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### STRESS- BIO-DETERMINANT OF OBESITY IN MEDICAL UNDERGRADUATE STUDENTS

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#### ABSTRACT

**Background-** Obesity is a major public health problem worldwide, affecting mostly adults of middle age but recently, also the young adults, mainly the college students. Increasing Stress and stress related disorder among students has become a major concern in college students. M.B.B.S. students, particularly, the 1st year students are more prone to stress due to hectic schedule, academic pressure, cultural and environmental change.

**Aims and Objectives:** This research was done among the First year Medical students with the aim to study the obesity, the incidence and severity of stress and to see if there is any relationship between the stress and body mass index (BMI).

**Methodology:** This study was conducted among 63 First year Medical students (2020-21 batch) of Jawaharlal Nehru Medical college, Belagavi. BMI and Stress were measured. The BMI was calculated by measuring the weight (in kg) and height (in meter) of students. Stress was studied by using a validated Medical Student Stressor Questionnaire (MSSQ).

**Result and Discussion:** Out of 63 students of MBBS Phase -I, 34 students (53.96%) were of normal weight, 16 students (25.39 %) were overweight and 13 students (20.63%) were obese. Also 7 students had mild stress, 31 students had moderate stress, 19 students had high stress and 6 students had severe stress. Thus 25 students (39.68%) had high and severe stress. Out of these 25 highly and severely stressed students,12 students (48%) were normal weight, 11 students (44%) were overweight and 3 students (12%) were obese. On analysis, there is positive correlation between BMI and Stress level amongst the amongst the overweight and obese students.

**Conclusion:** Overweight and obesity is seen in 46.02% of MBBS Phase –I students. Stress is one of the bio-determinant of obesity. This finding is consistent with the literature and promotion to adopt healthy lifestyles is urgently required.

**Keywords-** Stress, Obesity, Bio-determinants, Medical students

## INTRODUCTION

Obesity is a major global public health problem and the fifth leading risk factor for mortality globally.<sup>1-2</sup> Obesity increases the risk of type 2 diabetes, many types of cancer, fatty liver, hormonal imbalances, high blood pressure, and cardiovascular disease (cardiovascular disease). disease) and increased mortality.<sup>2-5</sup> The incidence of obesity is increasing dramatically worldwide. Overall, 23% of the world's adult population is overweight and 9.8% obese.<sup>3</sup> In India, obesity rates range from 10% to 50%.<sup>4</sup> Obesity mainly affects middle-aged people, but recently obesity has become a common trend among young people, especially college students.<sup>5</sup>

Body mass index (BMI) is commonly used to measure obesity. Therefore, the World Health Organization (WHO) classifies people with a BMI  $\geq 25$ kg/m<sup>2</sup> as overweight, those with a BMI  $\geq 30$ kg/m<sup>2</sup> as obese, and those with a BMI  $\geq 40$ kg/m<sup>2</sup> as extremely obese.<sup>6</sup> Due to increased body fat accumulation and ethnic differences, the World Health Organization recommends lowering the BMI limit for Asians to 23 kg/m<sup>2</sup> for overweight and 25 kg/m<sup>2</sup> for obese.<sup>2</sup>

Stress can be defined as an inappropriate, excessive and harmful response of the body to a particular situation.<sup>7</sup> Stress is associated with immediate changes in physiological (eg hormonal responses) and mental processes.<sup>8</sup> Chronically elevated levels of perceived stress may affect cortisol levels and be associated with an increased risk of central obesity.<sup>9</sup> Nutrition is recognized as a coping mechanism for alleviating and managing stress and emotions<sup>10-13</sup> caused by undernutrition or over nutrition.<sup>14</sup> The increase in stress and stress-related illness among college students has become a major problem faced by college students.

Medical students are under tremendous stress during their training.<sup>15</sup> M.B.B.S. students, especially freshmen, are more likely to feel stressed due to busy schedules, academic pressures, cultural and environmental changes, and various uncertainties.<sup>7</sup> Several studies have been conducted to determine the prevalence of stress among medical students,<sup>16-17</sup> but few studies have looked at different BMI types.<sup>18</sup> Medical students are role models, future physicians, health leaders to the communities. Therefore, there is a need to investigate obesity, frequency and severity of stress, and the relationship between stress and body mass index (BMI) among first-year medical students.<sup>19</sup>

## MATERIALS AND METHODS

This cross sectional study was conducted on MBBS Phase-I students, having age of 18 to 19 years, of Jawaharlal Nehru Medical College, KAHER, Belagavi. Students on glucocorticoids, antidepressants and antipsychotics, suffering from any known systemic disease, didn't give consent to participate in the study, and COVID-19 Positive or Post-COVID-19, such students were excluded from the study. 63 MBBS Phase-I (2020-21batch) students were included in this study.

