SALIVARY AMYLASE LEVELS IN TISSUE SUPPORTED COMPLETE DENTURE WEARERS - AN EXPERIMENTAL CLINICAL STUDY

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ABSTRACT

Treatment of edentulism with complete dentures is very common. There is no direct way of understanding if the denture delivered to the patient has improved the nutrition quality of the patient. Salivary alpha amylase (sAA), a metalloenzyme released in the oral cavity, begins the digestive process by breaking down starch to maltose. The levels of salivary alpha amylase change according to the chewing of the patient. The aim of this study was to check if there is difference in the sAA levels in edentulous patients after wearing complete dentures.

INTRODUCTION

Complete denture is one of the most commonly given treatment plans for edentulous patients (Gupta et al., 2019). This treatment greatly improves the overall quality of life of the edentulous patient (Nuñez et al., 2015). Saliva along with its multitude functions in the oral cavity, plays an important role in the retention and stability of denture (Sachdeva et al., 2014). It is comprised primarily of water along with electrolytes (sodium, potassium, calcium), secretory proteins (amylase, lipase, albumin), immunoglobulins (IgA, IgG & IgM) and various other small weight metabolites (de Almeida et al., 2008).

The most abundant protein in human saliva is the digestive enzyme alpha amylase. Salivary alpha-amylase (sAA) is a calcium containing metalloenzyme that cleaves large starch molecules into dextrin and subsequently into smaller molecules, ultimately yielding maltose, which in turn is cleaved into two glucose molecules by maltase. It basically hydrolyzes the α-1, 4 linkages of starch and accounts for 40–50 % of the total salivary gland-produced protein (Zakowski and Bruns, 1985). It is produced by the acinar cells of the parotid gland and is also known as ptyalin (Butterworth, Warren and Ellis, 2011). The pH for optimal activity of sAA is ~7.0 and it requires the presence of chloride ions. It just begins the digestive process and cannot produce complete degradation of starch molecules due to the rapid oral transit (Blanco and Blanco, 2017).

Salivary amylase is probably important in initiating starch digestion in the oral cavity. According to one of the theories, its secretion is dependent upon the time spent on chewing (Zakowski and Bruns, 1985). In the recent past, sAA has also been used as a sensitive biomarker for stress related changes in the body that reflect the activity of sympathetic nervous system (Rohleder et al., 2004). The amount of sAA released in the saliva of edentulous patients depends on his or her diet and chewing efficiency. Complete denture improves the chewing efficiency of the edentulous patients (Kroll et al., 2018). There could be a possible change in the levels of salivary alpha amylase released in the saliva of edentulous patients wearing or not wearing complete dentures.

The aim of this study was to analyse variation in the secretion of salivary amylase levels after the use of complete denture by edentulous patients.

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MATERIALS AND METHODS

Place of study

The study was carried out in the department of Prosthodontics, Saveetha Dental College, where complete denture treatment is a common protocol.

Study design: Experimental, in-vivo paralleling group design. The patients were selected in both the groups according to the inclusion criteria and their saliva sample was tested for salivary alpha amylase.

Experimental groups

A (n=12) - Completely edentulous patients wearing complete dentures.
B (n=12) - Completely edentulous patients not wearing complete dentures.

Total sample size: 24

The patients were matched in both the groups with equal numbers of males and females and same age.

Inclusion criteria

1. Healthy patients without any systemic diseases
2. Age between 50-65 years
3. No gender differences
4. Patients who could understand the procedure and follow

Collection of saliva sample

Collection of unstimulated whole saliva was done using the USCS guidelines (Navazesh, Kumar and University of Southern California School of Dentistry, 2008)

The saliva collection was done in the morning, where on the day of appointment the patient was asked to be nil by mouth except for water for an hour before arriving. Patient was asked to sit in a relaxed position and was explained the entire procedure. The patient was asked to keep his mouth slightly open and the draining saliva sample was collected in a sterile plastic container and stored in the refrigerator for further analysis.

Salivary alpha amylase estimation: Amylase CNPG3 Method (IFCC) was used in the laboratory and colorimeter was used to decipher the readings (Zagami, no date).

Principle of the test: α-Amylase hydrolyzes the 2-chloro-p-nitrophenyl-α-D-maltotriose (CNPG3) to release 2-chloro-nitrophenol and form 2-chloro-p-nitrophenyl-α-D-maltoside (CNPG2), maltooltriose (G3) and glucose (G). The rate of increase in absorbance is measured at 405 nm and is proportional to the α-amylase activity in the sample.

The reagent was pipetted into the sample collected in the test tube and the change of absorption (DA) readings were obtained on the colorimeter after 2 min (120 sec) at 37°C.

CALCULATIONS: Amylase Activity in U/L = DAbs/mint of Test x 5172

Statistical Analysis

Data was analyzed using the statistical software package IBM SPSS (Version 23.0, IBM Corporation, Armonk, NY, USA). Students paired t test was used for statistical analysis, where the significance level was set at p-value of 0.05. The dependent variables were normally distributed in each group.

RESULTS

The amount of sAA was determined in the saliva obtained from the patients by using the above mentioned formula and the obtained data was statistically analyzed by t test for the observations.

Salivary amylase levels: Group A- 69.96 U/L Group B- 56.17 U/L

A statistically significant difference was observed between the groups at 5% significance (p<0.05) and the patients wearing complete dentures showed higher levels of sAA.

Higher levels of sAA were found in males compared to females but there was no statistically significant difference (Fig 1).

DISCUSSION

In this study, it was found that there is a significant difference in the levels of salivary alpha amylase in the saliva of edentulous patients between complete denture wearers and non-wearers. Though difference was also found in the males and females but it was not statistically significant. Various confounding factors could affect the result of the study like age, gender, saliva collection method, diet and psychological factors.

The confounding factors like age and gender were matched in both the groups. Each group had 6 males and 6 females of the same age. Salivary amylase begins the breakdown of starch in the oral cavity but its activity is limited due to the brief exposure time before swallowing (Wyllie and Hyams, 2010). The diet of the patient could act as a confounding factor as that was not matched. Giving a diet plan to the patient and conducting the study in the same group of patients before and after delivering the denture could help to avoid this bias.

Salivary amylase is probably important in initiating starch digestion, depending upon the time spent chewing. Human salivary amylase is 94% identical with pancreatic amylase, but is inactivated in the acid pH of the gastric lumen (Alpers, 2003). Stimulated saliva collection would have been a better option than the unstimulated saliva collection done in this study.

The levels of sAA are proven to change with psychosocial stress (Rohleder et al., 2004; Petrukova et al., 2015). Acinar cells, which produce salivary amylase, are innervated by sympathetic and parasympathetic pathways. According to few studies, sympathetic activity increases amylase synthesis, which in turn increases the concentration of amylase in the saliva. Parasympathetic activity has little effect on amylase synthesis though it increases salivary flow rate (Damodaran, 2014).

The limitation of this study was its small sample size. A larger study would be needed to ascertain whether any changes of sAA are good enough to be of clinical significance. Also it would be better to conduct the study on the same group of patients before and after wearing complete dentures.
No study has been done on the effect of complete dentures on the salivary alpha amylase levels in the oral cavity. An improvement in the levels of sAA after denture therapy could prove an improvement in the chewing efficiency of the patient. This could become an objective method for measuring the quality of complete denture delivered.

**CONCLUSION**

Within the limitations of this study, a significant increase was observed in the levels of salivary amylase in the complete denture wearers but an elaborate study needs to be conducted with a larger sample size.

**Conflict of Interest:** The authors declare no conflict of interest, financial or otherwise.

**References**


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