

Original Research Article

Effect of Exam Stress on Salivary Interleukin-6 level in Healthy Students

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Abstract

Cytokines are important small protein molecules one of them is Interleukin-6 (IL-6). Many tissues secrete IL6 like activated leukocytes. In immune system, IL6 plays main role in production of acute-phase proteins like C-reactive protein. Human labial salivary glands, contain Messenger RNA for IL-6.

Aim of study was to demonstrate the effect of exam stress on salivary concentrations of interleukin-6 (IL-6) in healthy secondary school students.

Salivary specimens were collected from thirteen male students before and after final academic exam. Cytokine levels were measured by commercial enzyme linked immunoassay.

Salivary IL-6 was insignificantly higher after final exam when compared with its level before exam. (P > 0.05). Students after exam have increased level of inflammatory cytokine (IL-6) in their saliva. The IL6 level may be used for monitoring the stress.

Key Words: Saliva, interleukin -6 (IL-6), stress.

تأثير اجهاد الامتحان على مستوى الانترلوكين اللعابي لدى الطلبة الاصحاء

الخلاصة

انترلوكين (IL-6) هو واحد من عائلة من جزيئات البروتين الصغيرة النشطة بيولوجيا المعروفة باسم السيتوكينات. يتم تحريرها من قبل مجموعة متنوعة من الأنسجة، بما في ذلك الكريات البيض، والخلايا الشحمية، والخلايا البطانية، وهي تشارك في العديد من العمليات في الجسم. IL-6 يلعب دورا هاما في تحفيز الاستجابة المناعية للإصابة أو الصدمة عن طريق تحفيز إنتاج بروتينات المرحلة الحادة مثل البروتين وحمي الاستقرء. وقد وجد IL-6 mRNA في أنسجة الغدد اللعابية الشفوية للإنسان، وكانت مستويات التعبير للـmRNAs تنظم إما إنتاج أعلى أو أقل عن طريق تسلسل الخلايا للمفاوية.

وكان الهدف من الدراسة للتدليل على تأثير اجهاد الامتحان على التركيزات اللعابية للـ (IL-6) (interleukin-6) في طلاب المدارس الثانوية الاصحاء.

تم جمع العينات اللعابية من ثلاثة عشر طالبا قبل وبعد الامتحان الدراسي النهائي و قياس تركيز IL-6.

IL-6 كان أعلى معنويا بعد الامتحان النهائي بالمقارنة مع مستوياته قبل الامتحان.

ارتفاع التركيزات اللعابية IL-6 بعد الامتحان يمكن أن تستخدم لرصد مستوى الاجهاد.

الكلمات المفتاحية: اللعاب، انترلوكين -6 (IL-6)، الاجهاد.

Introduction

Interleukin-6 acts as a pro-inflammatory cytokine [1]. Immune response is produced by immune system through IL-6 secretion. It is capable of passing to the blood-brain barrier and initiating synthesis of hypothalamus prostaglandin [2]. Many medical and psychological conditions associated with IL6 level. Acute and chronic stress may affect the level of IL6, many researcher found that IL6 increase with stress and there was a connection between them. IL-6 connects peripheral controlling processes with the central nervous system which act as a messenger molecule [3].

A Central part of many inflammatory diseases is now well known as chronic diseases. A healthy persons have a wide range of inflammatory mediators with wide range for certain one, like CRP [4]. It observed that IL-6 level was increased in many human body fluids like saliva and blood during acute and chronic stress, there was up- or down-regulation of mRNA of IL6 by adjacent focal infiltrating lymphoid cells [5]. In periodontal disease, salivary IL-6 levels are increased in addition to other inflammatory mediator [6].

There was a relation between salivary IL-6 and sleep dysfunction, psychosocial dysfunction, and other stress factors [7-9]. Normal parotid acinar cells in mice synthesize IL-which released from the gland after sympathetic stimuli [10]. IL-6 was also have a role in the nervous and endocrine systems regulation [11]. Exposure to stress activate many living systems, involving many endocrine glands one of them the hypothalamic-pituitary adrenal (HPA) axis [12].

Specific forms of immunological responses associated with many psycho-

logical states [13,14]. Anxiety and depression are linked with each other and the affinity to connect with negative emotions [15].

Stress may also be an important stimulus for cytokine production was inspired by a recent observation that heat stress stimulates interleukin-6 (IL-6) production in skeletal muscle and that IL-6 transcription can be blocked by application of heat shock factor (HSF) inhibitors [16].

Materials and Methods

Thirteen male secondary school students aged 18 years were involved in the study. A consent was acquired from each participating student. Students with chronic inflammatory diseases or smoker that might influence the levels of salivary cytokines were excluded.

Saliva samples were collected at 8 A.M. (before exam) and 12 P.M. (after exam). Saliva was collected 5 minutes into calibrated tubes by drooling method [17]. Samples were frozen and kept at -70 °C until analysis. On melting, saliva samples were centrifuged then analyzed within 1-2 hours.

