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ORIGINAL ARTICLE

# Association between salivary sialic acid and periodontal health status among smokers

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**KEYWORDS**

Cigarette smoking;
Sialic acid;
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**Abstract** *Background:* Smoking is an environmental risk factor causing poor dental health. Sialic acid is a salivary marker of oxidative stress for research of periodontal diseases.

*Aims:* To identify diagnostic sialic acid fraction and its scavenger effect for periodontal diseases among smokers and periodental health status.

*Subject and method:* This study carried out in the Khanzad specialized dental center – Erbil city. The study population is composed of 62 convenient samples. A structured interview questionnaire form was used to collect data about socio-demographic properties and smoking history. Clinical measurements were carried out to measure periodontal health status. Un-stimulated whole saliva samples were collected for measuring sialic acid fractions. Statistical package for social science (SPSS, version 18), was used for analysis and odds ratio.

*Results:* Risk of smoking increased significantly in young to mid ages, which included most of the current smokers, with periodontal diseases, and high total free sialic acid. Risk of periodontitis and teeth missing increased significantly by long duration of smoking, bad tooth brushing, and poor eating habits. Risk of teeth mobility and loss decreased significantly by early smoking cessation and low income. High levels of free sialic acid correlated significantly in current smokers with medium and deep pocket depth.

*Conclusion:* Salivary free sialic acid may be used as a diagnostic oxidative stress biomarker for periodontal diseases among young current smokers. Cumulative destructive effect of long duration of smoking on the periodontum can be controlled by smoking cessation, good oral hygiene and diet habit in early old ages.



## 1. Introduction

Periodontal diseases (gingivitis and periodontitis) are the most prevalent chronic diseases affecting population worldwide. Gingivitis is inflammation of the gum due to the accumulation of plaque, and affects 50% of the adult population (Sculley and Langley-Evans, 2003). Periodontitis affects the supporting structures of the teeth and if not promptly recognized and

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correctly managed can ultimately lead to gum recession, loss of gingival tissue, underlying alveolar bone and tooth, resulting in reduced masticatory function and subsequent alterations in dietary intake and nutritional status (Milward and Chapple, 2013).

Periodontal disease is initiated by the colonization of the gum by specific bacteria and their products which causes abnormal host response, involving the release of excess proteolytic enzymes and reactive oxygen species (ROS), that cause increased levels of biomarkers for host tissue damage (Chapple et al., 2007). Tissue injury from free radical production in periodontitis is related to low antioxidant (AO) capacity and may be caused by a number of factors including smoking and poor nutritional status (Sculley and Langley-Evans, 2003).

Smoking is a single, modifiable environmental risk factor responsible for excess prevalence of periodontal disease in the population and has a direct influence on periodontal variables (Sceedev et al., 2012). Smoking effects include chronic reduction of blood flow, altered neutrophil function, cytokine and growth factor production, inhibition of fibroblast growth and attachment, and decreased collagen production and vascularity (Naresh Kumar, 2012). It was demonstrated that smoking increases the levels of free radicals and lipid peroxidation in periodontal tissues. In addition to decreased antioxidant levels in blood, gingival tissue, saliva, and gingival crevicular fluid (GCF) of periodontitis and gingivitis smokers (Kurtul and Gökpinar, 2012). Smejkalova et al. (2012) reported that socioeconomic disadvantages, poor oral hygiene habit, and bad eating behavior associated with smoking and smoking related diseases.

Laboratory tests of samples from plaque, saliva or gingival crevicular fluid are more accurate than clinical measurements and are developed to measure biomarkers (derived from bacterial structure or the host inflammatory system) of periodontal diseases to detect of 'high-risk' individuals and an increased probability of disease (Beltrán-Aguilar et al., 2012).

Saliva is the first defense fluid and an important salivary biomarker is sialic acids, they are family of nine carbon acidic monosaccharide, systemic inflammatory marker, and component of salivary glycolipids, glycoproteins including IgA and other immunological and acute phase proteins (Sculley and Langley-Evans, 2003). Sialic acid levels increased in periodontitis, because it is protective constituent of human salivary mucin, and lipid bound sialic acid fraction can be used as diagnostic parameter for periodontitis (Jawzaly, 2010). Ogasawara et al. (2007) concluded that sialic acids of mucin acts as scavengers for hydroxyl (OH) free radical and react directly with it. Therefore this study was conducted to identify sialic acid fractions levels among smokers as biomarkers for periodontal diseases and its prognoses.

## 2. Material and methods

### 2.1. The study population

Sixty-two (62) convenient samples attending Khanzad specialized dental center/ Erbil city were recruited to this descriptive study after their consent had been taken.

*Inclusion criteria:* Patients should have been smoking at least one year and more, should not have any systemic condition and should not have be subjected to periodontal therapy or any antibiotic medication during the last 3 months.

*Exclusion criteria:* Patients just received dental treatment were included to avoid contamination.

The studied population ages were between 21 and 75 years with a mean of 48.3 ± 13.5 years, composed from 52 males and 10 females and were divided to two groups after clinical measurements of dental condition;

*Group I:* 41 smoker patients with periodontal diseases, consist of 35 periodontits patients and 6 gingivitis patients.

*Group II:* 21 non periodontal smokers consist of 6 patients with simple caries, 7 with partial edentulous patients (loss of teeth as a result of previous caries and periodontities) and 8 individuals with healthy dental condition, regarded as the control group.

### 2.2. Data collection and measures

A structured interview questionnaire form was used to collect data, which are composed of three parts:

#### 2.2.1. First part

Clinical measurements were carried out by the trained dentist. Periodontal examinations were repeated in 10% of the sample for calibration by the heads of the periodontal department in the center to measure the number of teeth remaining, and the indices of; gingivitis, periodontitis and caries.

*Oral examination:*

Bleeding on probing for gingivitis (Saxer and Muhlemann, 2004), Probing Pocket depth (PPD): Ramjford teeth were selected for pocket depth measurement as there was high agreement between these index teeth and full mouth situation concluded by Mumghamba et al. (2004). These teeth are (16, 21, 24, 36, 41, and 44). If one of these teeth is missing its distal neighbor (17, 11, 25, 37, 42, or 45, respectively) may be substituted. Probing pocket depth was done by measuring the distance with Williams periodontal probe from the gingival margin to the bottom of the pocket for each tooth and at the six sites (mesial, middle, and distal area of the facial and lingual surfaces). The greatest single measurement determines the pocket score for the tooth. Navy Periodontal Diseases Index (NPDI) second component (pocket scores) criteria were used for periodontal destruction diagnosis (Grossman, 1974) and classification of (Silvestre et al., 2009) was used for identifying severity of disease:

**0** probing depth not over 3 mm, (1–3 mm mild pockets).
**5** probing pocket depth greater than 3 mm but not over 5 mm, (4–5 mm medium pockets).
**8** probing pocket depth greater than 5 mm (⩾6 mm deep pockets).

Mobility degree of teeth (Fermin and Henry, 2005), missing of teeth and caries by World Health Organization diagnostic criteria was used for determining the decayed, missing, filled teeth (DMFT) index.

#### 2.2.2. Second part

Socio-demographic data and smoking history, collected by asking the studied population about social behavior factors, included; ages, sex, familial history of oral diseases, eating