

Effect of stress during university examination on the differential leucocyte count (DLC), Heart Rate (HR), and Blood Pressure (BP)

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Abstract

Background: Medical university examinations are known to cause mental stress. Stress can lead to changes in the normal functioning of the human body.

Objectives: This study was done among the 1st professional MBBS students of SMIMS to determine the effect of university examination on vitals and differential leucocyte count (DLC).

Material and Methods: 100 students, 26 male and 74 female, aged 18 to 21 years, were randomly assessed before and during their 1st professional university examination. Total of 13 Students suffering from fever, hypertension and on long term medication were excluded. 87 students were subjected to clinical check-up (Blood Pressure & Heart Rate) and estimation of DLC by staining the blood smear with Leishman's Stain.

Results: Data were analyzed and compared with pre-examination results. 85% students were having significant increase in neutrophil count, heart rate and systolic blood pressure. However, Eosinophil, Lymphocytes and Monocytes counts were found to be decreased.

Conclusion: Examinations in medical school are stressful enough to produce changes in heart rate, blood pressure and differential leucocytes counts although all the students were in good health status.

Key Words: Stress, Examination, DLC, Blood Pressure, Heart Rate.

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Introduction

Medical education course curriculum, examination pattern, fear of failure, inability to cope with first exposure to a very different system of education and competition among peer are extremely stressful condition for students^{1,3}.

Academic stress in medical school has not only an immediate impact on the academic performance, but can also lead to cynicism in the form of decreased empathy and humanitarianism⁴.

Stress causes an imbalance of the parasympathetic and sympathetic nervous system due to psychic stimuli which lead to disturbance of homeostasis in the body⁵. Stress has been reported to influence the development and progression of atherosclerosis in general population⁶ and may explain part of the differential cardiovascular and cerebrovascular mortality rates⁷. Physiological studies have shown that stress can affect the blood cell parameters⁸.

Fewer studies have been conducted on health problems due to stress. Hence the present study is

attempted to see the effect of examination related stress during University examination among young healthy MBBS students of SMIMS, Gangtok, India.

Material and Methods

The present study involved a total 100 students (26 Male and 74 female) Aged 18 to 21 years of 1st Prof MBBS students of SMIMS before and during their 1st professional university examination. Volunteers were selected after taking detailed history regarding presenting complaints, if any past history of illness likes thyroid disorder, psychiatric disorder, diabetes, hypertension, addiction to alcohol and tobacco or any medication for long duration.

Out of 100, 13 students suffering from fever, hypertension and long term medication in present or past were excluded. Only healthy volunteers were selected for the study.

The study was carried out in the department of Physiology SMIMS with informed consent. Eight months prior to the university examination (the students being unaware of the forthcoming examination) were subjected to clinical check-up (Blood pressure and Heart rate) and estimation of DLC by staining the peripheral blood smear with Leishman's stain. Cells were counted using Compound Microscope and similar procedure was repeated on the day of university examination (in between hematology practical and viva-voice).

Obtained data was analyzed and compared with pre-examination results.

Results

Data were analyzed and compared with pre-examination results. Among 87 students who have participated in the study there was significant increase in neutrophil count for 81.60% ($P=0.0001$), heart rate for 93.10% ($P<0.0001$) and systolic blood pressure for

80.45% ($P<0.001$). Whereas there was significant decrease in lymphocyte count for 83.90% ($P=0.0001$). However, Eosinophil, Basophil, Monocytes counts and diastolic blood pressure were found insignificant. These are shown in table I, and table II.

