Study of Some Stress Markers in Medical Students Committing Final Examinations

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Abstract

A total of 50 apparently healthy adult students (males ansd females) in College of Medicine in Tikrit University, were included in this study, they were underwent assessment of the serum levels of C-reactive protein and mlondialdehyde at two times intervals; first at the usual days of the term and the second time is during days of examinations. The aim of this study is to find the effect of the stress of examination on the serum levels of these two parameters. It was found that there is increase in the positive CRP results and increase in the serum level of mlondialdehyde at the day of examination more than before examination, which was statistically significant. These results suggest that during university examinations students are under increased oxidative stress.

دراسة عن بعض معايير الاجهاد لدى الطلبة خلال فترة الامتحانات

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المستخلص

اجريت هذه الدراسة على ٥٠ طالبا و طالبة بالغين يبدون أصحاء من طلبة كلية الطب و لقد تم قياس معايير حياتية تشمل مالونالديهايد و البروتين التفاعلي سي في مصل المتطوعين في فترتين هما قبل الامتحانات و اثناء اداء الامتحانات . أن الهدف من هذه الدراسة هو التعرف على تأثير التعرض لاجهاد الامتحانات على مستويات هذين المعيارين في مصل الدم. و قد تبين ان هناك زيادة في مستويات هذين المعيارين و بصورة دالة في فترة الامتحانات عما هي عليه في فترة قبل الامتحانات مما يدل على انه خلال فترة الامتحانات يتعرض الطلبة الى تأثير متزايد من الاجهاد التأكسدي والذي يؤدي الى ارتفاع هذين المعيارين في مصل الدم .

Introduction

Many different definitions of the term "stress" exist concurrently. "Stress" is interpreted as a more general term that describes the effects of psychosocial and environmental factors on physical or mental well-being. [1] Psychological stress can turn into physical pain and illness in a number of ways. One is the body's primitive "fight-or-flight" mechanism, it also creates biochemical changes that can affect the immune system, and can raise the level of inflammation in the body, which has been associated with heart disease.[2] Mental stress in psychiatric disease and in daily life contributes to oxidative stress in the body.[3] Studies suggest that oxidative stress may have pro-inflammatory effects, but data on the relationship between oxidative stress and C- reactive protein in healthy persons is sparse. [4] Oxidative stress is a cellular or physiological condition of elevated concentrations of reactive oxygen species that cause molecular damage to vital structures and functions.[5] It induces strain upon both emotional and physical endurance which has been considered a basic factor in the etiology of a number of diseases e.g. cardiovascular diseases, cancer, diabetes mellitus, etc.[6] Stressful conditions lead to the formation of excessive free radicals[7] which are major internal threat to cellular homeostasis of aerobic organisms.[8] Free radicals are formed in human body both in physiological and pathological conditions.[9] These free radicals are extremely reactive and unstable chemical species, which react with proteins, lipids, carbohydrates and nucleic acids in the body.[10] Free radicals generate a cascade producing lipid peroxidation,[11] which is considered as a serious consequence of free radical toxicity leading to profound changes in the membrane structure and function that may cause even cell death.[12, 3] Malondialdehyde (MDA) is one of the end products of lipid peroxidation and extent of lipid peroxidation is measured by estimating MDA levels most frequently. Increased serum level of MDA has been reported in cardiovascular, neurological and other diseases[13, 14] Malondialdehyde (MDA) is the principal and most studied product of polyunsaturated fatty acid peroxidation.[15]The plasma levels of MDA (one of the end products of peroxidation) directly correlated with the severity of emotional stress)[16]C-reactive protein (CRP) is a phylogenetically highly conserved plasma protein, [17] CRP is the classical acute phase reactant. [18] it is mainly produced by the liver [19] The synthetic function of the liver may be reduced due to physiological aging [20] Serum CRP values are routinely measured, empirically, to detect and monitor many human diseases, [18] and in determining disease progress or the effectiveness of treatment,[21] it has also been used to gauge the inflammatory response in chronic diseases and found in the blood of patients with febrile diseases . [22] The present study done to find out the effect of stress of examination on the level of the biomarkers; CRP and MDA.

