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## Stress and eating – A one way path or circular? Perceived Stress and its association with Body Mass Index among medical students in a medical college in South India

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### Abstract

**Background:** Psychosocial stress has been implicated as a risk factor for high blood pressure, cardiovascular disease, and cancer. Medical students experience a relatively high level of professional and personal stress, with adverse consequences on academic performance, competency, professionalism, and health. This may result in altered behavior pattern and dietary habit resulting in weight change.

**Objective:** This study was conducted to determine the prevalence and association between perceived stress and body mass index.

**Methods:** A Cross sectional study was done on 613 students in a medical college. Standardised PSQ-14 was used to calculate PSSI. Weight and height were measured by standard techniques, BMI was calculated and analysed with perceived stress.

**Results:** The prevalence of perceived stress was 57.7% and high stress was reported among female and final year students. Academics and curriculum was the most common cause of stress, and positive coping mechanisms were used by the students to relieve stress. The prevalence of overweight and obesity was 13% and 9.5% respectively. There was a strong positive correlation between perceived stress and BMI.

**Conclusion:** The prevalence of stress was high and a significant association was found between stress and BMI. It is important to identify the sources and symptoms of stress among medical students in order to facilitate early detection and treatment, which can prevent physical and psychological morbidities later in life.

**Keywords:** Perceived stress, Body Mass Index, Medical students, Obesity, PSSI.

### Introduction

Stress is a physical, mental, or emotional response to events that causes bodily or mental tension. Stressors are demands made by the internal or external environment that upset balance, thus affecting physical and psychological well-being and requiring action to restore balance <sup>[1]</sup>. Stress can be physical, emotional and psychological. How we perceive/appraise an event (stressor) plays a very large role in whether the stressor triggers our fight/flight response <sup>[2]</sup>.

Undergraduate medical students have been the most distressed group of students compared to any other course undergraduates <sup>[3]</sup>. Medical colleges are responsible for making sure that medical students have adequate knowledge and skill before taking professional responsibilities. In order to achieve these goals, medical colleges typically use a curriculum of lectures, clinical rotations in hospitals, mentoring, and hands-on experience to boost individual skill-set <sup>[4]</sup>. Medical students are expected to learn and master a huge amount of knowledge and skills <sup>[3]</sup>. The amount of material to be absorbed, social isolation, pressure of the examination, discrepancies between expectations and reality; with little or no time to relax and refresh in between; can all be anticipated to bring about physiological stress <sup>[5]</sup>. The personal and social sacrifice they have to make in order to maintain good academic results in a highly competitive environment puts them under <sup>[3]</sup> tremendous stress during various stages of their medical education and training, with an impact on their mental and physical health <sup>[6]</sup> Studies have classified the sources of stress into three main areas: academic pressures, social

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issues and financial problems [7]. The most common highlighted are exams and academics, followed by relationship problems in the college or family and homesickness [5]. In addition to the stress due to curriculum itself, the responsibilities of students increase drastically as there is a burden of self-management including health care and money management. The stay in the hostel as compared to the homes is a huge change in the environment as there is less privacy, home sickness, strong peer pressure for lavish lifestyle, social and cultural differences that may result in psychological stress [5]. High levels of stress can have negative impacts on their cognition and comprehension, [8] leading to the development of depression and anxiety which are under diagnosed and under treated in this demographic [2].

Stress itself is not an illness, but a chronic condition which can have a detrimental effect upon physical and mental wellbeing, and is one of several environmental factors associated with obesity [4]. The researchers found that higher the level of cortisol, the bigger the body weight, BMI and waist circumference of the person [9]. It is observed that adolescents cope up with the negative emotions generated by stressful events by engaging in emotional eating which involves eating unhealthy “energy dense foods” in a short period of time without hunger and any planning [5]. The chronic exposure to stress can also lead to serious health problems like hypertension, heart attack and stroke, diabetes mellitus, cancers, sleep disturbances, accelerates aging, impairs the immune system, suppresses fertility, digestive problems and loss of appetite, and increases psychological complications like anxiety, depression, alcohol and substance abuse, interpersonal conflicts and suicide [4, 8].