After getting ethical clearance from the Institutional Review Board Committee and taking an informed consent, these students were studied on the basis of-

- A structured questionnaire- a validated Medical Student Stressor Questionnaire (MSSQ)<sup>18</sup> which consisted of 40 questions with responses on a 5-point Likert scale [ 0 (no stress) to 4 (high stress)] was used to study the stress amongst the medical students.
- Anthropometric measurements – Body Mass Index (BMI) was calculated as per WHO standards by measuring,
  - Height (in meter) – It was measured by Stadiometer. It was calculated as distance from feet to the top of the head, subjects standing with heels together touching the Stadiometer base and heels, buttocks and upper part of back touching to the scale, head compressed by Stadiometer head board.
  - Weight (in kg) – Was measured by a calibrated Digital weighing machine.
  - Body Mass Index (BMI) – was be calculated as-

$$\text{BMI} = \frac{\text{Subject's weight in Kg}}{\text{Subject's height in m}^2}$$

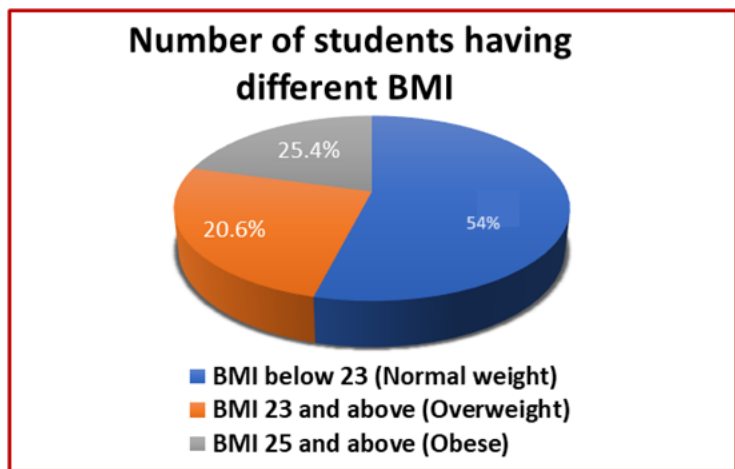
After completing the anthropometric measurements and collecting a filled Stress Questionnaire (MSSQ) from 63 students of MBBS Phase -I, the collected data was coded and entered in Microsoft Excel and data was analyzed.

## RESULTS

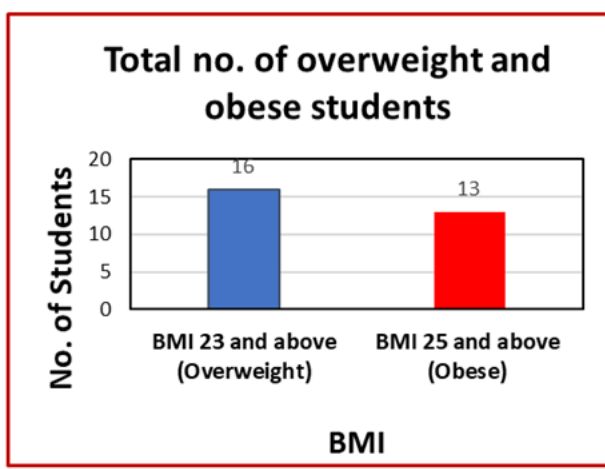
Analysis of Stress Questionnaire (MSSQ) from 63 students of MBBS Phase -I was done and it showed a positive correlation between BMI and Stress level among the students. Out of 63 students of MBBS Phase -I, 34 (54%) students were of normal weight, 16 (25.4%) students were overweight and 13(20.6%) students were obese. (Shown in Table 1 and Graph 1 & 2)

Table 1: Number of students having different BMI

Range of BMI	Number of students (63)
BMI below 23 (Normal weight)	34(54%)
BMI 23 and above (Overweight)	16(25.4%)
BMI 25 and above (Obese)	13(20.6%)



Graph 1: Number of students having different BMI

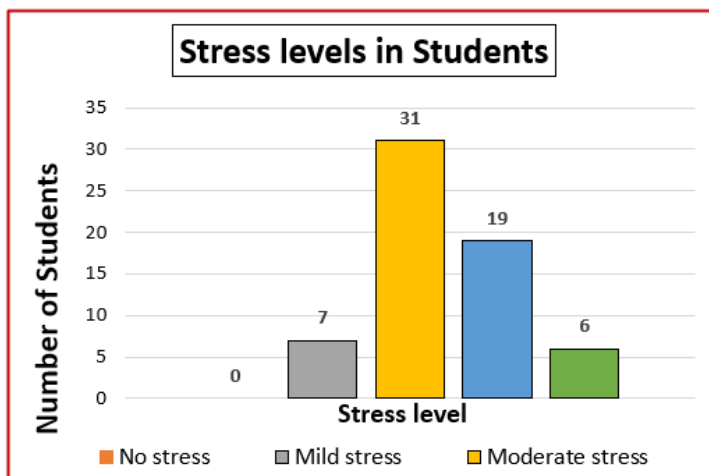


Graph 2: Number of overweight & obese students

Out of 63 students of MBBS Phase -I, 7 (11.11%) students had mild stress, 31 (49.21%) students had moderate stress, 19(30.16%) students had high stress and 6(9.52%) students had severe stress.( Shown in Table 2 and Graph 3)

