



**STUDY OF THE ACTIVITY OF SALIVARY ALKALINE PHOSPHATASE,
CONCENTRATION OF SALIVARY CALCIUM AND PHOSPHOROUS IN DENTAL
CARIES**

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ABSTRACT

Introduction – The minerals calcium and phosphorous from saliva, along with the enzyme salivary alkaline phosphatase plays an important role in the mineralization of the teeth. Dental caries is characterized by demineralization of the inorganic portion and destruction of the organic substances of the tooth which often leads to cavities. **Aims and Objectives** - To evaluate the activities of salivary alkaline phosphatase, and concentration of salivary calcium, phosphorous in dental caries. **Material and Methods** – Salivary calcium, phosphorous, alkaline phosphatase from stimulated saliva of 135 subjects with dental caries and 135 caries free Individuals, were analyzed with automated biochemistry analyzer – Corolyzer. **Results** – Data analysis revealed significantly decreased concentration of salivary calcium, phosphorous along with significantly increased activity of alkaline phosphatase. **Conclusion** – Stimulated saliva contains more amount of bicarbonate, it increases the pH of the saliva. This change in pH favours activity of alkaline phosphatase. Augmented activity of salivary alkaline phosphatase may promote the process of remineralization. This remineralization process utilizes calcium and phosphorous from the saliva for deposition on enamel, and may result into decreased concentration of these minerals in the saliva of study group.

KEYWORDS: Salivary alkaline phosphatase, calcium, phosphorous, dental caries.

INTRODUCTION

Saliva is the noninvasive biofluid of the human body permanently “bathes” the oral cavity, and is trying to cope with an ever changing milieu. Oral cavity is the only place where the mineralized tissue is exposed to the external environment. The saliva bathing the oral cavity performs major functions like digestion, protection, lubrication; maintenance of tooth integrity.^[1] Saliva consists of many organic and inorganic components, among which calcium and phosphorous are associated with the process of mineralization of the teeth and the enzyme salivary alkaline phosphatase also plays important role in this process.

Dental caries is a microbial disease of the calcified tissues of teeth characterized by demineralization of the inorganic portion and destruction of the organic substances of the tooth which often leads to cavities.^[2]

As this alters the milieu of the oral cavity, the present study was undertaken to evaluate the activities of salivary alkaline phosphatase, and concentration of salivary calcium, phosphorous in dental caries.

MATERIAL AND METHODS

The present study was carried out in the department of Biochemistry, Bharati Vidyapeeth Deemed University Medical College & Hospital, Sangli.

Study Design: Case control study.

Study population: Adults visiting dental OPD at Bharati Vidyapeeth Deemed University Dental College & Hospital, Sangli as study group and caries free healthy volunteers as control group.

Sample Size: 135 subjects in the study group and 135 in control group. Sample size was determined by using software – Primer of biostatistics.

Inclusion criteria: Adults visiting dental OPD for the complaint of dental caries.

Age group – 18-50years

Exclusion criteria: Adults with oral afflictions, acute systemic infections, chronic debilitating disease, liver diseases and metabolic bone disorders.

Collection of samples: The samples of saliva were collected one week after oral prophylaxis. Sugar free polystyrene balls used for chewing to stimulate saliva, and stimulated saliva (directly expectorated whole

saliva) was collected in clean, dry, sterilized glass bottles and fitted with proper rubber stoppers immediately.

Method: The samples were investigated for the estimation of activity of salivary alkaline phosphatase, concentration of salivary calcium and phosphorous with the help of fully automated biochemistry analyzer – Corolyzer.

The written consent was obtained from each individual for his willingness as a subject in this study before collecting the sample. IEC approval was obtained from the institutional ethical committee.

Statistical analysis – The data was analyzed by calculating mean and S.D. ‘Z’ test (standard error of difference between two means) was applied to compare results of study group with control.

RESULTS

Observation Table - Concentration of Salivary Calcium, Phosphorous and, activity of alkaline phosphatase in dental caries (study group) and in caries free controls.

Group	Salivary Calcium mg/dl Mean \pm S.D.	Salivary Phosphorous mg/dl Mean \pm S.D.	Salivary Alkaline Phosphatase IU/L Mean \pm S.D.
Study	8.06 \pm 1.87*	3.46 \pm 1.47*	70.03 \pm 45.31*
Control	8.66 \pm 1.94	6.07 \pm 7.35	55.84 \pm 24.59

*Statistically significant ($p < 0.039$) difference between values of study and control group

DISCUSSION

Despite advancement in oral disease science, dental caries is still a worldwide health concern, affecting humans of all ages.^[2] Enamel is the protective coat found on the visible portions of teeth above the gum. It is composed of mineral known as hydroxyapatite which is chemically $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$. Enamel protects teeth from damage. There is always a balance between demineralization and remineralization which maintains the enamel healthy. Bacterial production due to poor oral hygiene leads to the faster destruction of enamel coat and results into dental caries. This increases the dissolution of teeth enamel rapidly, when pH of saliva drops below 5.

Saliva plays a protective role in the oral environment. The defensive role of saliva against dental caries include clearance, buffering, antimicrobial agents and, calcium and phosphate delivery for remineralization.^[3]

Data analysis of present study shows, salivary calcium and phosphorous levels in study group were decreased significantly than those of control group, ($p < 0.010$) and ($p < 0.000$) respectively. Activity of salivary alkaline phosphatase in the study group was found increased significantly ($p < 0.002$) than that of control group. Results of previous work in this field, concerned with salivary calcium, phosphorous, alkaline phosphatase in dental caries in children were contradictory. Our results in adults are in line with Vijayaprasad et al^[4], S. G. Damale^[5] and co researchers for decreased salivary

calcium. These researchers found decreased mean salivary calcium in dental caries than that of controls but this difference was statistically not significant. For salivary phosphorous also S. G. Damale found mean levels decreased in dental caries than control but this difference was also not statistically significant. Significantly elevated activity of salivary alkaline phosphatase was also observed by Vijayaprasad^[4], Pandey^[6], Gandhi^[7], Mahjoub^[8], S.G.Damale.^[5]

As stimulated saliva contains more amount of bicarbonate, it increases the Buffering capacity as well as pH of the Saliva, which turns it to more alkaline. This change in pH favours stimulation of alkaline phosphatase activity in saliva. Augmented activity of salivary alkaline phosphatase may promote the process of remineralization, which is one of the defense actions against the dental caries. This remineralization process utilizes calcium and phosphorous from the saliva for deposition on enamel, and may result into decreased concentration of these minerals in the saliva of study group.

CONCLUSION

Human body possesses its own defenses in different ways to handle the unfavourable circumstances. In dental caries saliva performs its defense role may be by augmenting the activities of Alkaline phosphatase Which replenish the remineralization process with the help of calcium and phosphorous.

IMPLEMENTATION

The control of dental caries presents as one of the greatest challenges that must be dealt with by the dental professionals. Study of salivary biomarkers is one of the methods of caries control. In light of this present knowledge our study will help to control the caries.

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