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Stress and Obesity in Umm Al-Qura University Medical Students

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Abstract: This cross-sectional study aims to find out incidence and severity of stress among undergraduate male and female medical students and explore its association with Body mass index (BMI). A total of 523 young healthy males and females (19- 22 yrs) were categorized as normal, overweight and obese based on their BMI. The level of stress was determined among the participants using PSS-14 questionnaire. Majority of the male participants were found to be overweight with an average BMI 26.95±0.34 while average BMI noted in females was 23.66±1.25. Around 36% of these undergraduate medical students were found to be stressed with average stress score of 26.09± 0.51. In fact among overweight males incidence of stress was 33.66%. However, female subjects showed an increase in percentage prevalence of 94.12% in obese category. Interestingly stress score both in male and females showed a rising trend with maximum in obese being 26.09±0.51 in males and 32.53±1.73 in females. The level of stress was significantly different between obese male and obese females (P<0.00027). Statistically significant correlation (P<0.05) is observed between stress vs. BMI, Stress vs. Weight, Stress vs. Waist Circumference (WC) and stress vs. Hip circumference (HC) in the overweight females. The occurrence and severity of stress is found greater in female undergraduates.

Keywords: Perceived stress, undergraduate medical students, stressors, obesity.

INTRODUCTION

Undergraduate medical training is known to be stressfuI [1]. This journey is difficult, competitive, and strenuous. Studies have established that, 30-50% of medical students have perceived stress [2-3]. Nevertheless, academic stress is reported among both medical and nonmedical students [4-6] at different stages of their education and training, inparticularly during the transitional stage from school to university [7]. Jafri SAM et al, in his studies compared students of medicine with other fields in Karachi Pakistan and reported higher level of stress in 54% medical students compared to 20% in Arts, 32% commerce and 26% in engineering students [4]. In another study 48% stress is observed in female medical students where-as 38% among students of accounting, marketing and Secretarial training at Dammam medical college and college of applied sciences and community services Dammam Saudi Arabia [5]. Another survey showed more frequent symptoms of anxiety and depression in medical, particularly among the female students compared to the pharmacy at University of Belgrade [6]. A number of factors are attributed by researchers to be responsible for this higher level of stress in medical students like, exposure to high psychological demands with low decision autonomy [8] higher expectations of parents and teachers that can't be meet with in the given time [9]. Insufficient recognition and feedback that a medical student receives in response to all the effort, sometimes inadequate resources and support from family, friends are the possible reasons of higher stress in medical students [10]. Exposure to academic overload, long working hours, time limitation, frequent exams, competitive environment, rigid authoritative faculty, language, family and financial difficulties make the environment complex leading to stress [7,11]. Although some level of stress is good for learning in a medical school training [12], but continuous pressure and demanding atmosphere of medical school decreases the academic performance along with its effect on the physical and mental health [13]. This stressful environment presents in the form of problems like anxiety, depression, behavioral, eating and sleep disorders [14] which may lead to premature deaths, [15] attempt of suicides [16] and low quality of life [17]. Further an increased use of alcohol, cigarettes and drugs among medical students is found as an attempt to reduce their stress [15]. In addition, studies regarding stress in medical students observed a gender difference as well in the level and severity of stress and female students are generally found to have higher than the males [6]. A study on Saudi medical students reported highest level of stress in 1st year medical students with female preponderance [18]. Sani and Abdul Ghani

observed females to be more stressed than males but Al Sunni found no significant difference in the stress scores of male and female [19, 18, 20]. Earlier Dyrbe and Khan *et al*., also indicated higher prevalence of stress among females [21, 22].

Stress induced physical and mental problems can be reduced by the effective use of different coping strategies such as, regular exercise and prayers [23]. It is further observed that, stress causes under or overeating and this change is influenced by stressor severity, type of stressor and genetic predisposition [24, 25]. According to Rebuffe-Scrive1992 and Karatsoreos mobilization of fat occurs under acute stresses while chronic stress results in deposition of fat preferably with in the abdomen because of long standing exposure to Glucocorticoids [26, 27].

So, medical students have to cope with phases of mild, moderate or severe stress during the entire course of their education and training. This stress will not only have a negative impact on their attentive functioning and learning but also increases the risk of hypertension, diabetes, peptic ulcer, cardiovascular and musculoskeletal problems [28, 29]. Although, both stress and obesity are recognized as serious health issues for Saudi medical students however, the available literature fails to show the relationship between stress and body weight clearly among them. Moreover, the influence of gender if any is also not duly addressed. This study aims to investigate young Saudi male and female medical students for:

- Occurrence of stress and obesity.
- The relationship between stress and body weight.
- Determine the effect of gender on occurrence and severity of stress.