Table 2: Number of students having different Stress levels

Stress level	Number of students (63)
No stress (level 0)	0
Mild stress (level 1)	7 (11.11%)
Moderate stress (level 2)	31 (49.21%)
High stress (level 3)	19 (30.16%)
Severe stress (level 4)	6 (9.52%)

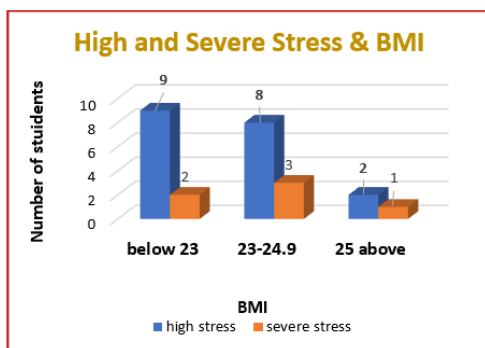


Graph 3: Number of students having different Stress levels

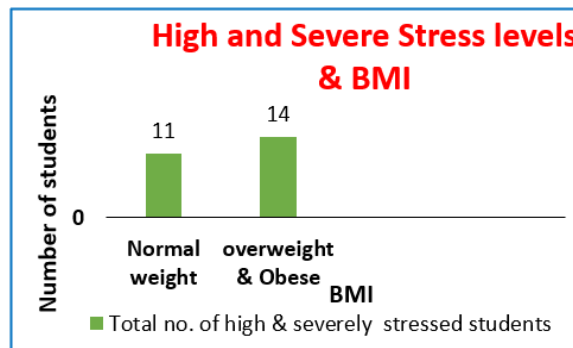
Out of 63 students of MBBS Phase-I, 25 students (39.68%) had high and severe stress. Out of these 25 stressed students, 11 (44%) students were Normal weight, 14 (56%) students were Overweight and Obese. [11 (44%) overweight and 3 (12%) Obese] . (Shown in Table 3 and Graph 4 & 5)

Table 3: Number of students having different BMI and various stress levels

Students having Range of BMI	High Stress (Level 3)	Severe Stress (Level 4)	Total number of students
Below 23 (Normal weight)	9	2	11
23-24.9 (Overweight)	8	3	14
25 and above (Obese)	2	1	



Graph 4



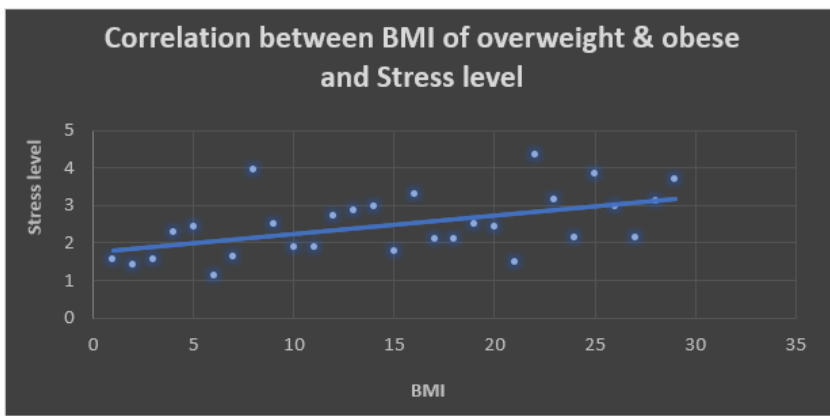
Graph 5

Graph 4: Number of students having High and Severe stress and different BMI; Graph 5: High and Severe stress in students with Normal weight and Overweight & Obese

Analysis of Stress Questionnaire (MSSQ) from 63 MBBS Phase -I students showed that there is positive correlation between BMI and Stress level amongst the overweight and obese students. (Shown in Table 4 and Graph 6)

**Table 4:** Number of overweight & obese students having different BMI

BMI	Stress level
23	1
25.28	1
26.06	1
23.8	2
24	2
24.1	2
24.4	2
24.84	2
25.1	2
25.2	2
25.6	2
26.2	2
26.9	2
27.6	2
27.7	2
32	2
25 .2	2
23	3
24	3
24	3
24	3
24.1	3
24.82	3
29.4	3
34.72	3
23	4
24	4
24.36	4
26.9	4

