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Original Article

Evaluation of the Relationship between Salivary Resistin and pH in Healthy Individuals

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ABSTRACT

Changes in composition and flow rate of saliva depict secondary systematic variations related to diseases, drugs and treatment of illnesses. This research examines the relationship between the saliva pH and saliva resistin in the seemingly healthy individuals. In this study 82 patients referring to the Department of Oral Medicine, Faculty of Tabriz Dentistry were examined. Before sampling from the patients with inclusive conditions, their mouths were washed by water and after 15 minutes 5ml of their saliva were collected by drooling in the sterile polyethylene containers. The collected samples were transferred to the laboratory and their pH was measured. Then the enzyme-linked immunosorbent assay (ELISA) test was performed by specific kit for saliva resistin measuring. The mean value of saliva resistin was 15.60±7.56 and pH mean value was 7.61±0.68. Results showed that about 61% of patients had resistin higher than15 ng/ml. According to the analysis results, 15.9% of patients had pH less than 7 while 57.3% had pH between 7-8 and 26.8% had pH higher than 8. There was a positive relationship between saliva resistin and pH. Since salivary resistin levels vary in response to different clinical conditions, direct relationship between the saliva resistin and pH indicates that pH changes can depict risk factor for specific diseases.

INTRODUCTION

The prevalence of inflammatory diseases is increasing in both advanced and developing societies (1). Various methods have been reported for easier screening and diagnosis of inflammatory diseases. Saliva, as one of the body's secretory fluids, reflects human health and can be collected non-invasively, without the need for special skills and is suitable for screening large volumes of the population (2). Resistin is a molecular weight adipokine of 12.5 kDa and is secreted by adipocytes, pancreatic islets, salivary gland epithelial cells and immune cells (3-5).Resistin represents an inflammatory marker of atherosclerosis in humans. High serum levels of resistin are associated with insulin resistance, kidney disease, and high cholesterol and triglyceride levels in patients (6-8).

Another salivary characteristic is pH that is about 6.2 before being discharged into the oral cavity, but after discharge into the oral cavity it reaches to 7.4 which is actually alkaline. As salivary flow increases, bicarbonate levels increase, thereby increasing pH and alkalinity (9,10). The salivary flow regulates the pH of the saliva so that in low salivary flow, the pH may reach 3.5, while in the high salivary flow, the pH of the saliva will be 8.7 (11). Also conditions such as puberty, menstruation and pregnancy affect the salivary flow rate and thus the salivary pH (12). Changes in the composition or flow of saliva may reflect secondary systemic changes associated with diseases, medications, and treatment of diseases (13). Since the measurement of salivary pH is a low-cost and simple method compared to the measurement of salivary resistin, the approximate amount of salivary resistin can be estimated if they are associated with salivary pH measurement. The purpose of this study was to determine the relationship between salivary resistin and salivary pH in patients referring to the Tabriz Dental School.

MATERIALS AND METHODS

The sample size in this study was 82 persons. All participates were selected from patients referring to the Tabriz Dental School based on inclusion criteria. Selected criteria are: having informed consent to participate in the study, not taking medication and don't having systemic disease such as hypertension, diabetes, and any other debilitating disease.

Saliva sampling was performed using NAVAZESH method (14). Before sampling from the patients with inclusive conditions, their mouths were washed by water and after 15 minutes 5ml of their saliva were collected by drooling in the sterile polyethylene containers. The collected samples were transferred to the laboratory and the pH of the samples was measured, repeated and recorded three times in each sample. Then the enzyme-linked immunosorbent assay (ELISA) test was performed by specific kit (108896 RETN Humun ELISA Kit Abcam England) for saliva resistin mea-

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suring. The results were analyzed using descriptive statistics (mean± standard deviation) and frequency distribution by SPSS software version 20.

RESULTS

Amongst 82 patients involved in this study, 39% were female and 61% were male. The mean value of saliva resistin was 15.60±7.56 ng/ml and pH mean was equal to 7.61±0.68. Results of this study have been shown in Figure 1 and Tables 1-3. Based on the results, there was a positive relationship between saliva resistin and pH. In patients whose saliva pH was less than 7, there is not any cases with resistin above 15% ng/ml. In all of patients with salivary pH of 8-7, resistin is the range of 15-15 ng/ml and in patients whose salivary pH was greater than 8; no one had resistin less than 5 ng/ml.

