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# Evaluation of Some Salivary Elements in Chronic Periodontitis Patients

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***Abstract***
***Background:****Periodontitis ismulti-factorial inflammatory disease that involves destruction of tissues that support teeth, including alveolar bone,which may cause tooth loss. The salivary parameters can be used for the contribute in the diagnosis of periodontal disease, several studies have focused on a possible relationship between the level of inorganic ions in oral fluid and periodontal disease. The objective of this investigation was to estimate the concentrations of the Cadmium (Cd), magnesium (Mg) and Lead(Pb) in saliva of periodontal disease patients then compare the results with the concentrations of these elements in control group.*
***Materials and methods:*** *this study include 40 saliva samples for both groups(chronic periodontitis patients and healthy control).All the three salivary elements (Cadmium, Magnesium and lead) were determined by Flame Atomic Absorption Spectrophotometer using standardized procedure by air – acetylene.*
***Results:*** *The results of this study show highly significant difference between chronic periodontitis patients and healthy control subjects in concentration of all the salivary elements (Cadmium, Calcium and Manganese).*
***Conclusion:*** *there was difference in concentration of salivary concentration of Cd, Mg and Pb between chronic periodontitis patients and healthy control subjects.*
***Keywords:*** *salivary elements, Chronic Periodontitis, Magnesium and le*ad.

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## I. Introduction

Chronic periodontitis isa chronic inflammatory diseases of the tissues surrounding, supporting and protecting the tooth,this disease begins as an initial response to bacterial infection, there is a topical inflammatory reaction that activates in the immune system. periodontitis may cause destruction of alveolar bone,which may lead to tooth loss.Due to a widespread of periodontal diseases among the human population, the identification of biomarkers is important for clinical evaluation of periodontal status. Thus, many investigators attempted to identify biomarkers specific to periodontitis(Herman et al., 2016).Several publications have been proposed that saliva could be usedas a non-invasive diagnostic fluid to help in the diagnosis of oral and systemic diseases(Teles et al., 2009).It is a biological material of choice for the diagnosis of periodontitis, and canidentify stages of periodontal disease(Korte and Kinney, 2016).Analysis of saliva can be an excellent method for detection of heavy metal contamination (Rahimzadeh et al., 2017).The metallic elements divided into two groups: fundamental for survival, and non-fundamental or toxic such as cadmium and lead (Ghinwa et al., 2009).Analysis of the elemental profile during periodontal disease and evaluation ofthe changes inmetals concentration have potential diagnostic value(Herman et al., 2016).Cadmium (Cd) is a toxic metal in our environment.Exposure to Cadmium is possible from several sources;smoking being a main contributor(Paschal et al., 2000).industrial activities are another source of Cd, and also existing in trace amounts in certain foods such as, potatoes, leafy vegetables, seeds, kidney and liver, mollusks and crustaceans (Satarug et al, 2003).Many studies reported that Cd has the ability to promote inflammation, andmay related to periodontal disease, where disturbance of the host inflammatory response play a major role in disease progression and subsequentloss of alveolar bone(Järup 2003; Kazantzis, 2004).Lead (Pb) is a toxic metal, which can encourage different behavioral, biochemical, haematological and histological defect both in humans and animals **(Ciobanu et al., 2012)**. Magnesium(Mg)is one of the most abundant mineral in cells, it is present in the typical human body as

magnesium ions (positively-charged Mg atoms found either in solution or compound with other tissues such as bone **(Kruse et al., 1932)**. Mg is a cofactor in enzymatic systems, required for protein synthesis, functioning of muscular and nervous systems, bone metabolism, and regulation of glycaemia and blood pressure **(Rude, 2012)**. The present study was designed to evaluatethe salivary concentrations of the Cadmium (Cd), magnesium (Mg) and Lead(Pb) of periodontal disease patients then compare the results with the concentrations of these elements in control group.