Table 1: Differences in number various vital and haematological parameters

Parameters	Difference Between before & During examination data			
	Increased	Decreased	No Change	Total
Heart Rate	81	5	1	87
Systolic Blood Pressure	70	8	9	87
Diastolic Blood Pressure	35	31	21	87
DLC (Neutrophil)	71	12	4	87
DLC (Basophil)	22	21	44	87
DLC (Eosinophil)	27	34	26	87
DLC (Monocytes)	32	36	19	87
DLC (Lymphocytes)	12	73	2	87

Table 2: Differences in mean values of various vital and haematological parameters

Parameters	Before examination		During examination		P value
	Mean	SD	Mean	SD	
Heart Rate	70.90805	3.703478	88.48276	9.456327	<0.0001
Systolic Blood Pressure	119.4712644	8.356756713	129.4483	6.778531	<0.001
Diastolic Blood Pressure	79	4.11054154	78.82759	4.894776	0.7930
DLC (Neutrophil)	59.45977	4.660434	66.14943	5.061754	0.0001
DLC (Basophil)	0.390805	0.487931	0.413793	0.515322	0.7903
DLC (Eosinophil)	2.333333	0.811797	2.16092	0.981128	0.3799
DLC (Monocytes)	3.448276	0.867799	3.344828	1.293917	0.5482
DLC (Lymphocytes)	34.27586	4.406607	27.93103	4.848968	0.0001