SUBJECT AND METHODS

This cross sectional study was carried out between January–June 2016. A total 523 undergraduate medical students of Umm Al Qura University (UQU) Makkah, Saudi Arabia participated in the study. All the Subjects were 19-22 years of age with no history or evidence of any chronic disease. The project was approved by the university Ethical committee and all the participants signed a written consent before joining the project.

Anthropometric measurements

Standardized protocols were used to measure body weight, height, waist and hip circumference [30]. BMI was calculated dividing weight in Kg by height in Meters Square. As per WHO guidelines [31]. The Participants were then classified in four categories on the basis of their BMI. Underweight= BMI (< 18.5), normal= BMI (18.5-24.9), Overweight= BMI (25-29.9) and obese= BMI (≥30).

Waist hip ratio (WHR) an indicator of abdominal visceral fat was calculated as waist circumference (WC) divided by the hip circumference (HC) [32].

Perceived stress score

Perceived stress scale 14 (PSS-14) was used to assess the levelof stress Perceived. It consists of 14 questions each with five options from never to very often. The PSS has an internal consistency of 0.85 (Cronbach α coefficient) and test-retest reliability during a short retest interval (several days) of 0.85 [33]. To make the process reliable all the questions were presented both in English and Arabic languages. On the basis of stress score subjects were categorized as normal (0-14) mildly stressed (15-28), moderately stressed (29-42) and severely stressed (43-56). Participants with a stress score of (≥ 28) were identified as being stressed [34].

Statistical analysis

The values are expressed as mean ± SD. Unpaired student t test was used for continuous normally distributed variables. Whereas, Non parametric Mann Whitney U test (two tailed) was used to compare the severity of stress level between two groups and a *p value of less than 0.05 was considered significant. A* non-parametric spearman correlation was performed to assess relationship between PSS-14 scores and anthropometric components. All statistical analysis was performed using graph pad prism (Graph Pad 6 Software, La Jolla CA, USA).

RESULTS

Characteristics of the participants

All participants of this study age between 19-22 years. Out of 727 students who received the questionnaire 523 (males n=418 and females n=105) responded by returning it after completion. Thus, the response rate was 72percent. Stress is known to change eating habits among medical students. We investigated our medical students using different paraphernalia/tools (Table-1).

BMI is used as an indicator of obesity in most of the research studies. Its calculation in our subjects, showed mean value of 26.95±0.339 for males and 23.66±1.25 for the females (Table 1). It reflects that, majority of our young male participants are in the overweight category according to the WHO criteria. However, many researchers consider waist circumference (WC) and waist hip ratio (WHR) to be the better indicators of central or abdominal fat than BMI. In our subject population mean values of WC and WHR among males is 90.24±0.872,0.94±0.009 and females is 73.92±13.13, 0.89±0.016 respectively (Table 1). This confirms that, majority of our male participants are overweight. All anthropometric parameters are significantly ($p<0.00001$) higher in males.

Moreover analysis of perceived stress established a mean of 24.57±0.026 among males and 30.90±5.96 in female participants. These results indicate that, female participants have moderate degree of stress (Table 1). On the other hand our male subjects are overweight but not stressed perhaps they are coping their mild stress efficiently. Whereas, females have normal BMI and are suffering with moderate level of stress may be because of poor coping strategies. However, statistically the difference between male and female stress score is non-significant.

Table-1: Characteristics of the participants

Parameters	Male	Female	p value
	n=418	n=105	
Age	19.04±0.023	19.98±0.08	p<0.0001
Weight	78.13±1.013	56.16±11.78	p<0.0001
Height	1.7±0.005	1.55±0.06	p<0.0001
BMI	26.95±0.339	23.66±1.25	P<0.05
Waist circum	90.24±0.872	73.92±13.13	p<0.0001
Hip circum	97.76±0.887	92.82±16.70	p<0.0001
Waist hip ratio	0.94±0.009	0.89±0.016	p<0.0001
PSS 14	24.57±0.026	30.90±5.96	NS

BMI; body mass index, waist circum; waist circumference, hip circum; hip Circumference, PSS14; perceived stress score 14

