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Effect of stress on arterial blood pressure In dental students

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ABSTRACT

Aims: To study the effect of stress and fear on blood pressure that are imposed on student before attending examination in particular final year examination at the College of Dentistry. **Subjects and Methods**: Arterial blood pressure (indirect method) was measured for 99 dental student (21 $\pm$ 0.6 years) before 30 minutes of final examination on a particular subject and immediately after examination. **Result**: The data reflected a significant increase in systolic blood pressure before passing the final examination, whereas there was no significant increase in the diastolic blood pressure in all students. **Conclusions:** Stress produces a significant elevation in blood pressure that can be controlled by systemic defense mechanisms naturally present.

Key Words: Stress, blood pressure, examination.

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INTRODUCTION

Blood pressure varies as the product of cardiac output and resistance to the flow of blood in the peripheral circulation (peripheral resistance).[1] Normal physiological responses act to defend arterial blood pressure. There are three principal systems act to defend arterial pressure in acute and chronic situations:

1) Sympathetic nervous system.
2) Renine angiotensin system.
3) Extracellular fluid volume.

These systems act in concert to restore arterial pressure to baseline levels. Blood pressure defense mechanisms are activated physiologically in certain situations such as hemorrhage, or dehydration or (fight, fright) phenomena.[2] For high blood pressure to develop, there must be increase in either cardiac output or peripheral resistance or both.

Causes of increase cardiac output include stress, sodium overload, disorder of cellular ion transport and hormonal changes.[3] Controlling stress is an important way to reduce raised blood pressure.[4]

The aim of this study was focused on the effect of stress and fear on blood pressure that are imposed on student before atending examination in particular final year examination at the College of Dentistry.

SUBJECTS AND METHODS

Total of 99 dental students at the College of Dentistry/ University of Mosul with an average age of 21 $\pm$ 0.6 years were ready to attend a final examination on a particular subject. The arterial blood pressure of each was measured 30 minutes before examination and then immediately after completing the examination. The equipment used included sphygmomanometer and stethoscope.

The procedure involved that the subject was in sitting position, the arterial blood pressure was measured by indirect method.[5, 6]

Statistical analysis of data included Student's t–test. Significant values were recorded at a level where $p < 0.05$.

RESULTS

Total number of 99 individuals with an average age of 21 years participated in this study (Table).

Systolic blood pressure for all individuals when it was recorded before attending examination (pre–examination) was 120.2 ± 0.11 mmHg, while after completeng examination (post–examination) dropped to 110.7 ± 0.1 mmHg ($p < 0.001$) (Table).

Diastolic blood pressure record of pre–examination was 70.49 ± 0.1 mmHg, while post–examination record was 70.26 ± 0.9 mmHg with no significant differentces for all individuals.

Total number of 67 males participated in the study. The systolic pre–examination record was 120.3 ± 0.12 mmHg dropped to 110.84 ± 0.1 mmHg in post–examination record with $p < 0.01$ (Table).

Diastolic blood pressure for males was not significantly altered in pre–examination with that of post–examination record. The pre–examination was 70.48 ± 0.12 mmHg while 70.26 ± 0.1 mmHg ($p \geq 0.05$) (Table).

Total of 32 females participated in the study. The systolic pre–examination record was 120 ± 0.22 mmHg dropped to 110.4 ± 0.22 mmHg with post–examination record ($p < 0.05$) (Table). The diastolic pre–examination record for females was 70.5 ± 0.2 mmHg dropped to non significant level of 70.28 ± 0.18 mmHg ($p \geq 0.05$) (Table).

Table: Systolic and diastolic blood pressure records in students

BP	Examination	Females n = 32 Mean* ± SD	Significance	Males n = 67 Mean* ± SD	Significance	Total n = 99 Mean* ± SD	Significance
Systolic	Pre	120 ± 0.22	$p<0.05$ S	123 ± 0.12	$p<0.01$ S	120.2 ± 0.11	$p<0.001$ S
	Post	110.4 ± 0.22		110.84 ± 0.1		110.7 ± 0.10	
Diastolic	Pre	70.5 ± 0.2	$p \geq 0.05$ NS	70.48 ± 0.12	$p \geq 0.05$ NS	70.49 ± 0.1	$p \geq 0.05$ NS
	Post	70.28 ± 0.18		70.26 ± 0.11		70.26 ± 0.93	

BP: Blood Pressure; S: Significant; NS: Not significant.
* Measurement in mmHg.

The systolic pre–examination record for males was higher than that of females with no significant difference ($p > 0.05$) (Table and Figure 1).

The diastolic pre–examination record for males and females was almost the same with no significant difference (Table and Figure 2).

