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Salivary Total Protein and Calcium in Caries Active and Caries Free Adults

[1]Mithilesh Kumar Singh, BDS, M. Sc. Medical Biochemistry, School of Medical Sciences and Research, Sharda University, Greater Noida, India.

[2]Gladys Rai, MD Biochemistry, Professor and HOD, Department of Biochemistry, School of Medical Sciences and Research, Sharda University, Greater Noida, India.

[3]G. Ratna Velugu, MDS Conservative Dentistry and Endodontics, Reader, Department of Conservative Dentistry and Endodontics, School of Dental Sciences, Sharda University, Greater Noida, India.

Corresponding Author: Mithilesh Kumar Singh, BDS, M. Sc. Medical Biochemistry, School of Medical Sciences and Research, Sharda University, Greater Noida, India.

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Abstract

Background: Dental caries are a microbiological disease of the teeth resulting in localized dissolution and destruction of calcified tissue. The oral homeostasis is maintained by saliva by modulating the ecosystem within the oral cavity. Saliva protects the structure of teeth from caries development and prevents demineralization. The ability of saliva to prevent the formation of dental caries depends on the composition and quantity of the secretion.

Aim: To evaluate the salivary total protein and calcium in caries-active and caries-free adults.

Material and Methods: 70 adults were divided into caries-active and caries-free based on DMFT score with 35 in each. Saliva collected was estimated for total protein by Biuret Reagent and calcium by the OCPC method.

Statistical Analysis: Statistical analysis was performed by using an independent sample t-test to compare mean values between the two groups. A p-value of less than 0.05 considered significant at a 95% confidence level. The statistical software SPSS version 18.0 was used in the analysis.

Results: The mean total protein in caries-active is 0.02±0.01 g/dL and caries-free is 0.03±0.02 g/dL and mean calcium in caries-active is 2.63±1.87 mg/dL and caries-free is 0.39±0.88 mg/dL.

Conclusion: Based on the present study and available literature it can be concluded that total protein is decreased in the saliva of caries active patient and calcium is increased in the saliva of caries-active adults when compared to caries-free adults.

Keywords: Dental Caries; Calcium; Total Protein; Saliva.

Introduction

The prevalence of dental caries in developing countries is increasing at an alarming rate[1]. Saliva possesses

antimicrobial components and buffering agent which protect and maintain oral tissues[2]. The oral homeostasis is maintained by saliva by modulating the ecosystem within the oral cavity[3]. Proteins that are found in saliva, such as lactoferrin, lysozyme, peroxidase, defensins, and histatins, can destroy and inhibit the growth of microorganisms in the oral cavity[2]. Saliva also plays an important role in maintaining the integrity of dental tissues due to the presence of calcium which helps in remineralization of dematerialized zones of enamel. Therefore calcium acts as a defense mechanism against the dissolution of teeth [4].

Material And Methods

The study was conducted on 70 adults, divided into 35 with caries-active and 35 with caries-free based on DMFT score.

Inclusion Criteria

1. 18 years of age and above and of either sex.
2. Restoration with recurrent decay.
3. All permanent teeth.

Exclusion Criteria

1. Un-erupted and partially erupted teeth.
2. Primary retained tooth.
3. Patients who are currently on medications and with systemic diseases such as Uncontrolled Diabetes, HIV, Hepatitis C virus, Epstein-Barr virus, Cytomegalovirus, Tuberculosis, Hemochromatosis, Amyloidosis[5].

The un-stimulated saliva samples were collected for the estimation of salivary total protein and calcium which were estimated on semi-auto analyzer by Biuret Reagent[6] and OCPC (0-cresolphthalein complexone) method[7] respectively (Transasia bio-medicals Ltd. in technical collaboration with Erba diagnostics)

Ethics

The study was conducted after the ethical approval from the Institutional Ethics Committee (IEC) and after taking the written informed consent form and all the procedures follow standard protocol.

Results

Statistical analysis was performed by using an independent sample t-test to compare mean values between the two groups that are caries active and caries-free. A p-value of less than 0.05 considered significant at a 95% confidence level. The statistical software SPSS version 18.0 was used in the analysis.