The Occurrence and Severity of stress is more in females

Stress scores for all the subjects were determined from their responses to the questionnaire. Participants were classified into non-stressed and stressed groups based on a cut-off; <28 as Non-stressed and ≥28 as stressed. The Percentage of stress along with the average values of stress scores obtained from normal weight, overweight and obese male and female groups are presented (Table-2). According to the results 36 percent of the total respondents are stressed with a mean stress score of 26.09±0.51. In particular male subjects of the study group showed 24.7 percent stress with a mean stress score of 25.12±0.069, (Table-2) but when they are considered separately in different BMI groups, the prevalence of stress ranges from 27.36 percent in normal weight, 33.66 percent in overweight to 31.37 percent among obese subjects. On the other hand 61percent of females have a mean stress score of 31.16±0.59 and categorized as moderately stressed. However, stress observed among normal weight, overweight and obese female participants was 65.38 percent, 66.67 percent and 94.12 percent respectively (Table-2).

Table-2: Occurrence and severity of stress among participants

Parameters	Male	Female	P value
	n=418	n=105	
Prevalence percentage	24.7%	61%	
Stress Score	25.12±.069	31.16±0.59	Not significant
N.Wt. prevalence %	27.36%	65.38%	
N.Wt. Stress score	24.09±0.41	28.96±0.55	Not significant
Ovr.Wt Prevalence %	33.66%	66.67%	
Ovr.Wt stress Score	25.02±0.66	30.57±1.31	Not significant
Obese Prevalence %	31.37%	94.12%	
Obese stress score	26.09±0.51	32.53±1.73	*P*=0.00027**

All values are given as mean±SD. A value $p < 0.05$ is considered statistically significant and represented as (**)
N.Wt; normal weight; prevalence %; prevalence percentage, ovr.Wt; over weight

Influence of BMI on Perceived stress

An interesting outcome of our study is the different trend shown by male and female participants regarding relationship between perceived stress and BMI (Figure1A & B). Among the different groups overweight male participants showed maximum stress incidence (33.66%) (Figure-1A). Although, obese have higher stress score hence severity of stress than the other groups. Nonetheless, female participants in this study not only showed higher stress level than the males in every class of BMI but showed a gradual rise in percentage of perceived stress as well with increasing BMI, representing maximum effect of BMI in obese (Figure 1B &C).