Stress may lead to changes in dietary habit resulting in weight change – in some people to gain more weight while others may gain less weight or even lose weight when stressed [6]. This association between stress and weight change is less clear. In the light of the fact, that there are few literatures concerning this issue in our country, this study was carried out to provide baseline information for further studies and to offer an input for the responsible bodies to plan an intervention for this group of population.

**Aims and objectives:** This study was carried out to determine the prevalence of perceived stress among medical students and to observe any possible association between the levels of stress and (a) gender, (b) MBBS Academic years and (c) BMI.

### **Material and Methods:**

#### **Study design and setting**

This cross-sectional descriptive study was carried out among undergraduate medical students studying from first year to final year part II MBBS in a medical college. All undergraduate medical students present in the college were included in the study. The study was approved by the Institutional Ethics Committee. Written informed consent was obtained from all the participants. A pilot study was conducted on a batch of 19 students to understand any logistic difficulties in conducting the study

#### **Sample Size and sampling**

The sample size was calculated to be 526, based on the prevalence of 75.3% with a precision of 5% [6]. After adding a nonresponse rate of 10%, minimum sample size required

became 579. As all the students from the first to the final year were included, no specific sampling technique was required. Interns, chronic absentees, students refusing to give consent and those with already diagnosed psychological ailments and under medications were excluded.

#### **Study tool**

There is no gold standard for validating a measure of stress. The *Perceived Stress Scale* (PSS) is the most widely used psychological instrument for measuring the perception of stress and is an accepted parameter for stress [10]. It is a measure of the degree to which situations in one’s life are appraised as stressful. The PSS was designed for use in community samples with at least a junior high school education. PSS is based on psychometric principles and is considered sound [11].

The extent of Perceived Stress was assessed using the PSQ-14 (14 item Perceived Stress Questionnaire) which is a self-rated questionnaire to measure perceived stress, consisting of 7 positively stated and 7 negatively stated items related to 4 stressors – tension, worries, demand and joy [12].

The negatively stated items are reverse scored and then summed with the scores of the positively stated items to get the total score for perceived stress. The scores range from 0 to 56, with higher scores indicating higher levels of stress. This scale has an internal consistency score of Cronbach’s  $\alpha$  0.85 with a test-retest reliability of 0.85 after 1 week. The resulting PSS-14 (Perceived Stress Scale Index) scores were divided into stratified quartiles. The upper two and lower two quartiles were combined, with 28 being the operational cutoff value for stressed and not stressed conditions. This cutoff value was selected in accordance to with an earlier study [13].

#### **Method of Data Collection**

A list of the undergraduate medical students from first to final year part II MBBS was obtained from their class attendance registers. The total number of students was found to be 679. Out of 679 students, 66 were not available during the time of data collection and after two attempts to trace, were excluded. The study was undertaken in the afternoons between 2 – 5 PM. The data was collected by dividing the study population into small batches of 30 students. The students were explained about the purpose of the study and the method of filling up the questionnaire. Students were given adequate time to fill up the questionnaire which collected baseline data on age and sex, Perceived stress using PSQ-14. The students were made to sit separately and any doubts while filling the questionnaire was addressed at the same time by the investigator.

After completing the questionnaire, the students’ weight and height were measured by the investigator. Weight was measured using a standard spring balance bathroom weighing machine (Samsco Manufacturers). Weight was taken without shoes and with minimum clothes on the body, nearest to 0.5 kg after correcting zero error. Height was measured in the standing position by using stadiometer (Samsco Manufacturers) without footwear measuring to the nearest 0.1cm. BMI was calculated using Quetelet’s Index. Underweight, overweight and obesity was classified using the WHO classification for Asian population [14].

