

## **An Anxiety and Salivary Cortisol Correlation in Dental Managements between Different Dental Departments**

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**Abstract:** *Stress is a normal psychological and physical reaction to the ever-increasing demands of life. Studies show that many challenges with stress at some point during the year.*

*Seventy five Iraqi dental patients interning collage of dentistry divided in three groups, twenty five patients were admitted to oral medicine and diagnosis department, twenty five patients to periodontal department and the last twenty five patients were to oral surgical department. Each selected group was compared to the each other groups. The parameters of comparison were dental anxiety scale and salivary cortisol. The research was based on evaluation of salivary cortisol and modified dental anxiety scale (MDAS). The cortisol evaluation was achieved using*

*ELISA technique while, MDAS were based on scoring questionnaire.*

*The salivary cortisol levels and MDAS were ranges from  $0.243 \pm 0.190$  ng/L to  $7.760 \pm 2.488$  with a significant changes  $0.0001$  ( $p < 0.05$ ) in the oral surgery department. The collected cortisol level and MDAS were  $0.274 \pm 0.273$  ng/L to  $9.000 \pm 3.617$  in periodontal department with a significant changes  $0.0001$  ( $p < 0.05$ ), while the diagnosis department showed a cortisol changes between  $0.178 \pm 0.132$  ng/L to  $7.240 \pm 2.385$  with significant changes  $0.0001$  ( $p < 0.05$ ).*

*We concluded that the relations between the anxiety-fear of the patients were significantly changed and strongly related to the type of treatments ; we confirmed that by using MDAS according to the dental treatment in a different departments (oral medicine and diagnosis, periodontal and oral surgery) in compared with salivary cortisol level. The diagnosis department showed the lower values in salivary cortisol and MDAS with high correlation, while the higher values were recorded in periodontal department. MDAS was an effective tool in monitoring an anxiety for the patients. Types and*

*applying of dental instruments were associated with anxiety.*

***Keywords: Modified dental anxiety scale, salivary cortisol, oral medicine and diagnosis department, periodontal department, oral surgical department.***

## **Introduction**

Dental anxiety is a frequent problem among dental patients. It is a multisystem reaction to a perceived threat or danger [1, 2]. It reflects a combination of biochemical alterations in the body and patient's personal history, memory, and social state. The presence of dental anxiety is not a dilemma for patients only but also for the dental professionals themselves; and sometimes it renders the treatment more complicated to be accomplished successfully [3, 4]. Dental anxiety and fear pose a significant problem in patient management, with anxious patients more likely to avoid or delay treatment and more likely to cancel dental appointments [5, 6, 7]. In addition, people with dental anxiety often have poorer oral health than their non-anxious counterparts [8, 9, 10].

Dental anxiety is a common condition among the masses worldwide and remains a barrier to dental care for a consistent proportion of the population [11]. The Dental Anxiety Scale (DAS), devised by Norman Corah in 1969, is the most commonly used scale to measure dental anxiety [12]. It was found to have high validity and is easy to administer [13]; therefore, it was adopted as a measure of dental anxiety in this study. A number of different sets of data concerning the Corah Dental Anxiety Scale were evaluated. All researchers indicate that the scale is a reliable, valid, and useful measure of dental anxiety. It can be successfully used in the dental office or in research projects [11, 13].

Anxiety is regarded as a form of stress and, thus, has a physiological impact on the body. Stressors can cause the activation of the autonomic nervous system (ANS). When the brain perceives

a threat, it signals the body to release a burst of hormones to fuel the capacity for a response; This has been labeled the "fight-or-flight" response[14]. Once the threat is gone, the body will return to a normal relaxed state. Unfortunately, nonstop stress of modern life means that your alarm system rarely shuts off, However, hypothalamic-pituitary-adrenal axis, cortisol gets secreted from the adrenal cortex to all body fluids, including saliva [14, 15]. So salivary cortisol increases in response to stress and anxiety, and that it also presents an easy, non-invasive way of measuring stress [14, 15, 16].

The main purpose of this study was to evaluate the correlation between patients' dental anxieties in different dental clinical departments based on (MDAS) and salivary cortisol level. .

## **Materials and Methods**

Seventy five Iraqi Patients attended the teaching hospital of the College of Dentistry / Al-Mustansiria University needed treatment. Detail medical, dental history and a consent form were taken for each patient before salivary collection. The age range was between (20 - 50 years) with mean of (40.213 years old).

