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Effects of perceived stress on lipid profile and BMI (body mass index) in health professional students of Sumandeep Vidyapeeth Deemed to be University, Vadodara

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Abstract---Nelson Mandela, one of the all-time great personalities of the world beautifully described about how education is a powerful tool by commenting that "*Education is the most powerful weapon which you can use to change the world*". In order to be educated, one has to acquire adequate amount of competency in the program. We often experience that most of the students are under stress, not only striving to be competent but also to achieve a high level in this competitive environment. "stress is as an unpleasant state of emotional and physiological arousal that individuals experience in situations that they perceive as dangerous or threatening to their well-being" Cross sectional study was conducted in the Department of Biochemistry, SBKS MI & RC, SVDU for consecutive two batches 2016-17 & 2017-18. Total 506 first year MBBS, BDS & BPT students were studied for age, gender, Lipid Profile and Body mass index. Stress was assessed by PSS-10 scale. Two groups were identified as their PSS score, stressed and non-stressed. Various studies have shown to increase in total cholesterol and LDL level during stress stage also TAG in individuals who had experienced high levels of stress in the preceding 6–12 months also seen changes in body mass index. Screening once every in a years for healthy adults with no cardiovascular risk factors, are important.

Keywords---effects perceived stress, lipid profile, body mass index.

Introduction

The word 'stress' is used in everyday life and every profession and field. Generally it is talked about in a non-specific way to refer broadly to the process of coping with various pressures and problems of life and talked in a loose way, mostly negatively. When we look at a more precise definition of stress, in the Concise Oxford Dictionary, stress is defined as a 'demand on energy'. Occupational psychology extends the concept of stress quoting the Torrington that "stress is a demand made on our physical or mental energy. In student's life, academic stress is most prevalent.^{1,2} Competitive environment with long working hours due to huge burden of curriculum framed by the council; frequent assessment and limited time available for revision leads to fear of failure. Starting from the later years of schooling, many students are constantly under stress from the parents, peers and individual aspirations to get high ranking and enter good professional courses. To achieve this, students focus completely on academics, spending long hours for studies and neglecting completely social and extracurricular activities which facilitate relaxation. This academic stress does not end even after schooling and it continues after entry to professional courses³. Students who successfully enter a choice of their professional course such as medical education will be encountered with monumental tasks of completing the path in a productive way. Students who were toppers during the schooling days are not able to keep up that status in the initial years of professional course due to various academic and non-academic reasons. It will result into academic stress. Academic stress resulted due to lower academic performance will reflect on many other aspects. The emotions of students get affected and there will be a progressive rise in the levels of stress. The analysis of serum lipid profile was very much useful in the diagnosis of cardiovascular diseases, and CVD is recognized as an important threat to human health⁴. Serum levels of various lipids are influenced by not only nutrition, body weight, physical activity, medications and genetic factors but also are affected by mental status⁴. Stress can be explained as one of the causes behind disturbance in the metabolism of lipids leading to alterations in various lipid parameters of serum. Stress activates the sympathetic nervous system which increases the production of serum lipids and also by altering the lipid metabolism⁵. Stress hormones induce lipolysis and release free fatty acids into the blood circulation; which form triglycerides and subsequently to the synthesis of VLDL in the liver⁶⁻⁸. Anxiety, fear, worries and pain stimulate the release of cortisol hormone from the adrenal cortex, which acts on the muscle, liver and adipose tissues to supply the body with the fuel to withstand the stress. Stored fats in adipose tissue are mobilized by action of hormone, causing accumulation of lipids into the blood. According to Patterson and colleagues (1993) mental stress may alter the pattern of lipid profile⁹. Overweight and obesity are on the rise in the population especially in the younger population. There are many reasons for increasing prevalence of overweight and obesity. These are changes in dietary habits, sedentary habits and shifting from traditional food to fast food. One of the reasons often mentioned for putting up weight is mental stress. During mental stress, both behaviour and habits of persons change which in many instances leads to overeating and development of obesity. To categorize a person as normal weight, overweight or obese, body mass index is a very reliable parameter which is based on height and weight of an individual. Prevalence of obesity has been on the rise among the student community.

Materials and Methods

Cross sectional study was conducted in Department of Biochemistry, SBKS MIRC after Ethical clearance (SVIEC/ON/MED/PHD/16086). Total 506 health professionals beginners, who volunteered and gave consent, were recruited. Study was conducted for consecutive two years (2016-17 & 2017-18 batches) of first year students of MBBS, BDS & BPT. All the students were explained the objectives of present study in detail. Students of any kind of self reported psychological disorders considered as excluded. After recording of age, gender and demographic aspects stress was assessed with the Pre-validated Questionnaire "Perceived Stress Scale". Each item is rated on a 5-point scale ranging from never (0) to almost always (4). Positively worded items are reverse scored, and the ratings are summed, with higher scores indicating more perceived stress.