**Statistical analysis**

The collected data was compiled and analysed with appropriate statistical tests using SPSS version 17. The categorical variables were described in terms of proportions and the continuous variables in terms of mean ± 2 Standard Deviation (SD). Data on proportions were tested using chi

square test. The correlation of BMI and PSSI was done using Pearson’s correlation coefficient. The proportional influence of PSSI on BMI was studied using regression analysis. A P-value of <0.05 was considered to be statistically significant.

**Results**

**Table 1:** Baseline characteristics of medical students

Characteristics	Categories	No. of students (n = 613)
Age group	17 - 19	207 (33.8%)
	20 - 22	338 (55.1%)
	23 - 25	64 (10.4%)
	26 - 28	4 (0.7%)
Gender	Males	301 (49.1%)
	Females	312 (50.9%)
MBBS academic year	I MBBS	144 (23.49%)
	II MBBS	242 (39.48%)
	Final year part I	141 (23%)
	Final year part II	86 (14.03%)

Table 1 shows the baseline characteristics of the students. More than 80% of the students belonged to upper class families hailing from city and towns, while less than 10% from lower income and village backgrounds. Approximately

88% of the students belonged to nuclear families, while 12% belonged to joint families. The students predominantly resided in hostel premises (98.7%) within the college campus and consumed food from the hostel mess

**Table 2:** Relationship of Perceived Stress to gender and MBBS academic years

Baseline data	Variables	Stressed	Not Stressed	Total	χ <sup>2</sup> test
Gender	Male	165 (54.8%)	136 (45.2%)	301	χ <sup>2</sup> = 2.08, df - 1 P = 0.1
	Female	189 (60.6%)	123 (39.4%)	312	
MBBS academic years	I Year	95 (66%)	49 (34%)	144	χ <sup>2</sup> = 47.322, df - 3, P <0.0001
	II Year	112 (46.3%)	130 (53.7%)	242	
	III Year	73 (51.7%)	68 (48.3%)	141	
	IV Year	74 (86%)	12 (14%)	86	
	Total	354 (57.7%)	259 (42.3%)	613	

The mean PSSI score was 25.5±4.3. Out of 613 students, 354 students (57.7%) scored more than 28 in the PSQ-14. Female students were more stressed than male students, but this was not statistically significant as shown in Table 2. Among the 4 factors of PSSI -14, it was seen that the most dominating stressor was “demands”. Maximum students felt

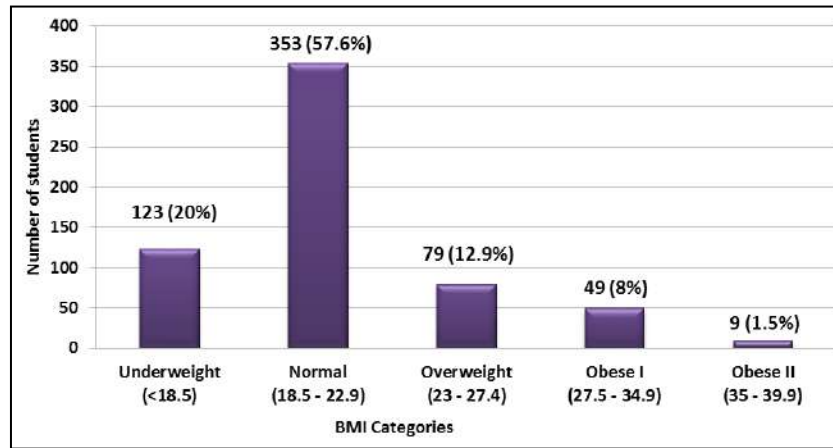
that they had many things to do and many expectations were made of them. Between tension and worries, tension emerged as the more prevailing factor. Many of the subjects were of the view that they had fear of not attaining of their goals and were afraid of the future.