	Group	N	Mean	Std. Deviation	t-value	p-value
TOTAL PROTEIN (gm/dl)	Caries Active	35	0.02	0.01	2.35	0.022
	Caries Free	35	0.03	0.02		
CALCIUM(mg/dl)	Caries Active	35	2.63	1.87	6.383	<0.001
	Caries Free	35	0.39	0.88		

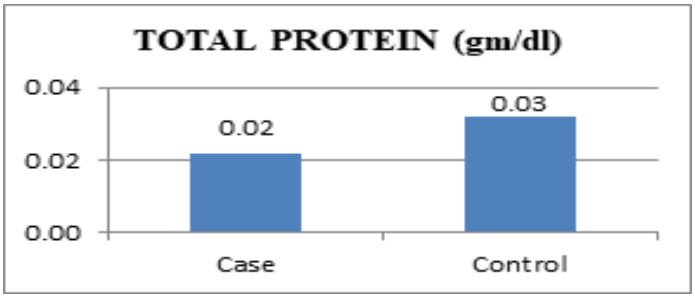

Fig.1: The mean levels of total protein in Caries Active (case) and Caries Free (control)

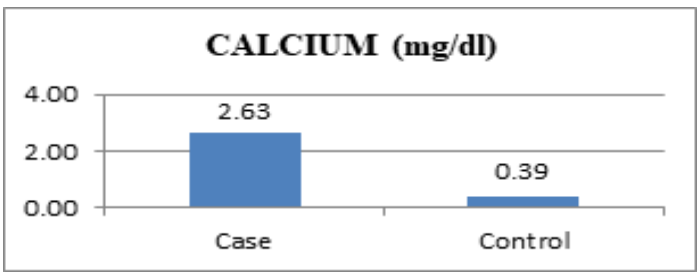

Fig 2: The mean levels of calcium in Caries Active (case) and Caries Free (control)

The gender distribution between caries active and caries-free. The p-value shows that there is a non-significant mean difference with p-value 0.925.

SEX	Group		Total	Pearson Chi-Square	p-value
	Caries Active	Caries Free			
Male	13	13	26	0.009	0.925
Female	22	22	44		
Total	35	35	70		

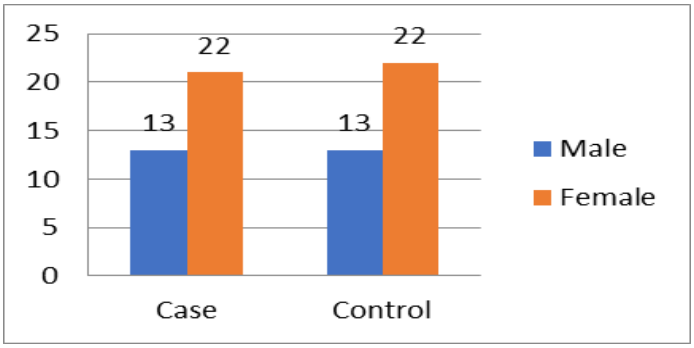

Fig 3: The mean gender distribution in Caries Active (case) and Caries Free (control)

Discussion

The saliva, when collected with no exogenous and pharmacological stimulation, is unstimulated whereas the saliva secreted by the mechanical or gustatory stimuli or by the pharmacological agent has stimulated saliva[8]. Stookey, 2008 found that stimulating the flow of saliva may alter its composition[9]. Kaufman and Lamster in 2002 reported that the quantity of saliva, the concentration of some constituents and the pH of the saliva altered due to salivary stimulation [10]. Therefore in this study, unstimulated saliva samples were collected.

The several ways of unstimulated saliva collection are[8]:-

- Draining Method
- Spitting Method
- Suction Method
- Swab Method

Navazesh in 1993 stated that the two best ways for collecting the whole saliva are draining and spitting methods. In the draining method, saliva drips off the lower lip whereas in the spitting method saliva is expectorated in the cointainer[11]. In this study unstimulated saliva is collected by spitting method.

The protein found in saliva such as lactoferrin, lysozyme, peroxidase, defensins, albumin, mucins, immunoglobulins and histatins destroys or inhibits the growth of microorganism in the oral cavity. Salivary protein protects the oral cavity by protecting against wear and tear by a film of salivary mucins and proline-rich glycoprotein. Salivary glycoproteins prevent oral microorganisms from adhering to the enamel and inhibit their growth. Salivary protein also helps in remineralization of enamel by binding calcium ions, decreases demineralization by pellicle proteins, in concert with calcium and phosphate ions in saliva [12].

The demineralization and remineralization are taking place simultaneously to maintain the level of minerals. If demineralization is faster than the remineralization it causes caries in the tooth. It is also hypothesized that saliva is blood filtrate. Therefore the changes in calcium level in the caries group might be due to parathyroid hormone (PTH) which plays a role in maintaining its level in caries active[13]. Another factor for increased salivary calcium levels might be the demineralization which releases calcium ion into the saliva[14].

The study done by Mahajan S, et al in 2017 found that mean calcium level was increased in caries affected group[13] whereas Elizarova and Petrovich in 1997 investigated 4 to 12-year-old children and found that the calcium level of saliva is higher in children with multiple caries than in children with single caries[15].

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