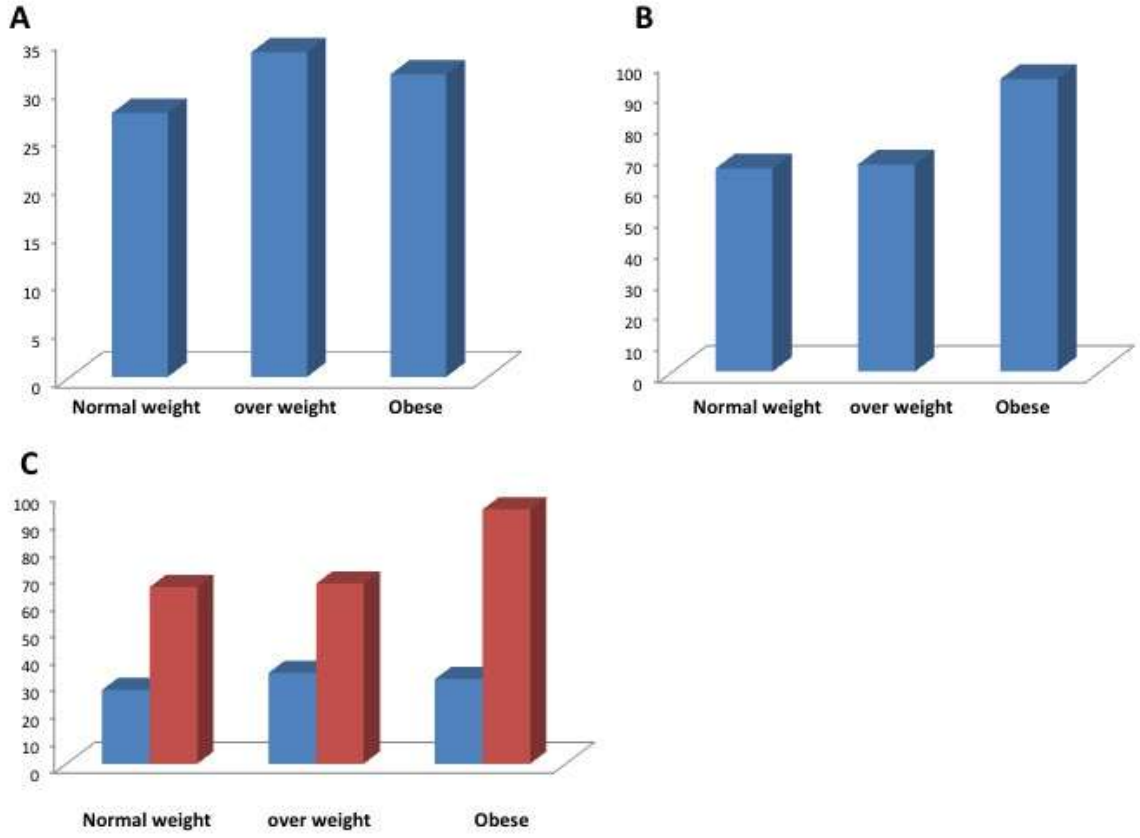

Fig-1: Perceived stress among different categories

A) Males classified as normal, overweight and obese; B) Females normal, overweight and obese; C) All the study participants grouped into (normal, overweight and obese), blue columns show stressed boys and red columns represents stressed girls.

Relation of stress Severity with BMI

It is important to note that, both the male and female participants demonstrated a rising trend in the mean stress score with an increase in the BMI being minimum in normal weight and maximum in obese (Figure 2A &2B). In males a gradual increase of 3.86 and 4.28 percent is observed between normal versus overweight and overweight versus obese respectively (Figure 2A).This gives 8.3 percent increment to the stress score on aggregate from normal weight to obese (Figure 2A). Similar pattern of rise in stress score is noted in the females as well from normal weight(5.56%) and overweight to obese (6.4%) but in comparison to males it is stronger and associated with smaller change in BMI being 12.35 percent for 55 percent increase in BMI (Figure 2B). In addition, comparison of male and female stress scores among different BMI classes also showed an increasing difference in females being 20.21 percent, 22.18 percent and 24.68 percent respectively in normal weight, over weight and obese. However, statistically this difference in stress score between male and female participants is significant only in obese group (Table 2).This indicates that, among females occurrence of perceived stress and its severity are highly sensitive to increase in BMI whereas, in males this association between stress and BMI is limited to stress score (Figure 1C,2A,2B).

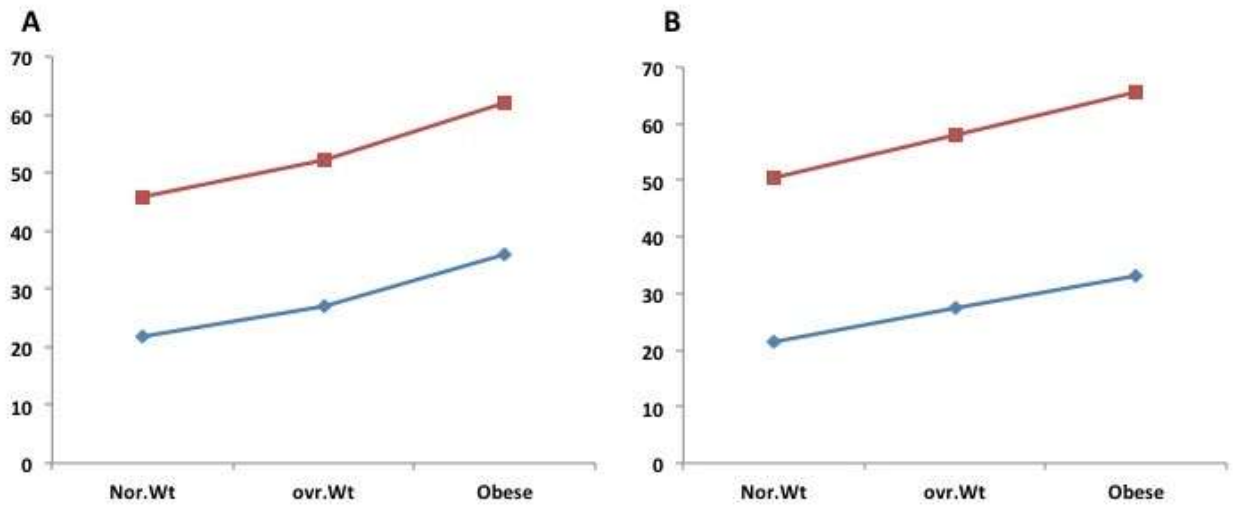

Fig-2: Relationship of the level of stress with body mass index

A) Males red line (top) indicates stress level and bottom line represents rising BMI. B) Females stress is shown with red line (top) and bottom line (blue) denotes BMI Nor. wt; normal weight, ovr. Wt; over weight,