**Table 3:** Sources and Coping strategies of Perceived Stress of medical students

Patterns of perceived stress	Responses	Number (n=613)	Percentage (%)
Sources of stress	Fear of exams or academic pressure	358	58.4%
	Personal problems	188	30.7%
	Scolding by teachers	34	5.5%
	No reason	29	4.7%
	Health issues	4	0.7%
Coping strategies	Share with their family and friends	208	33.9%
	Sleep	129	21%
	Music	104	17%
	Cry or get depressed	51	8.3%
	Meditation or pray	44	7.2%
	Alcohol or smoke	39	6.4%
	Nothing	38	6.2%

The mean BMI was found to be 20.9 ± 3.1. Figure 1 shows the distribution of BMI, using the latest classification for South East Asian Region. For simplicity, the last three categories of overweight, obesity I and II are grouped

together as overweight in further analysis. Therefore the prevalence of combined overweight and obesity (BMI >23) was 22.4%.



**Fig 1:** Bar diagram of medical students showing distribution according to BMI:

Higher proportions of students were stressed in both overweight (75.2%) and underweight (67.5%) categories

and this was highly statistically significant as indicated in Table 4.

**Table 4:** Relationship of BMI with perceived stress

Stress PSS-14 score	BMI			Total
	<18.5 (Underweight)	18.5 – 22.9 (Normal)	> 23 (Overweight + Obesity)	
< 28	40 (32.5%)	185 (52.4%)	34 (24.8%)	259 (42.3%)
>28	83 (67.5%)	168 (47.6%)	103 (75.2%)	354 (57.7%)
Total	123 (20%)	353 (57.6%)	137 (22.4%)	613

$\chi^2 = 36.763, df = 2, P < 0.0001$

Nearly 13% of the students were overweight and 9.5% were obese. Pearson’s correlational analysis reports a strong positive correlation between stress and BMI. (Pearson’s correlation coefficient  $r = 0.83$ ; significant (two-tailed)  $P = 0.001$ ). Regression studies indicate that the effect of Perceived stress on BMI was found to be highly significant ( $F = 65.884, p < 0.0001$ ).  $R^2 = 0.59$  indicated that 59% of variation in BMI was due to perceived stress in this study.

**Discussion**

This study confirmed the general impression that there is a considerable amount of stress in medical college. A number of factors including academic pressure, excessive work load, sleep deprivation exposure to patients’ suffering and deaths and lack of adequate holiday break could be reason why mental distress is very common in medical students than the general population [15]. The prevalence of stress in our study was found to be 57.7% which is somewhat median range compared to other studies conducted among medical students all over the world with prevalence of stress ranging from 20% to as high as 95% [16]. Wide variations in prevalence are due to differences in stress tools being applied to measure stress, medical curricula of the settings and socio-cultural and environmental factors of the medical student. Sherina MS observed that, the number of students with mental health problems was increasing and that the severity of their problems was also increasing [3].

In this study, female students were more stressed than their male counterparts, but this was not statistically significant as reported in other studies too [3, 6, 17]. We obtained a statistically significant association of stress with year of study, with higher proportion of students in final years being stressed, as observed in other studies too [7, 17, 19]. Few studies show high proportion of stress in the early years of medical schooling [3, 15]. Adjustment difficulty to the new environment, new academic challenges, being separated

with their close family and old friends might explain why mental distress is common in early years. [15] This justifies that medical curriculum is stressful throughout its length of course.

The major cause for stress among medical students in this study is academics and performance in exams which is also reported in many studies globally [2, 3, 7, 8, 15, 16, 18, 21]. The sources of stress are not simple - adjustment difficulty to the academic challenge, new social interaction within the mixed cultural pool and separation from pre-existing social support could have their own contribution for making mental distress high among medical students [15]. Sreeramareddy *et al.*, points out that even though 'tests/exams' are the major sources of stress, they are necessary in the medical training as a tool for evaluation/assessment and to encourage student learning [7]. When examining the stress of medical education, the General Professional Education of Physician (GPEP) Report, Association of American Medical Colleges, suggested placing a greater emphasis on health programmes including stress management to help students cope with the stress of tertiary education [3].