Subjects & Method

The absence of epidemiologic data on oxidative damage in normal human populations represents a serious gap in our knowledge about the distribution, correlates, and causative factors of oxidative damage. In this paper, we selected two biomarkers that are widely used, sensitive, and appropriate for use

in large studies: MDA and CRP and a number of physiologic factors associated with these two measures. The participants were healthy adults female and male, selected from medical students in college of Medicine in Tikrit University. The study conducted at two times intervals; the first time at the usual days of the attending college, while the second time was at time of examination; to study the impact of stress of examination on the levels of MDA & CRP. At both time points, participants underwent a brief physical examination, had venous blood drawn, and completed questionnaires to confirm that they are apparently healthy subjects, to be included in the study. This paper presents data levels of the two biomarkers in 50 healthy adults aged 18–23 years. Body mass index was calculated as weight (in kilograms) divided by height in meters squared (m^2) and was categorized as normal weight or overweight, using the classification recommended by the National Heart, Lung, and Blood Institute.[23] MDA in plasma was determined using lipid peroxidation analysis kits (Oxis International, Inc., Portland, Oregon) [24] C-reactive protein concentrations were measured by rheumajet CRP kit (Biokit, Spain). It is a rapid test for qualitative and semi quantitative determination of C-reactive protein in serum by agglutination of latex particles on slide.[25] Student t- test used to determine if the mean values for biochemical tests were significantly different between both times of testing (prior ,and at time of examination). Any P value of less than 0.05 was considered significant.

Results

There were no statistical differences between males and females regarding the age (19 –23 years), as well as before and during the examination regarding BMI (BMI for males 23.62 Kg/m^2 and for females 24.958 Kg/m^2). Table (1) shows the physical characteristics of the subjects included in this study, in which the individuals had a nearly similar number of males and females included in this study (26 males and 24 females), a narrow range of age for both males and females (19 to 23 years of age), and a non significant difference regarding the BMI (males = 23.6 ± 1.6 and females = 24.95 ± 1.7).

Table (1):- Physical characteristics of the subjects.

	No. of subjects	Age Range (y)	BMI mean ± SD
Before Exam.			
Male	**26**	**19 - 23**	**23.6 ± 1.6**
Female	**24**	**19 - 23**	**24.95 ± 1.7**
Total	**50**	**19 - 23**	**24.26 ± 1.64**
During Exam.			
Male	**26**	**19 - 23**	**23.6 ± 1.6**
Female	**24**	**19 - 23**	**24.95 ± 1.7**
Total	**50**	**19 - 23**	**24.26 ± 1.64**

Table (2) reveals the serum of CRP of the studied individuals before and during the examination. It is evident from this table that there was an increase in the number of the positive results during the examination (8 positive before the examination and 24 positive results during the examination) which is statistically significant at a P value of less than 0.05.

Table (2):- Biostatistical calculation for serum CRP in the studied groups.

S.CRP	No. of subjects	+ve test	-ve test	Statistical Significance
Before Exam.	50	8	42	P < 0.05*
During Exam.	50	24	26	

Table (3) and figure (1) show the serum level of MDA for the studied individuals, it is evident from this study that there was a significant increase in the serum level of MDA during examination in comparison with the serum level before the examination, this difference is statistical different at a P value of less than 0.05

Table (3):- Biostatistical calculation for serum MDA in the studied groups.

S. MDA (nmol/ml)	**No. of subjects**	**Mean ± SD**	**Range**	**Statistical Significance**
Before Exam.	50	1.05 ± 0.22	0.8 – 1.45	P < 0.05*
During Exam.	50	1.54 ± 0.33	0.85 – 1.97	