Comparison of severity of stress between male and female

On the basis of stress score both male and female participants are labeled normal, mild, moderate and severely stressed (Figure 3). Majority of male subjects are in the mild group with few in normal and small number in the moderate category. However, none of the male is found severely stressed (Figure 3). However, majority of females are moderately stressed along with few severely stressed in the obese group. A reasonably good number of female students belong to mild category as well with no one in normal group (Figure 3). This confirms that, in females occurrence of stress is higher as well as stronger in terms of severity than males.

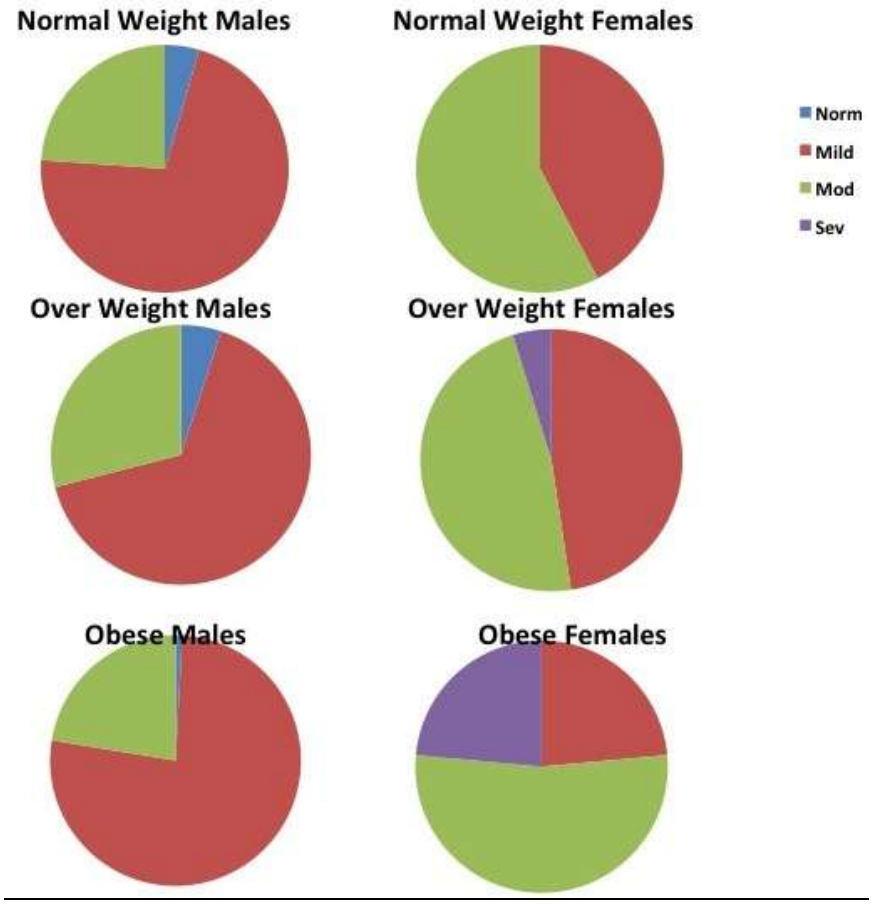

Fig-3: Comparison of the severity of stress

Pie chart on the left indicates three male groups. Whereas the right side represents the female groups

Stress is associated with anthropometric components

In this study we observed increase in occurrence of perceived stress as well as in its severity with rise in BMI. Therefore we examined existence of any association between stress score and anthropometric variables. Positive and significant ($P<0.05$) correlation is observed between stress score and BMI, Weight, WC and Hip circumference only in the over weight class of female participants. The strongest correlation (r 0.620) was observed between stress score and BMI while the weakest (r 0.335) between stress score and WC. However, normal weight and obese females demonstrated non-significant Pearson correlation between Stress score and anthropometric variables. Pearson correlation between Stress score and anthropometric variables in all male participants is found non-significant.