## II. Materials And Methods

### 2.1 Subjects

forty saliva samples were collected from chronic periodontits patients and healthy control subjects . The selected subjects were from attendants enquiry periodontal treatment in the Periodontics Department at Teaching Hospital of Baghdad College of Dentistry. The two group's age was ranged between (25-45 years). Diagnosis of clinically healthy gingiva (for control group 15 subjects) & chronic periodontal disease was done by a periodontist, based on the criteria of Gingival Index by Löe**(**Löe,1967)& Clinical Attachment Level (CAL); which can be defined as the distance from the cemento- enamel junction to the of position of the inserted probe tip (bottom of gingival crevice or periodontal pocket) (Carranza and Newman, 1996).The exception criteria inclusive were: any patient had history of any systemic disease, taking any medications or mouth wash, alcohol consumption or have mucosal lesions.

### 2.2Sample Collection

Before clinical examination,Five ml of unstimulated saliva was collected from each subject. Each Subject was asked torinse his mouth with water, then waiting for 1-2 min for water clearance. The saliva was collected into small plastic polyethylene tube and the sampling time was early in the morning. The collected saliva was centrifuged at 4000 rpm for 10 minutes. The centrifuged supernatants werestocked at (-80ºC) until time of analysis.

### 2.3Biochemical analysis

The biochemical analysis was completed atintoxication Consultation Center, Medical city. Frozen saliva were allowed to dissolve and come to room temperature before their analysis .Thereafter, they were subjected to biochemical analysis. All the three salivary elements (Cadmium, magnesium, and Lead) were determined by Flame Atomic Absorption Spectrophotometer using standardized procedure by air – acetylene.

## III. Statistical Analysis

Data were analyzed using SPSS (Statistical Process for Social Science) version 14.The data are normally distributed according to the Shapiro –Wilk tests (test of normality) ($p < 0.05$).Descriptive statistics (mean, standard deviation, bar chart, minimum and maximum) were used in the present study.Inferential statistics (Student t-test, p-value and Pearson correlation)were also included. The significance level was accepted at $P< 0.05$, and highly significance at $P< 0.01$.

## IV. Results

The results of the present study showed in the tables (1,2) and figures (1,2,3). Table 1 showed the descriptive statistics ofsaliva concentrations of Cd, Mg and Pb in healthy controls subjects and chronic periodontitis patients. Table 2 reveal t-test and significant level for the three salivary elements (Cd, Mg and Pb) between the two studied groups(control and chronic periodontitis patients). The three salivary elements cadmium, magnesium and lead show highly significance value between the two groups. Mean and standard deviation for the three salivary elements (Cd, Mg and Pb) show in figure 1 ,2 and 3 respectively.

**Table(1)** Descriptive statistics for the two studied groups

| Groups | Salivary elements | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|---|
| Control | Cd1 | 15 | 0.07 | 0.15 | 0.109(µg/dl) | 0.025 |
| | Mg1 | 15 | 0.77 | 2.20 | 1.024(mg/dl) | 0.349 |
| | Pd1 | 15 | 1.60 | 2.50 | 2.087(mg/dl) | 0.302 |
| Chronic periodontitis patients | Cd2 | 25 | 0.14 | 0.21 | 0.179(µg/dl) | 0.016 |
| | Mg2 | 25 | 0.38 | 0.65 | 0.515(mg/dl) | 0.073 |
| | Pd2 | 25 | 2.50 | 9.00 | 5.400(mg/dl) | 1.568 |

**Table(2)** t-test and significant level for the three salivary elements (Cd, Mg and Pb) between the two studied groups(control and chonic periodontitis patients**)**

| | T | df | Sig. (2-tailed) |
|---|---|---|---|
| **Cd1 and Cd2** | **-10.685** | **38.000** | **0.000** |
| **Mg1 and Mg2** | **5.576** | **14.732** | **0.000** |
| **Pb1 and Pb2** | **-10.255** | **26.886** | **0.000** |