A study conducted in Nepal reported that students generally used active coping strategies and a very few percentage of students (2.5%) took to alcohol/smoking as a coping mechanism [7] similar to our study. This is in contrast to studies from the United Kingdom, where the use of alcohol, tobacco and drugs was a common coping strategies adopted by the medical students [20, 22, 25]. In Karnataka, a study on 251 medical students reports that 68.97% of the medical students who had the habit of alcohol intake and 78.26% of the smokers had experienced severe stress, which was statistically significant. This indicated that the two substances were indulged in as a method of stress relief [16]. In our study, low percentage (6.5%) could be due to under reporting of such behaviour by students in spite of assurance of anonymity and confidentiality of their responses.

The prevalence of overweight (12.9%) was similar, but obesity (9.5%) reported in our study is higher compared to other studies [5, 6, 26]. This could be due to the new classification of BMI for South Asian population used in this study which uses lower cut-offs for overweight and obesity. Several studies have demonstrated heterogeneity in eating behaviors in response to stress; some people eat more when stressed while others eat less thus, some people experience weight gain whilst others report reduced weight, [6] as seen in our study. Weight status prior to onset of stress has been found to be predictive of individual response, with those who were already carrying excess weight more likely to experience weight gain than non-overweight individuals. [9] In our study, a statistically significant association was observed between BMI and stress. There is a strong belief that stress levels can influence the eating habits and may affect weight and Body Mass Index [5, 21]. Other studies conducted in India confirm our finding of a strong positive correlation between perceived stress and BMI [6, 26]. Our study reports that 59% of variation in BMI was due to perceived stress. Other studies found that 52% and 11.8% variation in BMI was contributed by stress [5, 26] This could be due the small sample size used in these studies, which may not be representative. Chronic stress is a known risk factor for obesity, but the direction of causality has yet to be established [4].

Medical students exhibited increased frequency of emotional snacking and binge eating due to stress and had a sedentary life style due to academic pressure. The consumption of highly palatable, calorie rich “comfort foods” may lead to a more positive dispositional state for several reasons including sensory pleasure, reduction of hunger, and the diminution of aversive physiological symptoms, thus reducing the intensity of negative emotional state, but in the process invites overweight/obesity [5]. It is not clear whether this relation of stress induced eating resulting in weight change is linear or circular; and longitudinal studies need to be carried out. As obesity grows as a public health problem, the challenge the health researchers and health professionals face is to develop more effective and innovative strategies for managing psychological stress which reduce stress induced eating.

### Conclusion

This study reports a high prevalence rate of perceived stress (57.7%), which increases with academic years. Academic pressure was the most common reason cited for stress. Overweight and obesity was reported to be 13% and 9.5% respectively, with a strong positive correlation between perceived stress and BMI. It is important for medical educators to know the prevalence and causes of students' stress, which not only affects their health but also their academic achievement and future career. The right amount of stress can be a helpful, positive force. Early intervention for perceived stress and weight management will help in improving the general condition of medical students. The ultimate aim is to help medical students understand what is required of them and to adapt as quickly as possible.

### Recommendations

- An incredible approach to overcome stress is by social support given by family, friends, teachers and counselors
- Serious efforts in the form of health education,

counselling and monitoring are required for curbing tobacco, alcohol and other drugs abuse in medical students.

- Stress releasing recreational activities and exercises e.g. extra-curricular activities, yoga, meditation and pursuing individual hobbies should be encouraged
- Providing a stress-free college environment could improve academic performance, reduce professional mistakes, and prevent the consequences of stress.

### Limitations

- The study was done in one medical college, limiting generalization of results.
- Stress questionnaire data are self reported – Subject bias and recall bias could have occurred
- Interns were excluded due to logistic problems
- This was a cross sectional study design; hence changes in weight pattern could not be assessed.

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