All considered patients did not have history of any systemic diseases and were not on any medication. Anxiety measures by using modified dental anxiety scale

### **Cortisol Evaluation:**

An ELISA for the quantitative analysis of cortisol levels in saliva. This test kit operates on the basis of competition between the hormone conjugate and the cortisol in the saliva for a limited number of binding sites on the antibody coated plate. The sample or standard solution is first added to the microplate. Next, the diluted hormone conjugate is added and the mixture is shaken and incubated at room temperature for one hour. During the incubation, competition for binding sites is taking place. The plate is then

washed removing all the unbound material. The bound hormone conjugate is detected by the addition of substrate which generates an optimal color after 30 minutes. Quantitative test results may be obtained by measuring and comparing the absorbance reading of the wells of the samples against the standards with a microplate reader at 650nm. The extent of color development is inversely proportional to the standard amount of cortisol in the saliva. For example, the absence of cortisol in the sample will result in a bright blue color, whereas the presence of cortisol will result in decreased or no color development [17].

### **Statistical Analysis:**

The data were analyzed using the SPSS computer software (Statistical Package for the Social Sciences, version 22, SPSS Inc., Chicago, IL, USA), involved Mean  $\pm$ SD, standard error of mean, 95 % confidence intervals lower and upper limits, correlation and t-test.

### **Results**

The statistic evaluation of salivary cortisol level and MDAS for patients in oral surgery, oral periodontology, and oral medicine and diagnosis were listed in table 1, 2 and 3, respectively.

The salivary cortisol level changes among patients in the three investigated departments (1, oral surgery, 2 periodontal, and 3 Oral medicine and diagnosis) were plotted in figure 1. The higher values were observed in periodontal treatment while, the lower value were recorded in oral medicine and diagnosis department.

Figure 2.represent the MDAS for the three departments. The plot of MDAS showed that the higher score is in the periodontal department among other departments.

The changes in expected and observed values for salivary cortisol level in oral surgery, periodontal, and oral diagnosis were

plotted in figure 3 , 4 and 5, respectively. The oral medicine and oral diagnosis department was the more linear than other departments.

**Table 1: Statistical evaluation of estimated cortisol and MDAS in patient attended oral surgery department.**

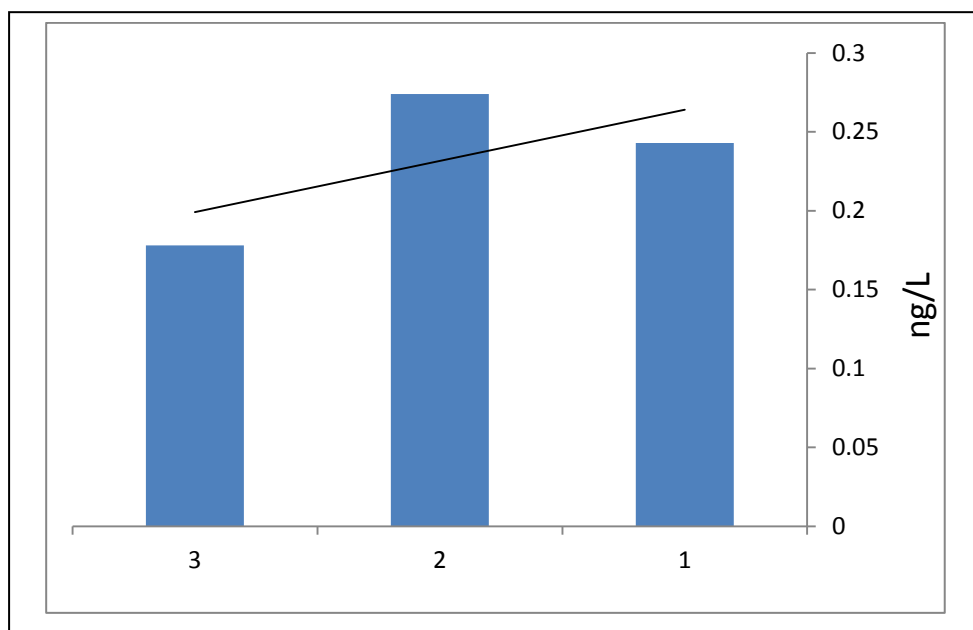
Function		Estimated cortisol	MDAS
N		25	25
Mean ±SD		0.243± 0.190 ng/L	7.760±2.488
St. error of mean		0.038	0.498
Paired			
95 %	Upper	6.491	
	Lower	8.543	
Correlation		0.052	
T-test		15.122	
Sign(p<0.05)		0.0001	

