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Salivary Protein Components and Oral Health in Patients Undergoing Therapy with Beta Adrenegic Agonist and Antagonist

Tahani A Al–Sandook
BDS, MSc, PhD (Prof)

Fayhaa AM Al-Mashhadane
BDS, MSc (Assist Lect)

Amer Taqa
BDS, MSc, PhD (Assist Prof)

Dept of Dental Basic Science
College of Dentistry, University of Mosul

ABSTRACT

Aims: To study the effect of Beta–adrenergic agonist (salbutamol) and Beta adrenergic antagonist (atenolol) on salivary protein concentration and to study relation between salivary protein concentration and oral health. **Materials and Methods:** This study was carried out on 45 individuals; 15 individuals of them were apparently healthy with no history of systemic diseases and represent a control group, the second group which comprised 15 subjects were given adrenergic agonist drug (salbutamol) for treatment of asthma, and third group (15 individuals) were given adrenegic antagonist drug (atenolol) for treatment of hypertension. subjects were selected from the out patients attending Oral Surgery Department, College of Dentistry, University of Mosul. The samples of saliva were collected using spitting method and oral hygiene index simplified was recorded for each individual and total protein concentration of these saliva samples were determined. Its relation to oral health was measured according to simplified oral hygiene index by Greene and Vermillion. **Results:** The results of this study revealed that in all study groups, significant differences were present for both salivary protein concentration and oral health scores and there is correlation between salivary protein concentration and oral health in patients receiving atenolol. **Conclusions:** Chronic treatment with adrenergic agonist and antagonist drugs, resulted in changes in salivary protein concentration and those will affect the oral health of patients treated by these drugs.

Key words: Salivary proteins, adrenergic agonist and antagonist, oral health.

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INTRODUCTION

Normal salivary gland function, secretion and composition have an important role in the protective mechanism of oral cavity. Saliva is essential for maintenance of good oral health [1,2].

Quantitative variation in salivary protein concentration will affect oral disease prevalence [3]. The proteins of saliva include enzymes, immunoglobins (IgA, IgG, IgM), mucous, glycoproteins (mucins), trace of albumin, certain polypeptides and other antibacterial factors of importance in oral health [4]. Medications like Beta–adrenergic agonist (salbutamol) which is Beta–2 adrenergic long acting agonist used as bronchodilator, and adrenrgic antagonist (atenolol) which is used for treatment of hypertension [5] may influence concentrations of these proteins [6] leading to changes of oral health status among individual using these drugs.

The aim of this study was to evaluate the salivary protein concentrations in patients receiving salbutamol and atenolol, and to find out their effects on oral health of these patients.

MATERIALS AND METHODS

Forty–five individuals have partici-

pated in this study, their age ranged between 30–60 years with mean age of 45 ± 1 year. Fifteen of them were healthy individuals and considered as control group, while the other 15 individuals, asthmatic patients, were treated with salbutamol only with dose ranged 2–4 mg/day (mean 3 ± 1 mg/day). The third group, hypertensive patients, were treated with atenolol only with dose ranged 50–100 mg/day (mean 75±1 mg/day). The duration of treatment for both groups ranged between 2–10 years (mean 6 ± 1 year). All these individuals were selected from out patients clinic at Oral Surgery Department, College of Dentistry, University of Mosul.

Subjects were seated on a straight chair under quite standardized condition [(1)]. The samples of stimulated saliva were collected from 45 individuals using spitting method, the time of collection was 10 minutes and the collection of saliva was performed at the same time of day (2 hr after having breakfast) to avoid circadian variation [(7,8)], each subject was asked to wash his/ her mouth three times with distilled water and to take drops of lemon juice before spitting. Saliva volume was measured (5 ml) and placed in a test tube then closed with a plastic stopper [(9)].

Total proteins for each sample of saliva was determined using the Biuret method by a mixing of 0.2 ml of saliva with 2.8 ml of distilled water and then adding 5 ml of Biuret reagent which was prepared by dissolving 9 gm of sodium potassium tarrate in 500 ml of 0.2 N – sodium hydroxide, adding 3 gm of copper sulphate and dissolved by stirring, then adding 5 gm of potassium iodide and making the volume to be 4 L with 0.2 N–sodium hydroxide [(7)].

Ultraviolet visible spectrophotometer (CECIL, CEI021, England) at wave length of 540 nm was used to determine the total protein in saliva sample according to method of NAZHAT 2003.