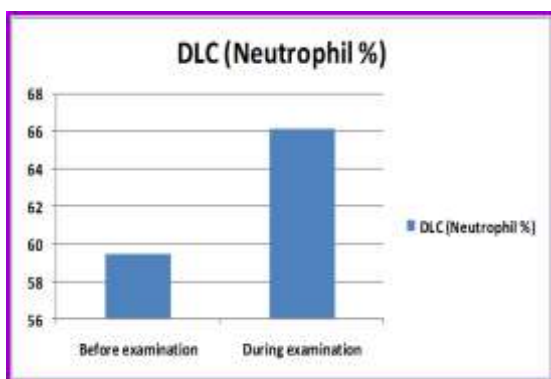


Fig. 1: Percentage of Neutrophil

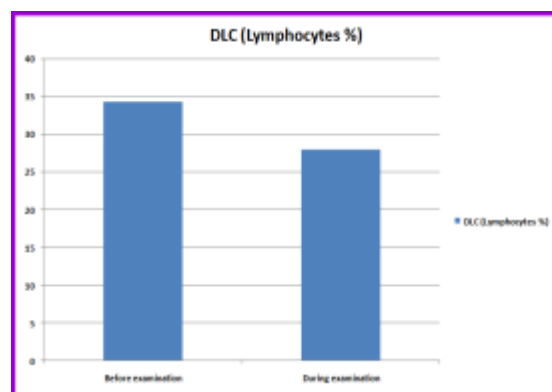


Fig. 2: Percentage of Lymphocyte

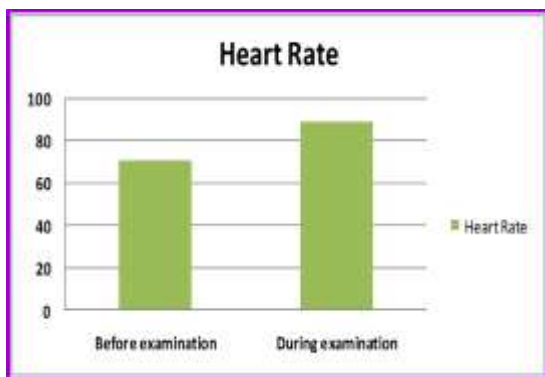


Fig. 3: Heart Rate

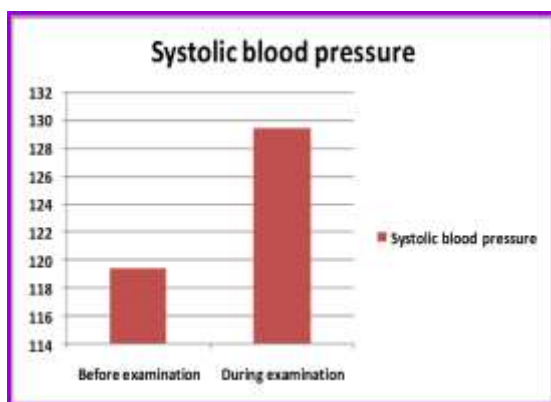


Fig. 4: Systolic Blood Pressure

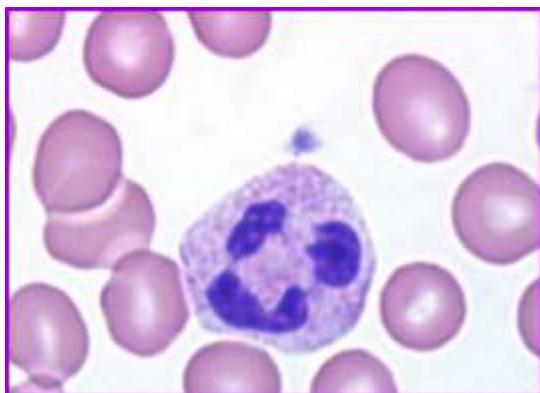


Fig. 5: Neutrophil

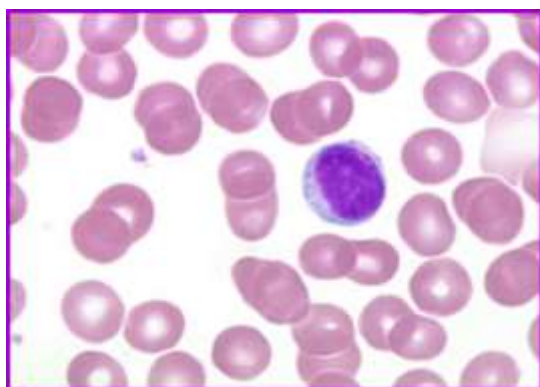


Fig. 6: Large Lymphocyte

Discussion

Stress during examination among medical students is a well-known phenomenon encountered worldwide, there are other possible stressors to which medical students may be exposed^{9,10}.

Physiological studies have shown that stress from any source can influence on the endocrine, hemopoietic and immune system. Cytokine and cortisol seems to play an important role in the communication between these systems^{8,2}.

From the perspective of Maharishi Vedic Medicine, stress and disease arise from a lack of integration of the various physiological systems with the holistic "inner intelligence" of the body¹³. This may result in loss of homeostasis in the CVS that could be expressed as higher BP, or atherosclerosis (in long standing condition).

Evidence indicates that chronic psychosocial stress induces excessive adrenergic activation and sympathetic hyper responsiveness, leading to carotid atherosclerosis^{11,12}.

Shahida et al¹⁴, found in their study that first year and final year students were more in trouble 75 and 71% respectively as compared to the students of second and third year batches due to vast academic curriculum followed by frequency of examinations.

Sani et al¹⁵, noted in their study that the major factor associated with perceived stress was long hours of study, examination, very tight time schedules, language problem and place adjustment.

It has been suggested that stress induced pro-inflammatory cytokine production may stimulate proliferation of haemopoietic cell¹⁶. Endocrine factors released during stress modulates leucocytes trafficking and result in redistribution of leucocytes between the blood and other immune compartments, such a redistribution may affect the ability of immune system to respond to potential or ongoing immune challenge. Study on the effect of stress in adrenalectomised animal's shows that changes in blood parameters are significantly reduced in compared to adrenal intact animals¹⁷. Raised blood pressure is associated with increased risk of cardiovascular disease. Stress can cause hypertension through repeated blood pressure elevation as well as by stimulation of the nervous system to produce large amount of vasoconstriction hormones that increases blood pressure. Furthermore when one risk factor is coupled with other stress producing factor the effect on blood pressure is multiplied¹⁸.

Present study showed that stress of University examination in 1st Professional Students of SMIMS was significant enough to produce changes in heart rate, blood pressure and Differential Leucocytes Counts.

Our study was restricted among 1st professional MBBS students of SMIMS, further study along with

all other semester examination may give different result.

Faiyaz Qureshi et al¹⁹, reported effects of examination stress on blood cell parameters, these findings were similar to the findings of the present study. However educational atmosphere of the SMIMS as well as geographical settings were totally different in these studies. We found significant changes in DLC, HR & BP among young healthy MBBS students of SMIMS due to stress. Since the data were collected over a period of eight months and sample included both gender (male and female, Sikkimese and non-Sikkimese subjects), who did not have similar mental status amongst them, it could have influenced the findings of the study. Thus further study required with adequate method.