**Table 2: Statistical evaluation of estimated cortisol and MDAS in patient attended periodontal department.**

Function		Estimated cortisol	MDAS
N		25	25
Mean ±SD		0.274±0.273 ng/L	9.000±3.617
St. error of mean		0.055	7.234
Paired			
95 %	Upper	7.231	
	Lower	10.221	
Correlation		0.022	
T-test		12.048	
Sign(p<0.05)		0.0001	

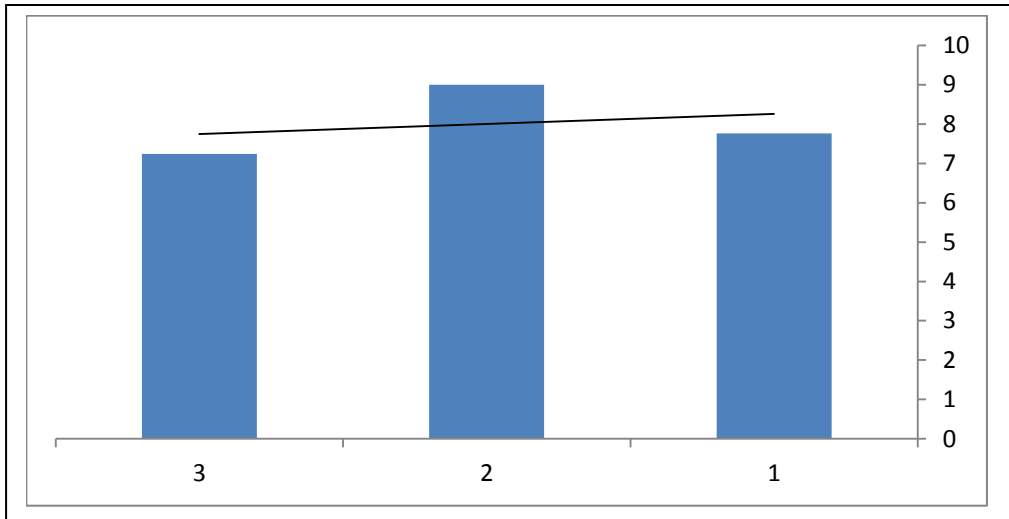
**Table 3: Statistical evaluation of estimated cortisol and MDAS in patient attended oral medicine and diagnosis department.**

Function		Estimated cortisol	MDAS
N		25	25
Mean ±SD		0.178±0.132 ng/L	7.240±2.385
St. error of mean		0.026	0.477
Paired			
95 %	Upper	6.100	
	Lower	8.024	
Correlation		0.444	
T-test		15.156	
Sign(p<0.05)		0.0001	



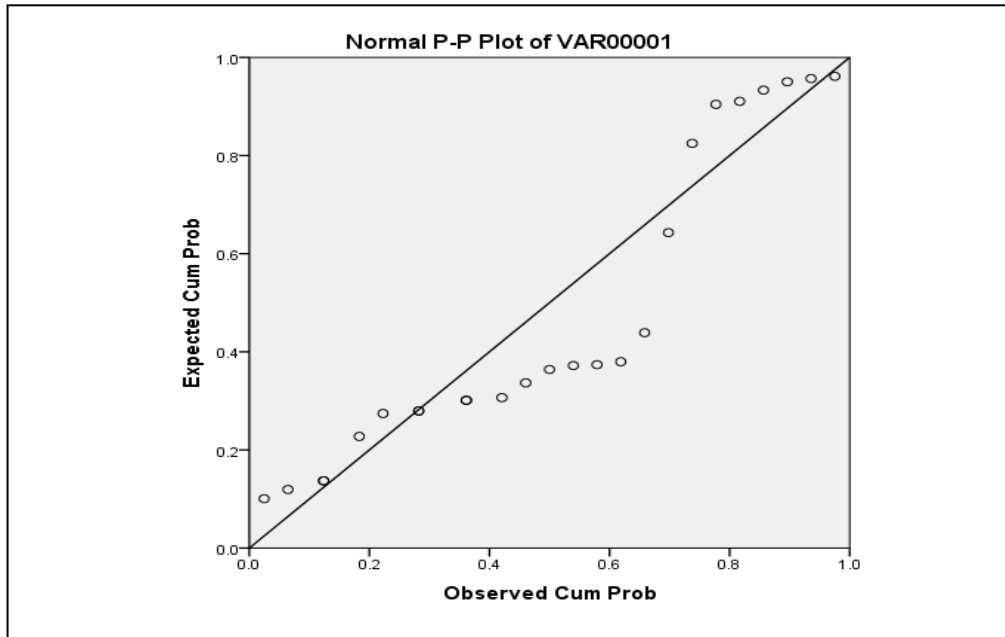
**Figure 1: The level of salivary cortisol in Dentistry Departments**