Biochemical Parameters

The study protocol involved collecting fasting blood sample from each participant by 9.00 am.

Lipid Profile

Subjects were made to relax before sample collection and care was taken while collecting samples as to cause minimal stasis and pain. Samples consisted of 5ml of venous blood collected aseptically from antecubital vein and dispensed into fluoride oxalate tube for blood sugar estimation and plain venoject® tube for other studies. The blood in the plain tube was transported to the lab in ice pack. The rest were stored at 4°C for the estimation of lipid profile within 48 hours. Both samples and reagents were brought to room temperature before analysis.

Body Mass Index (BMI)

Height was determined by using a measuring tape which was in cm and it was recorded to the nearest 0.5 cm. Weight was measured by using a Kg weight scale and it was recorded to the nearest 0.1 kg by using an electronic scale. The formula used for calculating BMI was weight in kg, divided by square of height in metres. BMI was classified into six groups according to the National Institute of Health (NIH) guidelines, 1998; Group 1 -underweight (BMI - < 18.5), Group 2 - normal (BMI - 18.5 to 24.9), Group 3 -overweight (BMI - 25-29.9) and Group 4 – obesity, which was subdivided in to obesity grade 1 (BMI - 30-34.9), obesity grade 2 (BMI- 35-39.9) and obesity grade 3 (BMI - ≥40).

Results

Table 1: Lipid Profile Parameters in First year Health professionals

Lipid Profile (N=506) mg%	Mean±SD
Total Cholesterol	173.21±4.89
Triglyceride	130.56±11.23
LDL	80.81±7.52

HDL	39.56±3.14
VLDL	26.11±2.25

Table 1 gives the details about the levels of various lipid parameters in all the 506 participants. Study found that the mean values of Total Cholesterol as 173.21±4.89 mg%, Triglyceride was 130.56±11.23 mg%, LDL-C was 80.81±7.52 mg%, HDL-C was 39.56±3.14 mg% and VLDL-C was 26.11±2.25 mg%.

Table 2: Comparison of Mean± SD of Total cholesterol ,Triglyceride, HDL-C and LDL-C between stressed and non stressed group

Lipid Profile	Stressed		Non Stressed		p value
	Mean	SD	Mean	SD	
Total Cholesterol	185.25	15.65	160.65	10.26	0.0001
Triglyceride	130.49	20.54	128.37	10.41	0.2403
LDL	87.82	7.38	71.56	5.96	0.0001
HDL	39.41	2.91	43.07	3.12	0.0001
VLDL	26.09	4.11	25.12	2.08	0.0074

Present study compared the lipid profile parameters in stressed and non stressed students. The levels of various lipid parameters between two groups was: Total Cholesterol (185.25±15.65 Vs 160.65±10.26, p value <0.0001) ,Triglyceride (130±20.54 vs. 128.37±10.41 p value is 0.24) , LDL(87.82±7.38 Vs 71.56±5.96, p value <0.0001), HDL(39.41±2.91 Vs 43.07±3.12, p value <0.0001) and VLDL(26.09±4.11 vs. 25.12±2.08 p value <0.001). Difference in all lipid profile parameters except triacylglycerol was statistically significant.

Table 3 Distribution of First year Health professionals as per their Body mass index (BMI)

BMI Category	N	%
Underweight	53	10.47%
Normal	302	59.68%
Overweight	89	17.59%
Obese	62	12.25%

Table 3 shows the distribution of the enrolled participants for their BMI value. Study found that out of 506 participants 59.68% (N=302) had normal BMI as per National Institute of Health (NIH) guidelines, 1998; while 17.59% were found overweight, 12.25% were found obese and 10.47% were found underweight.

Table 4: Body Mass Index (BMI) distribution between Stress and Non Stressed Groups

BMI Category	Stressed	%	Non Stressed	%	chi square value	p value
Underweight	38	10.47%	15	10.49%		
Normal	204	56.20%	98	68.53%		

Overweight	68	18.73%	21	14.69%	9.347	0.025
Obese	53	14.60%	9	6.29%		
Total	363	100.00%	143	100.00%		

Chi square test,*<0.05 significant

In the present study it was found that in both stressed and non stressed group, participants with normal weight were higher, i.e. 56.20% vs. 68.53% whereas it was observed that overweight and obese participants were higher in stressed group as compared to non stressed group, i.e. 18.73% vs. 14.69% and 14.60% vs. 6.29% respectively