Concentrations of salivary IL-6 were measured by enzyme linked immunoassay [18].

The concentration of salivary IL-6 was obtained from standard curve in Pg/ml.

Statistical analysis of data was done using SPSS version 17. Paired t- test was used for comparisons between the groups. P-Values lower than 0.05 ($p < 0.05$) were considered as statistically significant.

Results

There was no significant difference in the level of IL6 before and after final exam ($p > 0.05$). as shown in table (1).

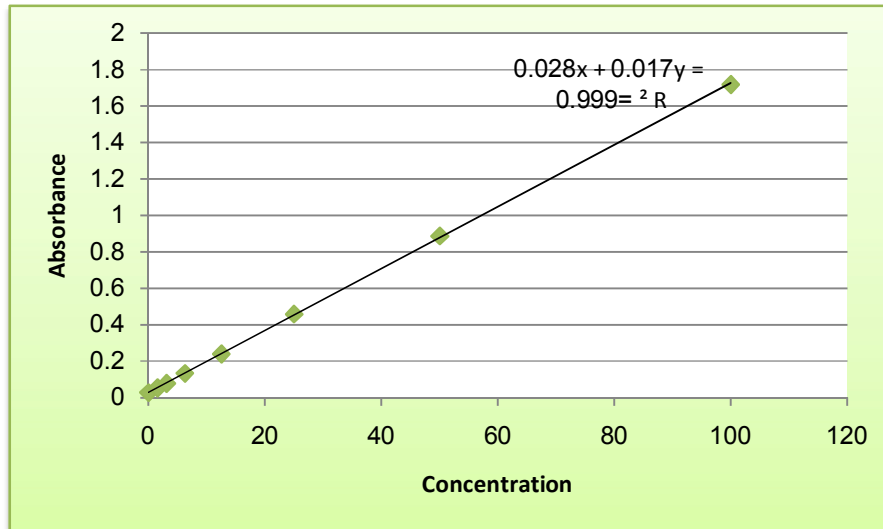


Figure 1: Standard curve for IL-6.

Table 1: Salivary IL-6 before and after final exam (pg/ml).

IL6	Before Mean±SD	After Mean±SD	P value
	7.49±3.86	9.19±4.80	0.334

Most students showed increase level of IL-6 after exam when compared to its level before exam as shown in figure (2).

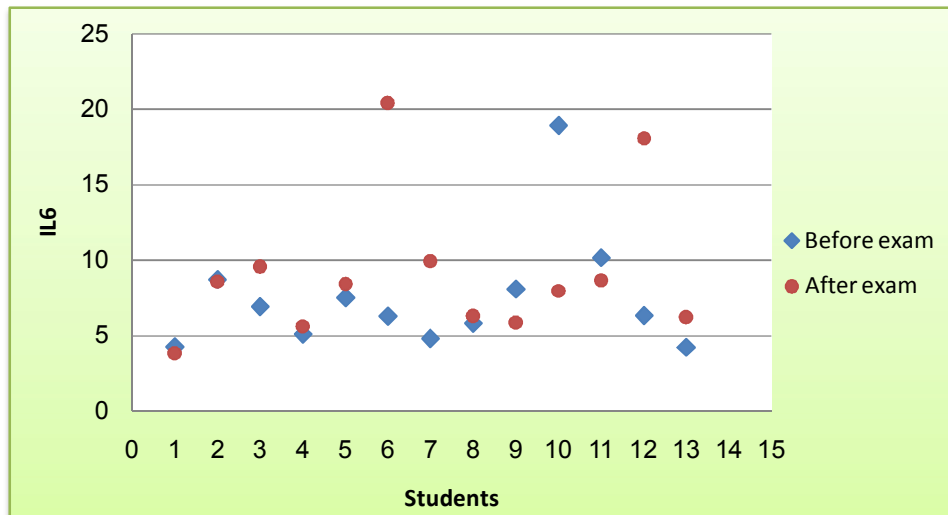


Figure 2: Salivary IL-6 (pg/ml) before and after final exam in each student.

Discussion

Results of this study show that concentrations of Salivary IL-6 was not significantly higher after final exam when compared with its level before exam ($p > 0.05$).

Acute and chronic psychological stress associated with increase IL-6 level supports the connection between human response to emotional stress [3]. Donovan *et al.* found that clinically stressed persons

exhibited significantly higher of IL-6 level [12].

Researchers suggests that, IL-6 may be affected by stress through their effect on neural and hormonal responses [19]. In general, these data suggest a direct connection between psychological and biological levels in emotional and inflammation state [13].

Some variables like body mass may effect on level of inflammatory mediators, but it remains unclear. It may affect by genetic differences which affect the stress level and liable to different diseases [20,21].

Conclusion

Students after exam have raised levels of salivary inflammatory cytokine (IL-6). Larger sample size are needed for further studies.

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