**Where: 1 represents the oral surgery dept., 2 represent periodontal dept., 3 represent oral medicine and oral diagnosis dept.**



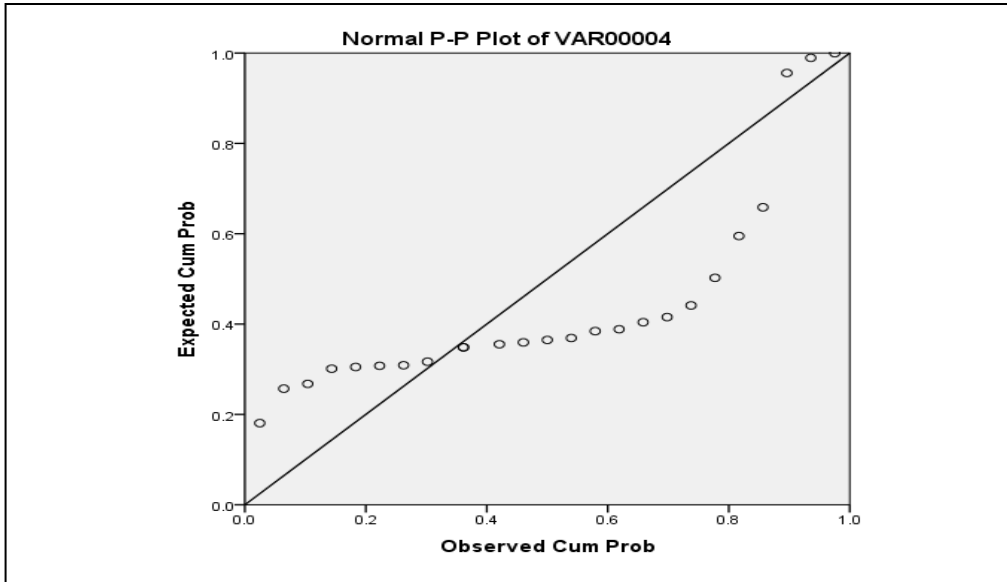
**Figure 2: MDAS in Dentistry Departments**

*Where: 1 represents the oral surgery dept., 2 represent periodontal dept., 3 represent oral medicine and oral diagnosis dept.*

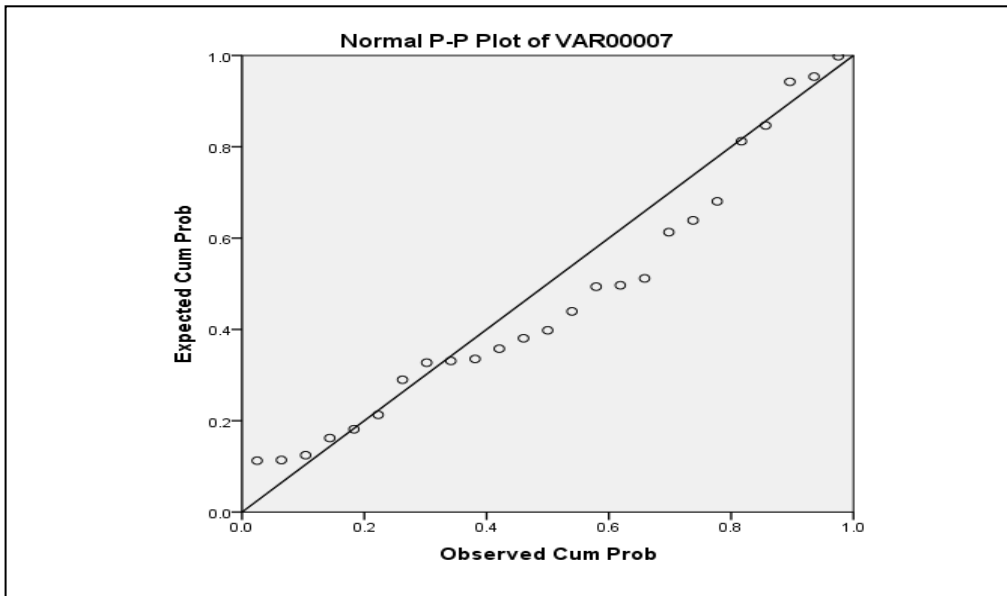


**Figure 3: The probability distribution between observed and expected values in Oral Surgery Department.**





*Figure 4: The probability distribution between observed and expected values in Periodontal Department.*