Discussion

It is well known that when a person is under stress there will be a change in behavioural pattern and also his/her dietary preferences also get affected. A number of studies have reported that one of the reason for obesity is eating of non-traditional food like junk food. It is often observed person under stress does not follow regular schedule of dietary intake and will have more inclination of consuming irregular items such as junk food. Changed pattern of diet affects various serum parameters such as lipid profile and blood sugar. In the present study we have analysed various parameters of lipid profile such as serum total cholesterol, LDL cholesterol, HDL cholesterol, VLDL cholesterol and Triacylglycerol in all the 506 medical, dental, Physiotherapy Health professional students. We have observed mean values of Total Cholesterol, triacylglycerols, LDL cholesterol, HDL cholesterol and VLDL cholesterol as 173.21 ± 4.89 mg%, 130.56 ± 11.23 mg%, 80.81 ± 7.52 mg%, 39.56 ± 3.14 mg% and 26.11 ± 2.25 mg% respectively. Other workers have reported similar findings (Meludu (2005) ¹⁰ .

In the present study serum cholesterol in stressed and non stressed students was 185.25 ± 15.65 and 160.65 ± 10.26 mg/dl. The difference between these groups was statistically significant with $P < 0.0001$. Serum cholesterol in stressed group was higher than that of non-stressed group. Surtees et al (2008) ¹¹ reported similar observations. It implies that mental stress leads to abnormal level of total cholesterol. Bacon and colleagues (2004) ¹² and Patterson et al (1993) ¹³ also showed that mental stress alter the total cholesterol level. Dimsdale and Herd (1982) showed that the level of free fatty acids and total cholesterol increase in acute and chronic stress ¹⁴.

Serum levels of serum triacylglycerol in the present study were 130 ± 20.54 and 128.37 ± 10.41 mg/dl in stressed and non stressed students respectively. The difference between both the groups was not statistically significant ($P < 0.24$). Where as other researchers reported an increase in the levels of serum triacylglycerol in individuals who had experienced high levels of stress in preceding 6-12 months (Fakhari and Peterson colleagues ^{15,16} Other parameters of lipid profiles such as HDL-Cholesterol, serum levels of this parameter in stressed students was 39.41 ± 2.91 mg/dl and in non-stressed students it was 43.07 ± 3.12 mg/dl. Serum levels of this parameter in both the groups was almost similar. A significant difference in the levels LDL-Cholesterol was found between stressed and non stressed students ($P < 0.0001$). Levels in these groups were 43.07 ± 3.12 and 71.56 ± 5.96 mg/dl respectively. Our findings are similar to

those reported by other workers (Shahnam et al in 2010.^{221,223}It is postulated that stress increases serum lipids due to increase in hepatic lipoprotein lipase activity caused by heightened sympathetic neuronal response. 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 profile¹⁷.

In the present study more than 30% of students were having BMI >23 kg/m² (overweight and obese). The findings of the present study were similar to those published studies by Shah et al (2014) and S Gopalkrishnan et al (2012). In the studies by these researchers reported percentage of 34.05% and 30.7% of students were found to be overweight respectively^{18,19}. Simultaneously, prolonged sleep deprivation and sedentary lifestyle increases both food intake and energy consumption enhanced by hormonal imbalance are leading causes of weight gain²⁰.

Present study found that the PSS score of stressed and non-stressed groups in obese (p<0.05) and overweight(p<0.05) category were found to be more significantly correlated. In the present study a significant association was found (chi square; p <0.05) when compared for BMI and PSS score. Many studies in literature found no correlation between PSS and BMI²³¹ where as some researchers reported a positive correlation of PSS with BMI.

Conclusion

This study also included analysis of biochemical parameters and their correlation with perceived stress with Lipid profil and BMI. One perceptible change in the way the study was conducted was inclusion of analysis of biochemical and physiological parameters in different biological fluids and correlation of the results obtained with the scores of perceived stress. Difference in lipid profile parameters such as total cholesterol, HDL cholesterol, LDL cholesterol and VLDL cholesterol was statistically significant between stressed and non-stressed students(<0.0001). No such difference was observed in case of serum triacylglycerol levels. No such difference was observed in case of body mass index when we compared stressed and non stressed students. Follow up study for a long period may be conducted to see for early onset of atherogenic changes related to blood lipid levels during stressful life events occurring from time to time. The inability to adapt to stress may be associated with the onset of depression and anxiety. These psychological stress variables probably influence the levels of standard risk factors for CHD. Hence psychological factors along with socioeconomic problems, especially of students coming from rural interiors, needed to be studied.

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