



**SERUM LIPID PROFILE STATUS IN EXAMINATION STRESS
CONDITION**

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ABSTRACT

Proper understanding of the correlation between various forms of stress and lipid profile can help in the management of stress related diseases. This study was carried out to assess serum lipid profile in stress condition on a total of thirty (30) Bayero University, Kano students whose information on general lifestyle, including reading habits as well as anthropometric measurement were taken by means of semi-structured questionnaire. Their blood samples were taken before, during and after the commencement of examination and serum lipid profile was assayed. Mean serum Total cholesterol and mean High-density lipoprotein cholesterol were found to differ significantly ($p < 0.05$) when compared on before and after the commencement of examination with higher mean value after the commencement of examination while no significant difference ($p > 0.05$) was found with mean serum Triglyceride and low-density lipoprotein between these periods. Similarly, when compared on before versus during and during versus after the commencement of examination mean serum Triglycerides levels, Total cholesterol and Low-density lipoprotein levels were found to increase significantly ($p < 0.05$) during the commencement of examination. However, the decrease in High-density lipoprotein levels was observed at this period. Moreover, the same parameters were found to be higher in male than in female subjects. Thus, the results of our study revealed an increase in serum Triglycerides, total cholesterol and low density cholesterol but decrease in high

density lipoprotein cholesterol levels during the commencement of examination; the period at which the subjects were thought to be under the highest stress condition.

KEY WORDS: Examination, stress, serum Lipid profile.

INTRODUCTION

In general term, stress is said to be any condition that poses threat to human body causing it to respond by releasing chemical substances known as stress hormones. Stress is inevitable, especially in today's life as human beings are constantly faced with challenges, making them susceptible to stress related diseases. A variety of stressors (such as anxiety, fear, worries and pain) stimulate the release of cortical hormone from the adrenal cortex. Cortisol acts on the muscle, liver and adipose tissues to supply the body with the fuel to withstand the stress. Cortisol causes the mobilization of fats (lipids) deposited in the adipose and other tissues, leading to an increased levels of lipids in the blood. ^[1] Patterson and colleagues studied the effect of mental stress on lipid profile in 1993. Their study showed that stress increases Total cholesterol and Low-density Lipoprotein. ^[2] The study of Bacon and colleagues in 2004 demonstrated that stress increased Total cholesterol and Low-density lipoprotein cholesterol levels in 51 patients with suspected coronary artery disease. ^[3] Another study conducted in 2008 on 20627 individuals investigating the relationship between mental stress and cardiovascular risk factors demonstrated high stress levels in individuals with abnormal cholesterol levels. ^[4] A review reported by Dimsdale and Herd showed that the level of free fatty acids and TC increase in acute and chronic stress. ^[5] Similarly a study conducted by Fakhari and colleagues in 2004 demonstrated increased TAG in individuals who had experienced high levels of stress in the preceding 6–12 months. ^[6]

The effects of stress on serum lipid profile have been studied extensively as cited above. However, studying stress under various exposure conditions, such as examination can be of clinical significance. This study was aimed at assessing serum lipid profile in examination stress condition. The specific objectives are: ^[1] To confirm whether examination stress is enough to cause changes in serum lipid profile ^[2] To find, by context of lipid profile, whether the examination stress affects body positively or negatively.

MATERIAL AND METHOD

Study Site and Subjects, Sample Collection and Preparation

The study was carried out at Bayero University Kano, Department of Biochemistry. A total of thirty Bayero university Kano students served as volunteering study subjects. They were selected from different departments and faculties randomly with no inclusion and exclusion criteria because students mainly, tend to adjust their study style/ reading habit as exam approaches or during exam. Thus, any undergraduate student could serve as a subject for the study. These subjects were maintained throughout the study. Information on their study styles, nutritional habits and general life style was recorded by means of semi-structured questionnaire prior to sample collection. Venous blood (5ml) was collected from each subject, centrifuged and the sera stored. These samples were collected two weeks before the university examination. The same procedure was repeated during and after the commencement of the examination on the same subjects.

Methodology

Estimation of Serum Cholesterol level was done using the method of Zlatkis *et al.*, 1953.^[7]

High Density Lipoprotein Cholesterol was estimated using Lopes-Virella *et al.*, 1977 Method.^[8]

Triglycerides was estimated using the method of Mgowan *et al.*, 1983.^[9]

Low Density Lipoprotein Cholesterol was calculated with Friedewald's formula.^[10]

The study was approved by the Ethical Committee of the Institution and informed consent of the study subjects was obtained.

Statistical Analysis

The lipid profile data obtained was analyzed using ANOVA followed by Student's t-test.^[11]

RESULT

Table 1: Mean serum total cholesterol, HDL Cholesterol, LDL Cholesterol and Triglycerides levels before, during and after the commencement of examination

Periods	Total Cholesterol (mg/dl)	HDL Cholesterol (mg/dl)	LDL Cholesterol (mg/dl)	Triglycerides (mg/dl)
Before Commencement of Examination n= 30	201.6 ± 12.3 ^a	47.8 ± 8.9 ^b	133.5 ± 14.1	102.1 ± 18.0 ^d
During Commencement of Examination n= 30	209.6 ± 6.3 ^a	40.5 ± 2.9 ^b	137.9 ± 7.6 ^c	119.6 ± 15.4 ^d
After Commencement of Examination n= 30	190.0 ± 9.9 ^a	41.3 ± 3.3	130.0 ± 14.8 ^c	100.5 ± 17.7 ^d

Values are presented as mean \pm standard deviation. Values with Similar superscript are significant at $p < 0.05$.