DISCUSSION

Stress can be defined as the harmful physical and emotional responses that occur when the requirements of the job do not match the capabilities, resources or the need. Stress sets off an alarm in the brain, which responds by preparing the body for defensive action. The nervous system is aroused and hormones are released to sharpen the senses, quicken the pulse, deepen respiration and tense the muscles. This response is sometimes called the fight or fright response. The response is pre–programmed biologically. Everyone responds in much the same way, regardless of whether the stressful situation is at work or home, short–lived or infrequent episodes

of stress pose little risk. But when stressful situation go unresolved the body is kept in a constant state of activation, with increase the rate of wear and tear to biological systems. Ultimately, fatigue or damage results and the ability of the body to repair and defend itself can become seriously compromised. As a result, the risk of injury or disease escalates.[7]

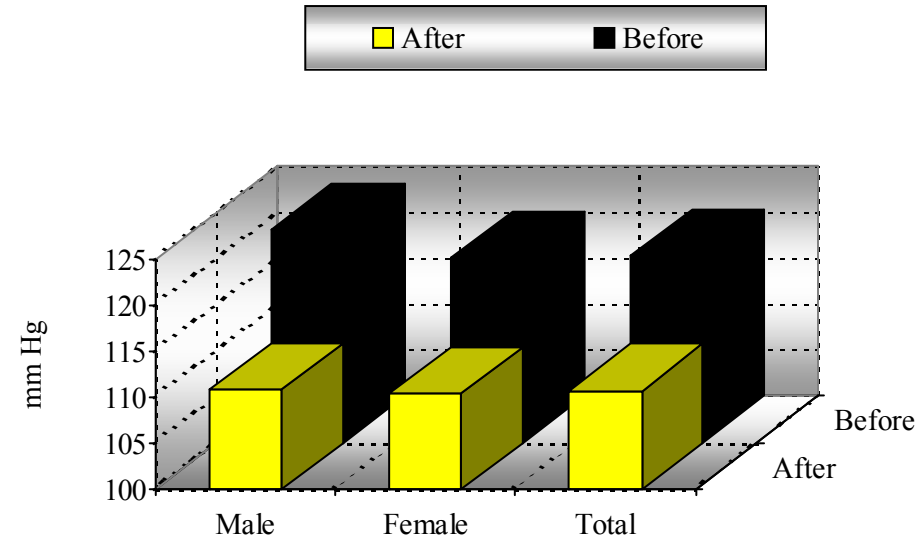

Figure (1): Systolic (pre–and post–examination) records in the study groups

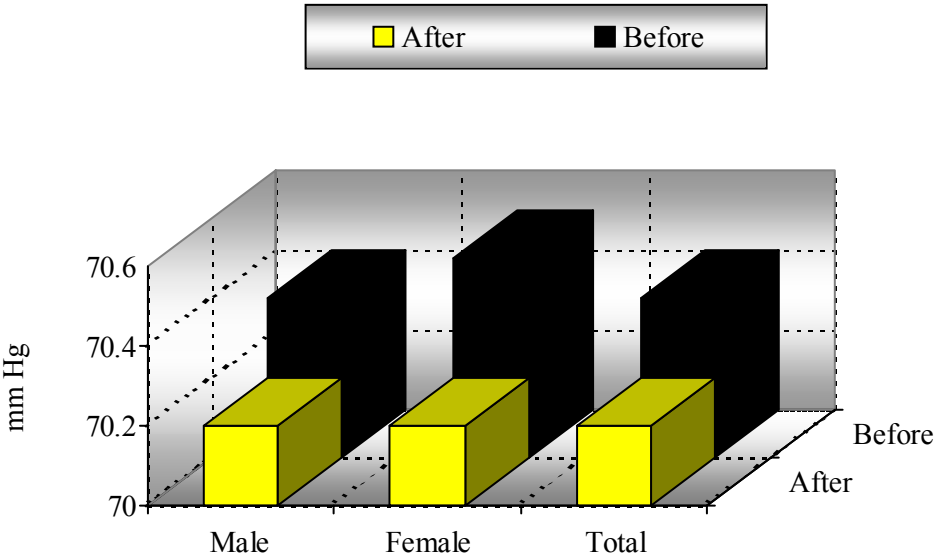

Figure (2): Diastolic (pre– and post– examination) records in the study groups

The average blood pressure of young adult males is about 120 mmHg systolic and 80 mmHg diastolic expressed as 120/80 mmHg. In young adult females, the pressure was 8 to 10 mmHg less.[8] This was in accordance with the results obtained in this study where the blood pressure in young females was 110.4/70.2 mmHg. In females blood pressure was lower than males but of no significant value. This was in accordance with other researcher.[5]

The diastolic blood pressure considered as the maximum pressure during ventricular diastole and its normal range is 60–90 mmHg with an average of 80 mmHg in adults. In this study the diastolic blood pressure was within the normal value with the pre– and post–examination records. In this study the systolic blood pressure (pre–examination record) for males and females were significantly higher than the post–examination record and this could be explained by stimulation of the adrenergic nervous system that lead to the release of catecholamine in particular noradrenaline at the post–synaptic neuron and adrenaline or epinephrine from adrenaline medulla that results in activation of α_1, β_1 and β_2 receptors consequently elevation of systolic blood pressure.[2] Yet the elevation of systolic pre–examination record was not significantly different from normal controlled values, but it was significantly higher than the post–examination records. The reduction of blood pressure follows on the reduction of peripheral arteriolar resistance and/or cardiac output by a variety of mechanisms at a variety of sites, as listed below:

1. Dilatation of arteriolar resistance vessels, the heart pumps against lower resistance (after load).
2. Dilatation of venular capacitance vessels, reduction of venous return to the heart (pre–load) level to reduce cardiac output.
3. Reduction of sympathetic drive to the heart leads to lower cardiac output, especially in response to stress.[9]

These mechanisms explain the dropping of systolic blood pressure once the student complete his or her examination.

CONCLUSIONS

From this study, it can be concluded that stress produces a significant elevation in blood pressure that can be controlled by systemic defense mechanisms naturally present.

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