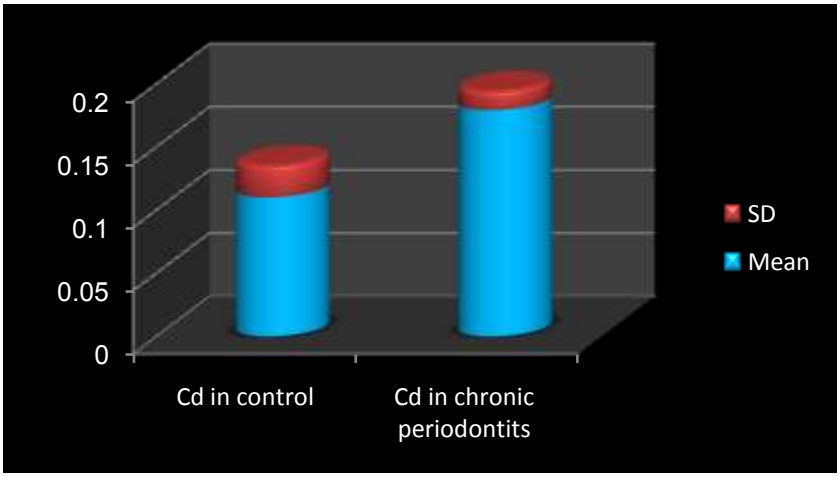


**Figure (1):** Mean and standard deviation of Cd level in saliva of two groups.

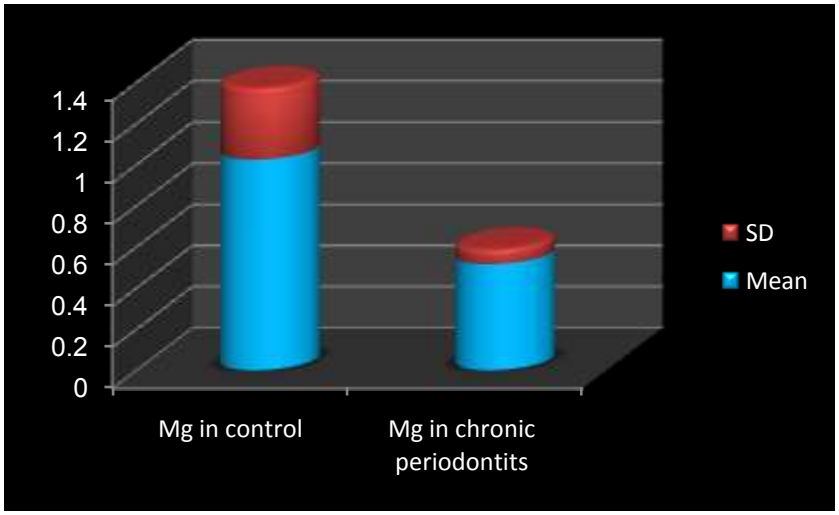


**Figure (2**): Mean and standard deviation of Mg level in saliva of two groups.

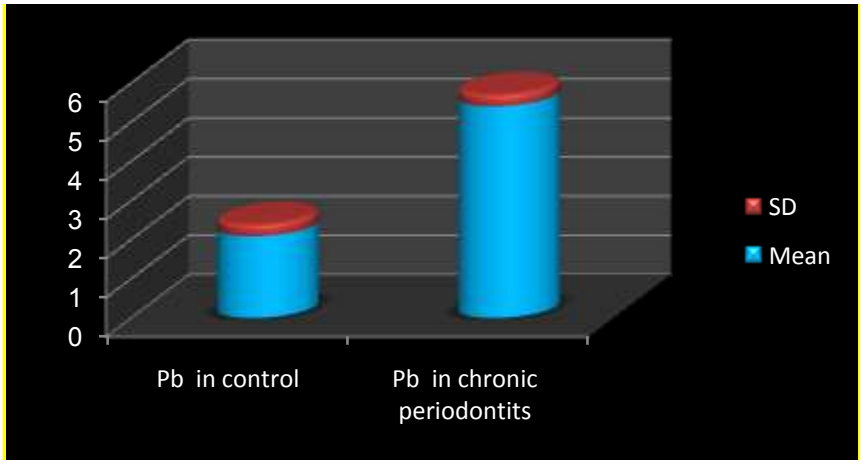


**Figure (3):** Mean and standard deviation of Pb level in saliva of two groups.

## V. Discussion

Traditional clinical methods for diagnosis of periodontal disease involvethe evaluation of some parameters such as probing depth, clinical attachment level, and radiographic measurements. Toovercome the limitations of these methods , many scientists attempt to find biomarkers for early diagnosis of periodontal diseases and for evaluation of treatment effects**(Herman et al., 2016)**. The salivary parameters used for the diagnosis of periodontal disease, severalstudies have focused on a possible relation between inorganic ions present in oral fluid and periodontal disease **(Khamees et al., 2012; Sewón et al., 1998;Acharya et al., 2011;** Manea and Nechifor, 2013;Mahmood and Shukri, 2012).saliva has been increasingly attractive to use as alternatives to blood due to the noninvasive nature of saliva testing.Cadmium (Cd) is a ubiquitous toxicant in our environment (Arora et al., 2009).The result of the present study showedthat the concentration ofsalivary Cadmium (Cd) in chronic periodontitis patients was significantly higher than that in a control group($p= 0.00$) this association between the Cd and chronic periodontitis may be related to the pathologic effects of Cd on bone, counting the ability to stimulate inflammation,Cd can stimulatetherelease of inflammatory mediators that may contribute to progression of disease and subsequent alveolar bone loss (Järup, 2003; Kazantzis, 2004). Cd maydisturbs the boneremodeling process, decreases skeletal mineralization, andpromote bone loss (Arora et al., 2009).Lead (Pb) is a toxic metal, study done by Dye et al. showed that there is relationship between the concentration ofblood lead and periodontal disease(Dye et al., 2002). The result of the present study showed that the concentration of Lead(Pb) in saliva of chronic periodontitis patients was significantly higher than that in a control group($p= 0.00$). Dye et al. in 1988–1994, studiedthe relationship between the level of blood lead and periodontal bone loss in the united states, and