Table 2: Mean serum total cholesterol, HDL Cholesterol, LDL Cholesterol and Triglycerides levels before, during and after the commencement of examination according to sex.

Period	Serum TC (mg/dl)		Serum TAG(mg/dl)		Serum HDL-C(mg/dl)		Serum LD-C(mg/dl)	
	Male n=8	Female n=7	Male n=8	Female n=7	Male n=8	Female n=7	Male n=8	Female n=7
Before Exam, n=30	206.2 \pm 6.7 ^a	192.3 \pm 4.4 ^a	41.9 \pm 5.4	40.4 \pm 5.5	132.0 \pm 3.3	131.2 \pm 4.2	106.0 \pm 4.3	107.2 \pm 15.5
During Exam, n=30	209.8 \pm 8.8 ^b	199.5 \pm 2.1 ^b	48.7 \pm 2.1 ^c	42.0 \pm 2.2 ^c	127.2 \pm 2.3	129.4 \pm 5.5	128.8 \pm 11.2 ^d	121.7.0 \pm 14.4 ^d
After Exam, n=30	194.7 \pm 4.3	191.0 \pm 5.8	42.6 \pm 4.9 ^e	38.9 \pm 2.4 ^e	133.1 \pm 3.3 ^f	139.4 \pm 5.3 ^f	109.3 \pm 7.6	115.1 \pm 12.7

Values are presented as mean \pm standard deviation. Values with superscript are significant at $p < 0.05$

Mean serum total cholesterol (TC) and mean High density lipoprotein (HDL) cholesterol were found to differ significantly ($p < 0.05$) when compared on before and after the commencement of examination with higher mean value after the commencement of examination while no significant difference ($p > 0.05$) was found with mean serum Triglyceride (TAG) and low density lipoprotein (LDL) cholesterol between these periods. Similarly, when compared on before versus during and during versus after the commencement of examination mean serum TAG levels, TC, LDL cholesterol and mean serum HDL cholesterol levels were found to differ significantly ($p < 0.05$) with higher value of TAG, TC and LDL Cholesterol but lower value of HDL during the commencement of examination.

DISCUSSION

Mean serum TC, LDL cholesterol and TAG were found to be higher during than before the commencement of examination in this study. Our result is consistent with the findings of the previous studies on the relationship between stress level, TC and LDL-C. Patterson and colleagues studied the effect of mental stress on lipid profile in 1993. Their study showed that stress increases TC and LDL-C [1]. The study of Bacon and colleagues in 2004 demonstrated that stress increased TC and LDL-C levels in 51 patients with suspected coronary artery disease.^[2] Another study conducted in 2008 on 20627 individuals investigating the relationship between mental stress and cardiovascular risk factors demonstrated high stress

levels in individuals with abnormal cholesterol levels. [3] A review reported by Dimsdale and Herd showed that the level of free fatty acids and TC increase in acute and chronic stress. [4] Similarly a study conducted by Fakhari and colleagues in 2004 demonstrated increased TAG in individuals who had experienced high levels of stress in the preceding 6–12 months. [5]

Studies concerned with explaining the pathophysiological mechanisms underlying lipid profile disorders and mental stress emphasize that following acute stress, serum cholesterol concentration increases. This can be justified knowing that insulin, a hormone that stimulates glucose metabolism in stress period through the activation of glucose transporters, also activates HMGCoA reductase, an enzyme that catalyzes the committed step in cholesterol synthesis, leading to increased rate of glucose synthesis. [5]

It is also understood that activation of the sympathetic nervous system in stressful episodes increases free fatty acids. On the other hand, chronic stress is associated with behaviours such as intake of high-fat meals, cigarette smoking and drinking alcohol, which in turn lead to disorders of lipid profile. [11] Nelson and Cox (2008), thought that cortisol hormone secreted by the stimulated adrenal cortex in stress situation, stimulates synthesis of triglycerides in the liver through glycerogenesis by activating phosphoenolpyruvate carboxykinase in the liver. [12]

Following the analysis of the data according to sex, mean serum TC, TAG and LDL-C levels were found to be significantly ($p < 0.05$) higher in male subjects than in female subjects in similar pattern. This points to the fact that males are more susceptible to stress caused lipid alterations than females.

Our study observed significant decrease ($p < 0.05$) in HDL-C during examination which is thought to be due to the increase in LDL-C levels. Thus, prolonged exposure to stress, according to this study, can be associated with increased risk of hypercholesterolaemia.

CONCLUSION

Our study showed that the higher the examination stress the higher the serum total cholesterol, Low density lipoprotein cholesterol and Triglycerides levels and lower the serum High density lipoprotein levels, suggesting an increased risk of hypercholesterolaemia in stress condition.

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Recommendation

We recommend further research to study the effect of various forms of stress on cardiac enzymes.

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