On the other hand, oral hygiene for each individual was evaluated by Simplified Oral Hygiene Index according to Greene and Vermillion (1960), it consists of two components, a Simplified–Debris Index and a Simplified Calculus Index. Each component was assessed on a scale of 0 to 3, only mouth mirror and sickle type dental explorer were used for the examination. The criteria for scoring the debris and calculus components of the simplified oral hygiene index are as follows:

Oral Debris Index (D1–S): 0 = no debris or stain present; 1= soft debris covering not more than one third of the surface or the presence of extrinsic stains without other debris, regardless of surface area covered; 2 = soft debris covering more than one third but not more than two third of the exposed tooth surface; 3 = soft debris covering more than two thirds of the exposed tooth surface.

Calculus Index (C1–S): 0= no Calculus present; 1= supragingival Calculus not more than one third of the exposed tooth surface; 2= supragingival calculus covering more than one third but not more than two thirds of the exposed tooth surface, or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth, or both; 3= supragingival calculus covering more than two thirds of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical portion of the tooth, or both.

The simplified oral hygiene index score per person is the total of the debris and calculus scores per person [(10)].

Statistical analysis of the data was carried out using ANOVA test ($p < 0.05$) to examine the differences among the 3 groups, also correlation was used to study the relation salivary protein concentration and oral health scores because salivary protein concentration is a quantitative measure while, oral health score is a qualitative measure.

RESULTS

One way Analysis of variance was performed to test the differences in saliary protein concentrations among among the control group (first group), patients treated with salbutamol (second group) and patients treated with atenolol (third group). It was found that there is significant difference among them ($p < 0.001$), the results of Duncan's Multiple Analysis Range Test demonstrated that there is no significant difference in salivary protein concentration between the first and second groups. While, significant difference was observed

between first and third groups and between second and third groups (Table 1).

Table (1): Analysis of variance of salivary protein concentrations in all study groups.

	First group (Control)	Second group (salbutamol)	Third group (atenolol)	*p*–value	F–value
Salivary protein concentration (mean±SD)	3.64 ± 0.74	2.59 ± 1.79	1.42 ± 0.64	0.001**	8.161
Duncan's grouping*	A	A	B		

SD= Standard deviation. * Different letters mean significant difference exists, ** Significant compared to control group at $p < 0.05$.

Oral health scores showed significant difference among the 3 groups ($p < 0.007$). Significant difference was noticed between first and second groups and between first and third groups, while a non significant difference was noticed between second and third groups (Table 2).

Correlation between salivary protein concentration and oral health scores for all study groups are presented in Table (3), which shows that there is correlation between salivary protein concentration and oral health scores in the third group; while no correlation was found in the first and the second groups.

Table (2): Analysis of variance of oral health in all study groups.

	First group (Control)	Second group (salbutamol)	Third group (atenolol)	*p*–value	F–value
Oral health scores (mean ±SD)	5.9 ± 10.9	4.53 ± 0.92	4.271 ± 0.96	0.007**	5.685
Duncan's grouping*	A	B	B		

SD= Standard deviation. * Different letters mean significant difference exists, ** Significant compared to control group at $p < 0.05$.

Table (3): Correlation of salivary protein concentration and oral health in each of the study groups.

Group	Salivary protein concentration mean ± SD	Oral health scores mean ± SD	Correlation	*p*–value
First group (control)	3.64 ± 0.744	5.9 ± 10.9	– 0.033	0.906
Second group (salbutamol)	2.59 ± 1.79	4.53 ± 0.915	– 0.158	0.573
Third group (atenolol)	1.42 ± 0.642	4.27 ± 0.961	0.128	0.649

SD= Standard deviation.

The distribution of mean values of salivary protein concentration and oral health scores in all study groups are demonstrated in Figure (1).