DISCUSSION

We have established that 36 percent participants of the study are stressed. This is lesser than the percent incidence reported earlier in Saudi medical students by different studies ranging from 40.4—77.9 percent [35-37,18-20]. As for the percentage of study population with stress in our studies is also lesser than reported among the medical students of many other countries, Egypt (43.7%), Malaysia (41.9%), Thai (61.4%), Ethiopians (52.4%), Indians (73%) and Pakistanis (90%) [38,2,39,40,11,3]. This lesser percentage of stress that we observed in our students can be explained on the basis of factors like, different type of questionnaire that we use compared to the other studies, difference in the curriculum and or evaluation system. A maximum of 95 percent of our respondents live with their families, this is another reason of low stress incidence in our study as loneliness, quality of food in mess and staying away from family and friends associated with the hostellers are psychosocial factors producing stress [41]. All of our participants belongs to 1st year where as in many other studies that we mentioned earlier students from different academic years were included.

Conflicting results have been reported regarding the association between gender and stress. Few groups have [19,18,42,43] observed female Saudi medical students to be significantly more stressed than males but Farooq SN and Sunni found no significant difference in the stress occurrence or scores between male and female [36,20]. However, in present study large number of our female participants showed moderate stress while, some of them are noted to be severely stressed, but most of the males showed mild stress. Our results also demonstrate 37 percent higher

occurrence and 24 percent greater stress score among the females compared to male participants. One of the possible reason for the higher level of stress found among females of this study may be the different social, cultural and religious restrains for females in every field of life whether educational or recreational. Moreover, females are more likely to perceive challenging and threatening events, like exams, dissecting cadavers and dealing with males whether staff or patients, more stressful than the males and such events are integral part of medical education [43, 6].

Stress is considered as one of the factors involved in the etiology of obesity. Stress, Psychological in particular is reported to have an association with changes in choice of food, quantity of food intake, weight gain and visceral fat deposition, which is linked with greater health risk [44]. Present study not only demonstrated stress associated weight gain in our participants but it is also observed that, the more the stress prevalence and stress score increases the more will be an increase in BMI from normal to overweight and obese (Fig-1a,b & 2a,b) both in male and female with female preponderance. Another study by Qahtani MH [45] revealed 91.3 percent Saudi students consume fast food three times/week with lot of soft drink and less vegetables and fruits. He also observed that, 65 percent males and 80 percent females are not engaged in any regular exercise. As such we can deduce that, under the influence of stress, changes in the energy intake and expenditure are one of the reasons for increasing BMI in our subjects.

In a study on female Saudi medical students reported increased plasma level of Cortisol, Adrenocorticotropic hormone, neuropeptide Y, Adrenomedulin, Nitrite and Nitrate during the time of academic stress as compared to base line level. We are of the opinion that, our participants being Saudi medical students as well, with the same social and cultural background, responds to different stressors, academic in particular in similar fashion.

The association observed between stress and BMI is possibly because of stress induced hormonal imbalance that might leads to an increase in the body weight and BMI [46]. Awaking in the night and going to sleep in early morning hours is common in Saudi society particularly in young ones. Majority of students also prefer to study in the night so, an additional stressor. Further, working in the night is found to associate with high total energy intake in the form of snacks and lot of soft drinks thus leading to increase in BMI [47]. So we can conclude that, medical education like many other countries is stressful in Saudi Arabia as well, which could be one of the important causes of overweight and obesity in Saudi medical students. Serious efforts are required to minimize stress and associated effects, during the course of medical education with particular reference to female students.

CONCLUSION

Both the incidence and severity of stress is found stronger in females. In current study we noticed an increase in BMI with both an increase in stress prevalence and stress score. Therefore, serious measures have to be taken to minimize the stress as well as stress associated changes in BMI. Students usually blame academic overload, travelling problems and lack of recreational opportunities for their stress. Changes in curriculum contents, teaching methodologies, student counseling programs, time management programs, teamwork and recreational opportunities should be extended particularly for those identified stress prone and with low coping capabilities.

Limitations of the study

Due to the cultural restrains number of female participants is very low compared to males, which in our opinion is a limiting factor in the study. In some of previous studies plasma level of different hormones were measured to demonstrate stress induced stimulation of hypothalamic pituitary adrenal axis and sympathetic nervous system. Biochemical investigations were not included in present study, which is another limitation and is part of our future research plan.

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