*Figure 5: The probability distribution between observed and expected values in Oral Medicine and Oral Diagnosis Department.*

## Discussion

Dental anxiety is an important factor that interferes or rather prevents the effective utilization of the services available and quality of treatment that could be provided to the patients [18, 19, 20]. Fear and dental anxiety scales have been used to examine changes brought about by experiences or treatment over time and the related risk factors. MDAS are the best recommended so far to be used by clinicians to aid in screening dental fear and anxiety, providing better and more tailored treatment options [21].

The consideration of an anxiety is a real problem that can become a barrier to treatment in the long run [22]. Moreover, there are some patients who avoid dentists altogether because of their extreme fears [23, 24]. The hormone cortisol has a key role in the stress response, it is vital for normal body functioning. Cortisol has a very diverse set of actions ranging from effects on blood pressure, stored reserves of energy and the balance of the immune system [15]. The positive correlation between stress, anxiety and salivary cortisol has been well studied and confirmed [25]. A review by Loggia et al (2008) stated that pain pathways can be altered in relation to different stimuli and psychological pain perception can be altered in relation these stimuli [26]. Current study revealed that the collected data from three departments (oral surgery, periodontal and oral medicine and oral diagnosis) showed significant variations; however, periodontal department was the higher in salivary cortisol level and MDAS when compared the other groups. The high level of salivary cortisol and MDAS could be attributed to the complication and unknown procedure to which patients could escalate the anxiety and stress levels more than other departments that considered in this study. The long period of waiting treatments may play an essential role in such changes as well as the administration of anaesthesia with scaling and polishing procedures. The lower values were found in oral diagnosis department in both salivary cortisol and MDAS, can be related to the non-invasive nature of the treatment provided. The probability plots indicated the same behaviour with close result to linearity

observed in diagnosis than other departments. In a study by Miller et al (1995) it was demonstrated that salivary cortisol levels in dental treatment are highest in patients undergoing tooth extraction compared to other procedures such as prophylaxis, restorative, and examination [27].

The MDAS values changed following the same pattern as salivary cortisol in the three investigated departments. MDAS were reported as effective tool in anxiety monitoring between the patients and dentist; Monitoring of stress was very reliable by MDAS [11, 12, 13]. According to our observation, we found a strong correlation of salivary cortisol and anxiety with type of departments. The collected results improve the same changes with cortisol and MDAS.

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## العلاقة بين التوتر ومستوى الكورتيزول في اللعاب خلال عمليات العلاج بين مختلف اقسام طب الاسنان

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### المستخلص:

ان الهدف من هذه الدراسة هو بيان درجة الخوف لمرضى الاسنان وعلاقتة بنسبة الكورتيزون المقاس من اللعاب لثلاث عينات من المرضى تمت معالجتهم في ثلاثة فروع علاجية في كلية طب الاسنان- الجامعة المستنصرية.

شارك في هذه الدراسة خمسة وسبعون مريضاً. خمسة وعشرون مريضاً تمت معالجتهم في كل قسم (جراحة الفم و امراض وجراحة ماحول الاسنان والتشخيص الفمي). وزع على المرضى استبيان معدل لقياس الخوف من علاج الاسنان مع اخذ عينة من اللعاب من اجل قياس نسبة الكورتيزون لغرض معرفة العلاقة الاحصائية بينهما.

اظهرت النتائج الاحصائية ان المرضى الذين يعالجون في قسم امراض وجراحة ماحول الاسنان هم الاكثر خوفاً، يليهم المرضى المعالجين في قسم جراحة الفم وقد كان المرضى المعالجين في قسم التشخيص الفمي هم الاقل تخوفاً حسب النتائج الاحصائية بين مجموعة واخرى حسب نتائج الاستبيان والكورتيزون المقاس من اللعاب وارتباطها بالقسم الذي تم العلاج به وذلك يعود لعدة اسباب منها طول فترت انتظار المرض ومعرفته او عدم معرفته بنوع العلاج المقدم له وطبيعة المواد المستخدمة في العلاج.

الكلمات الرئيسية: القلق، الكورتيزول، طب الفم والتشخيص الفموي، جراحة الفم،

أمراض ماحول الأسنان