DISCUSSION

The results of this study show that there is a direct relationship between resistin and salivary pH, so that patients with a pH above 8 had no resistin lower than 5. In this study, cumulative saliva samples were used without any stimuli such as gum or paraffin or citric acid to stimulate salivary secretion, because stimulation with acids such as citric acid could affect saliva pH. Generally, cumulative saliva is a better source than stimulated saliva for measuring salivary parameters. It is noted that stimulated saliva has been used to measure salivary gland functions and does not have the stability required for other studies (15-17). Saliva as a convenient and simple diagnostic tool has many advantages over other body fluids. Saliva, as one of the body's secretions, reflects human health and has potential diagnostic value in the studies of health screening and risk classification (18,19). Also, saliva sampling is a non-invasive and easy technique, requires no special skill, is more tolerable to the patient and also contains enzymes similar to gingival fluid (20,21). Various studies have pointed to the similarities between the levels of some factors in serum and saliva and even measured some of these factors in saliva as a standard diagnostic and laboratory test (22,23).

In this study, salivary pH was measured to ensure both paper and digital methods, whereas in most studies only paper methods were used. Also, salivary pH has been studied in various diseases and it has been shown that salivary pH is influenced by high risk cardiometabolic factors. Baliga et al. showed that salivary pH in patients with chronic gingivitis is higher than the control group, but the salivary pH in patients with chronic periodontitis is acidic than the control group. They also suggested that changes in salivary pH could indicate the severity of periodontal disease (24). Al-Taee showed that salivary pH was significantly different in patients with oral aphthous and healthy individuals, as the pH is low and acidic; the risk of aphthous lesions is highe (25). Pokupec et al. showed a significant relationship between aphthous ulcers and salivary pH (26). Tremblay et al. showed a direct relationship between adiponectin and salivary pH. The researchers also reported that there is a direct relationship between diabetes and plasma adiponectin levels and salivary pH (13). Bakhshi et al. showed that salivary pH was higher in hemodialysis patients than in healthy subjects (27). Kuriakose et al. reported that salivary pH in children with extensive caries was lower than that of the control group (28). All these studies confirm the importance of salivary pH with systemic and oral diseases suggesting the importance of salivary pH in different diseases.

In recent years, a number of studies have shown that increasing adipocytokines, including resistin, increase cardiovascular events and metabolic changes in the general population, as Kristofnagy et al. Mittal et al. showed a significant relationship between resistin with probing depth, Plaque Index, Gingival Index, and Rumathoid Factor and reported that resistin levels increase in patients with chronic periodontitis and rheumatoid arthritis (29). Sabir et al. reported higher levels of resistin in patients with type 2 diabetes mellitus and chronic periodontitis (30). Yin et al. reported higher salivary resistin in diabetic patients

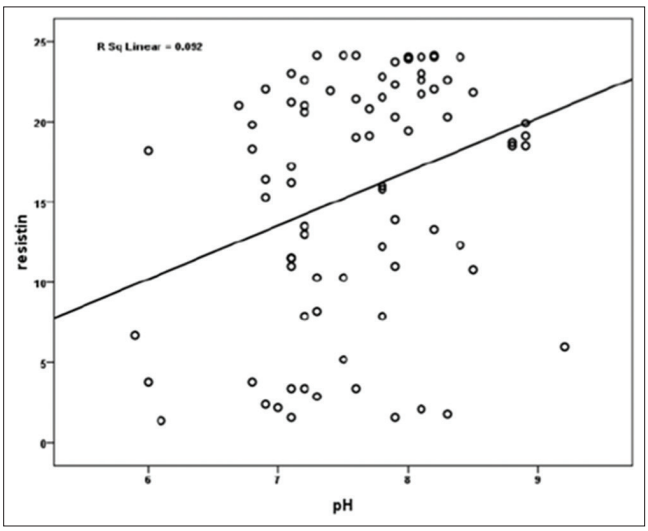

Figure 1. The relationship between salivary resistin and salivary pH

Table 1. Percentage of persons based on salivary resistin levels

Salivary resistin (ng/ml)	<5	5-15	>15
Percentage (%)	15.9	23.1	61

Table 2. Percentage of persons based on salivary pH levels

Salivary pH	<7	7-8	>8
Percentage (%)	15.9%	57.3%	26.8%

Table 3. Comparison of frequency of salivary pH levels based on salivary resistin levels

Resistin (ng/ml)	**pH**		
	<7	**7-8**	**>8**
<5	13 (59.1%)	0	0
5-15	9(40.9%)	19(100%)	19(46.3%)
>15	0	0	22(53.7%)

than in healthy controls (31). Karam et al. showed a direct relationship between salivary resistin and gingivitis and periodontitis (32). All of these studies indicate the association of salivary resistin with various diseases. However, the Thanakun study showed no association between salivary adipokines and metabolic diseases (33).

The results of this study show that there is a direct relationship between salivary resistin and salivary pH. Therefore, this direct relationship between resistin and pH changes may indicate that pH changes may be useful in determining the risk for inflammatory diseases.

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