they found a relation between increased PbB levels and advanced periodontal bone lossmainlyamong people with a history of smoking, they believed that alveolar bone loss promotes increased blood leadlevels, Since periodontal disease is a progressive chronic disease, and elevation of blood lead levels may be associated with the prolonged release from the skeleton (Dye et al., 2002).Additionally, lead may associated with increased expression of MMP-9, a protease that is also raised in periodontal disease(Arora et al., 2009).Magnesium (Mg) is one of the mostcations in cells. It is important mineral that is needed for many physiological functions and regulate the cell functions. Magnesium level is remarkably constant in healthy subjects, high normal Magnesium level is protective against many diseases. Imbalances in magnesium metabolism are related with different pathological conditions (Laires et al., 2004).According to the result of the present study, Magnesium level was lower inchronic periodontitis patients than in a control group with a highly significant difference between these two groups ($p= 0.00$), this finding was in agreement with the results reported byMahmood et al.(Mahmood and Shukri, 2012) they measured the concentration of three metals in oral fluid: Zn, Cu and Mg and stated that the Mg concentrations was lower in the periodontitis group than in controls. The relationship between periodontal status and Mg can beexplained by the fact that Magnesium level has a strong association with the immune system, it is act as a modulator of the immune response. The neutrophils activationin periodontal inflammation is an important factor in tissue injury, Neutrophils invading periodontal tissues and contribute to tissue destruction which manifested by loss of attachment and also by systemic reactions. Activation of neutrophils is an early effect of hypomagnesaemia, and high level of Mg inhibit free-radical generation. Therefore, decrease Magnesium level are correlated with enhanced inflammatory response to bacterial challenge (Mooren et al., 2003).Hence, it can be suggested that the concentration ofthesesalivary elements may associated with the clinical status of the periodontal tissues, so that the estimation of these elements may be used as a potential diagnostic marker of disease status in periodontal tissues.

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