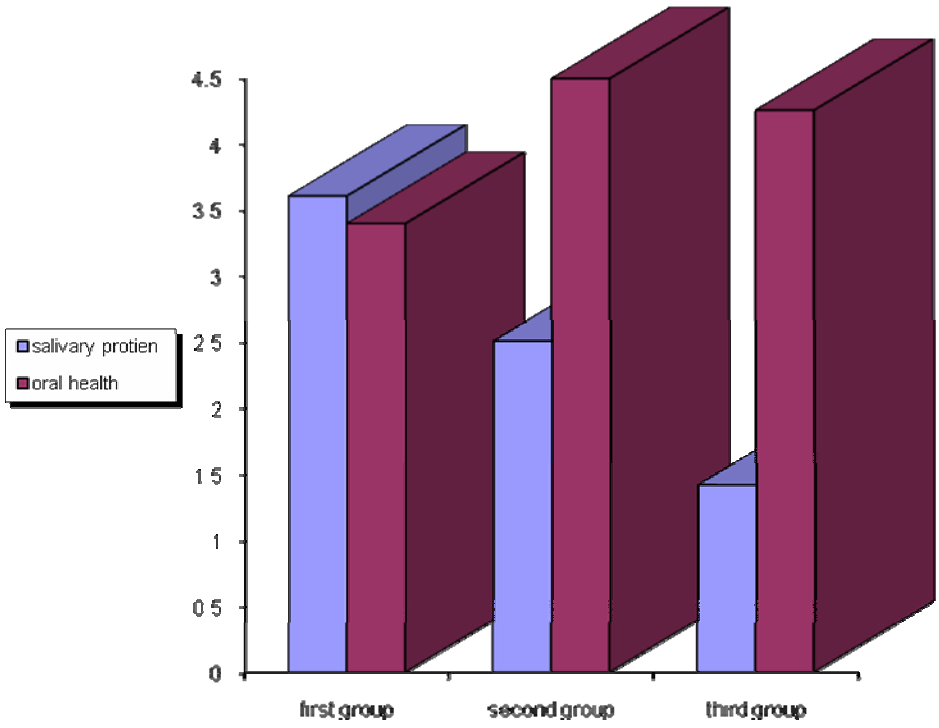

Figure (1): Distribution of mean values of salivary protein concentration and oral health scores in all study groups.

DISCUSSION

Saliva is essential for a life long conservation of the dentition and it has been used as a diagnostic fluid in dentistry and medicine [11,12].

The effects of salivary proteins on oral health have received considerable attention, both major and minor salivary glands are involved in the first line of defense in oral cavity [13]. For dental professionals, saliva is an important factor in preventing dental caries, mucositis, and gingivitis; also the lubrication properties and antibacterial/antiviral functions of saliva play an important role in the protection of the oral cavity. In addition, saliva have an essential role in food digestion [14,15]. These aspects may be suppressed in some patients receiving medication [16].

Many types of receptors exist in salivary glands t, suggesting that salivary glands may contain target systems for many drugs like Beta receptors drugs. Salbutamol is one of the Beta 2 agonist drugs that are widely used for treatment of bronchial asthma, it acts on Beta 2 receptors selectively and produces bronchodilation, this drug will lead to production of less saliva but of high protein concentration. On the other hand, it will decrease the amount of water reabsorption into the duct of salivary gland, therefore proteins can hardly pass the duct lining because they depend on the transepithelial water transport of these ducts; the net result of thist is reduction in the mount of salivary protein concentration in the secreted saliva [17–19]. On the other hand, atenolol which is one of the Beta 2 adrenoceptor antagonist, that are widely used for treatment of hypertension, can cause alteration in salivary protein concentration, it stimulate salivary glands to produce copious saliva of low protein concentration, so the protein out put in saliva will be reduced, according to that the reduction in salivary protein concentration caused by atenolol will be more than that caused by salbutamol [20].

In this study, it is demonstrated that there is significant difference in salivary protein concentration among all study groups and this result is in agreement with many studies [21–24]. Duncan's grouping showed that there is no significant differ-

ence in salivary protein concentration between the first and second groups, while significant difference was observed between first and third groups and between second and third groups;which indicates that the effect of atenolol on salivary protein concentration is more than that of salbutamol. On the other hand, results of this study showed significant effect of both drugs on oral health of patients receiving them compared to control group.

The results were consistent with other studies [8,25–27] regarding the significant reduction in salivary protein concentration, which showed a significant increase in Oral Health Index–Simplified in persons undergoing treatment with Beta 2 adrenergic antagonist (atenolol) compared to healthy persons. All these results are in disagreement with the results of Rudney [29] who reported no significant difference in oral health between salivary protein deficient subjects and controls.

So, quantitative variation in salivary proteins induced by medication will affect oral disease prevalence. These changes may not only affect peoples' oral health, but also have consequences on their general health [30].

CONCLUSIONS

Total protein concentration in saliva is essential for maintenance of good oral health. The change that occur in salivary protein concentration in patients receiving adrenergic agonist and antagonist drugs is a problem for both patients and clinicians trying to manage them, because such changes will affect the oral health of these patients. In this study, a significant reduction in salivary protein concentration in patients receiving adrenrgic agonist and antagonist drugs was found and also a significant correlation between salivary protein concentration and oral health was reported. The dental professional is faced with a challenge to solve the oral health problems of such cases. In this context, the potential contributions of saliva to the health and normal functions of oral cavity may represent a fertile area for future studies.

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