Conclusion

Examinations in medical school are stressful enough to produce changes in heart rate, blood pressure and differential leucocytes counts which may affect their health and day to day activities.

Exams emphasize the need to understand, organize and recall information. The students are expected to show the depth of knowledge. All these can be affected by the stress.

Thus- Transcendental meditation (TM) program, review of academic curriculum and exam pattern, proper guidance, counseling time to time will help them to cope up with stressful life.

References

1. Shah C., Trivedi R.S. Coping of stress by medical students. *J Clin Diag Res* 2009;19:401-523.
2. Benoit D., Esa L., Ralph G. The Driving Test as a stress Model: Effects on the blood picture, serum cortisol and the production of interleukins in man. *Life Sci* 2001 Feb 23;68(14):1641-7.
3. A. N. Supre. A Study of stress in medical students at Seth G S Medical College. *JPGM* 1998;44(1):1-6.
4. M. Hojat, S. Mangione, T. J. Nasca et al., "An empirical study of decline in empathy in medical school," *Medical Education*, 2004;38(9):934-941.
5. Dvivedi J. Managing lifestyle disorders: the physiological remedy. Proceedings of 56th National Annual Conference of APPICON2010.
6. Rozanski A., Blumenthal J.A., Kaplan J. Impact of psychological Factors on the pathogenesis of cardiovascular disease and implication for therapy. *Circulation*. 1999;99:2192-2217.
7. Otten M.W., Teutsch S.M., Williamson D.F., Marks JS. The effect of known risk factors on the excess mortality of black adults in the United States. *JAMA* 1990;263:845-850.
8. Maes M., Van der Planken M., Van Gastel A., et al. Influence of academic stress on hematological measurements in subjectively healthy volunteers. *Psychiatry Res* 1998;80:201-212.
9. Al-Dabal B.K., Koura M.R., Rasheed P., Al-Sowielem L., Makki S.M. A Comparative study of perceived stress among female medical and non- medical university

- students in Dammam, Saudi Arabia. *Sultan Qaboos Univ Med J* 2010;10:231-40.
10. Hsieh Y.H., Hsu C.Y., Liu C.Y., Huang T.L. The levels of stress and depression among interns and clerks in three medical centers in Taiwan: A cross-sectional study. *Chang Gung Med J* 2011;34:278-85.
11. Kaplan J.R., Manuck S.B., Clarkson T.B., Lusso F.M., Taub D., Miller E.W. Social stress and atherosclerosis in normocholesterolemic monkeys. *Science*. 1983;220:733-735.
12. Barnett P.A., Spence J.D., Manuck S.B., Jennings JR. Psychological stress and the progression of carotid artery disease. *J Hypertens*. 1997;15:4-55
13. Nader T. *Human Physiology- Expression of Veda and the Vedic Literature*. Vlodrop, Holland: Maharishi University Press; 1995.
14. Shahida Shaikh, Abdul Hameed Shikh, Inayatullah Magsi. Stress among medical students of university of Interior Sindh; *Medical channel* 2010;17:346-53.
15. Sani M., Mahfouz M.S., Bani I., Alsomily A.H., Alagi D., Alsomily N.Y. et al. Prevalence of stress among medical students in Jizan University, Kingdom of Saudi Arabia: *Gulf Medical journal* 2012;1(1):19-25.
16. Broxmeyer H. Role of cytokines in hematopoiesis. In: Agarwal B (ed). *Human Cytokines: their role in disease and therapy*. Blackwell Science, 1995:27-36.
17. Dhabhar F.S., Miller A.H., McEwen B.S., Spencer R.L. Effects of stress on immune cell distribution. Dynamics and hormonal Mechanisms. *J Immunol* 1995 May 15;154(10):5511-27.
18. Kulkarni S., O'Farrell I., Erasi M., Kochar M.S. Stress and Hypertension Medical College of Wisconsin, Milwaukee, USA. *WJM*: 1998;97(11):34-38.
19. Faiyaz Qureshi, Jane Alam, Masood Ahmad Khan, et al. Effect of examination stress on blood cell parameters of students in a Pakistani Medical College. *J Ayub Med Abbottabad* 2002;14(1):20-22.