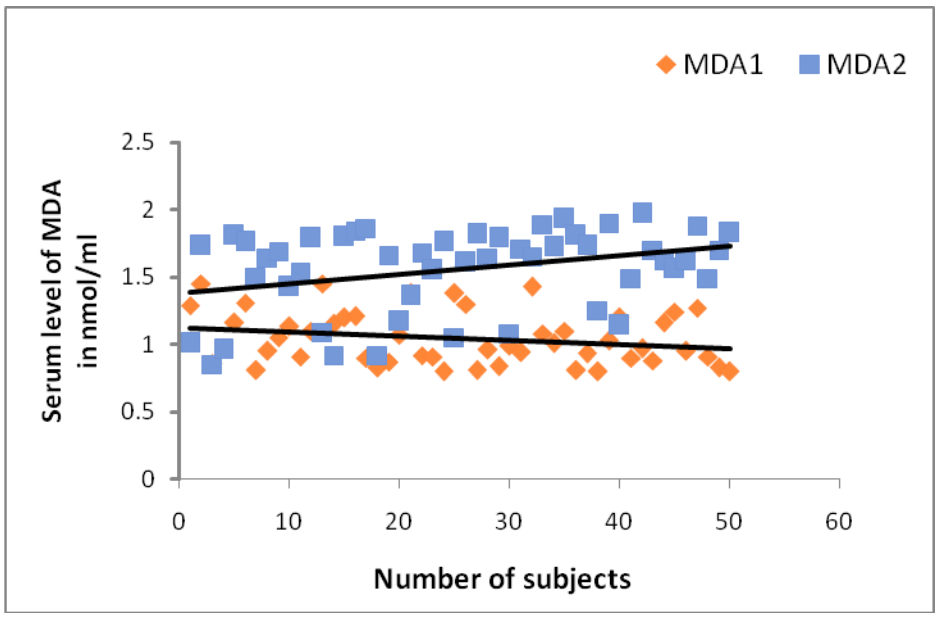

Fig. (1): The serum level of MDA in the studied individuals before (MDA1) and during examination (MDA2).

Discussion

The absence of epidemiologic data on oxidative damage in normal human populations represents a serious gap in our knowledge about the distribution, correlates, and causative factors of oxidative damage. Every year, as examinations time approaches, the question of student examination stress is raised in the press, on TV programs, and by students themselves. Increasingly, educational stress is affecting students as there is more pressure for academic achievement. Stressful conditions lead to the formation of excessive free radicals[7] which are major internal threat to cellular homeostasis of aerobic organisms.[8]

The present study investigated a connection between possible psychological stress caused by university undergraduate examinations and oxidative stress experienced by examined subjects reflected in the levels of CRP & MDA. These parameters of oxidative stress (MDA and CRP) were studied in medical students on the day of the examination (stress condition) and compared with the same parameters obtained from the same students during the term (non-stress condition). The results show that in the stress condition there was an increase in the number of the positive results concerning serum CRP level during the examination than those before examination, which is statistically significant at a P value of less than 0.05, and this study is in agreement with a study by Melinda Beck who found that stressful conditions can raise the level of C-reactive protein, a marker for inflammation that increases the likelihood of cardiovascular problems later. [2] The present study show that there was a significant increase in the serum level of MDA during examination in comparison with the serum level before the examination, this is in agreement with a study by

Casado et *al* who found a positive correlation between malondialdehyde, a biomarker of lipid peroxidation and occupational stress,[7] although it had been argued that plasma MDA may be too nonspecific to be a useful measure of oxidative stress status, [26,27] but in a study done by Monika *et al* on medical students at two period intervals; on the day of the examination (stress condition) and compared with the same parameters obtained from the same students during the term between two examination periods (non-stress condition) showed that in the stress condition oxidative damage were significantly increased ($p<0.05$) when compared with the same parameters in "non-stress" condition,[3] and it had been found by Aleksandrovskii IuA *et al* that the plasma levels of MDA directly correlated with the severity of emotional stress.[16] The present study conclude that there is significant increase in serum CRP and MDA during examination in comparison with the serum level before the examination. These results suggest that during university examinations students are under increased oxidative stress. Also, the resent study recommend, the followings, because of the limitation of the sample size in this study, we recommend a large-scale epidemiologic research on the role of oxidative stress, also studies investigating causal mechanisms or the association between oxidative stress and disease should collect data on these markers, as well as other markers of lipid peroxidation to expand our understanding of the role of these factors in disease processes.

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