electrolytes usually required in body fluids, to maintain pH in the oral environment. The salivary components have important roles during interactions with oral bacteria, which greatly depend upon the pH of saliva and amylase production [6]. Salivary amylase is metalloenzyme produced by serous cells of the parotid and other salivary glands [4-5], hydrolyzes starch to glucose and maltose; giving rise to products that are transformed into acids leading to dental caries [5, 6]. This also causes change in pH which subsequently affects the bacterial diversity in oral cavity. Earlier studies have reported a significant relationship between alpha- amylase, and dental caries formation [6, 8] while a few others have negated the relationship [9, 10]. Some of research indicates that this enzyme might be helping to provide starch granules which have an anticariogenic effect [11]. The aim of this study was to re-evaluate the interrelation between the pH of saliva, salivary alpha-amylase and dental caries. The most important functions for alpha-amylase: is to hydrolyse starch and also binds the oral Streptococci to the tooth surface [12]. Binding of a-amylase to bacteria and teeth has important implications for dental plaque along with caries formation [12, 13].

The results of our study showed that the mean value of salivary alpha amylase level is not statistically different according to gender. The Ph of saliva were log transformed, the normality was verified with the Shapiro-Wilk test. In this study, we observed that salivary amylase activity increases in patients with dental caries and may be used as a biomarker of dental caries. The results of this study demonstrate...
that salivary alpha-amylase level were significantly higher in caries cases as compared to healthy group. A number of studies supported this correlation as indicated in our findings (6, 8 11-13). It was earlier shown that more acid is produced during infection and due to processing of the starch by salivary alpha-amylase. Douglas et al. [14] stated that bacteria with alpha amylase produce acid by fermentation of starch, and interaction between them leads to formation of dental plaque and subsequently promote dental caries. The more in-depth molecular analysis is requiring facilitating the understanding the role of amylase in the dental caries and bacterial infection.

**Limitation:** Being a pilot study, a smaller sample was used. Larger sample size with more parameters can help in firmly establishing the relationship between the salivary amylase, pH and dental caries.

**Conclusion:** The evaluation of salivary alpha-amylase and dental caries in adolescents could be a helpful to determine high risk individuals for dental caries. More research to demonstrate the real relation between alpha amylase and dental caries is recommended.

**Figure 1** Comparison of pH and salivary amylase of dental caries and normal individual

---

**References**