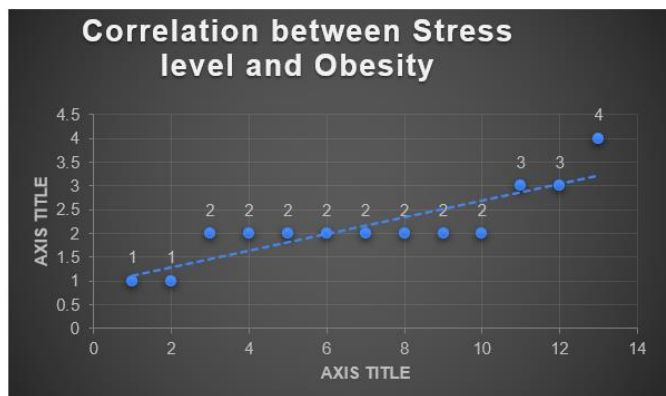


Graph 6: Scatter diagram showing a correlation between perceived BMI and Stress score among overweight and obese medical students

Analysis of Stress Questionnaire (MSSQ) from 63 students of MBBS Phase -I showed that there was positive correlation (Correlation coefficient value 0.5) between BMI and Stress level amongst the obese students. (Shown in Table 5 & Graph 7)

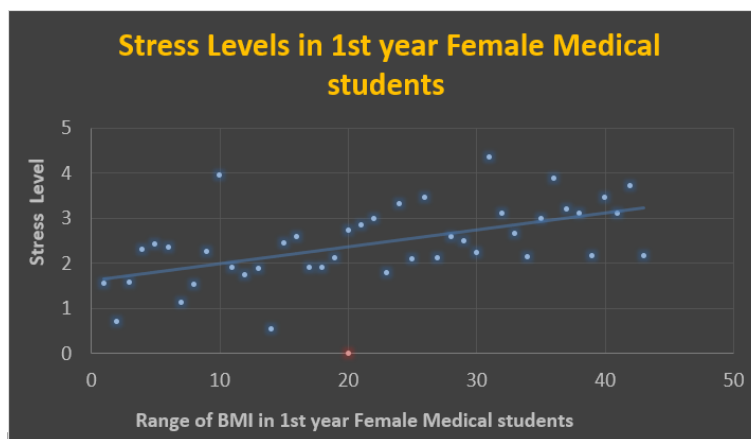
Table 5: Different stress levels seen in obese students

BMI	Stress level
25.3	1
26.1	1
27.7	2
27.6	2
25.1	2
25.6	2
25.2	2
26.2	2
26.9	2
25.2	2
29.4	3
34.7	3
26.9	4

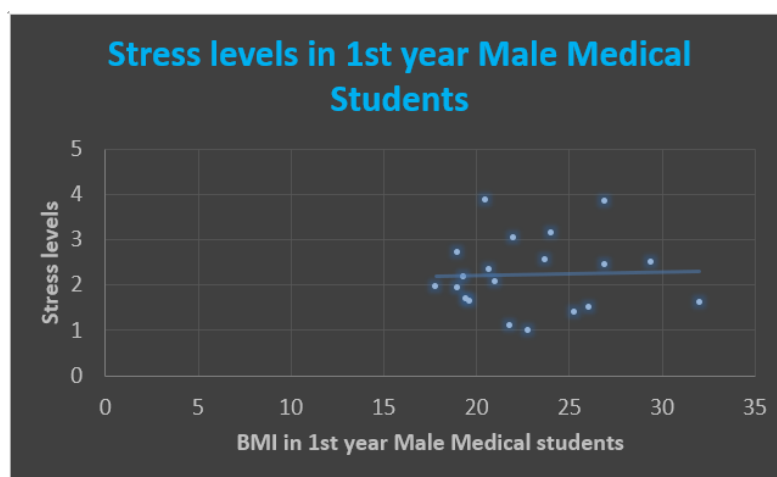


Graph 7: Scatter diagram showing a correlation between perceived BMI and Stress score among obese medical students

The analysis of data showed that female students had more stress as compared to male students. (Shown in Graph 8 and 9)



Graph 8: Scatter diagram showing correlation between BMI and Stress score among Female medical students (Correlation coefficient 0.015648 - positive correlation)



Graph 9: Scatter diagram showing correlation between BMI and Stress score among Male medical students (Correlation coefficient 0.0313 - positive correlation, but weak positive correlation)

## DISCUSSION

Stress and obesity are two common societal ailments prevalent throughout the world.<sup>20</sup> Stress can lead to overeating and eating high-calorie, high-fat, or high-sugar foods, which can affect behavior.<sup>20</sup> Stress can affect a person by reducing physical activity and change sleep patterns.<sup>20</sup> Obesity itself can be distressing because of the widespread belief that obesity is related to weight.<sup>21</sup> Due to their long and busy schedules, medical students often lead sedentary lifestyles and are at increased risk of obesity.<sup>22</sup> Rekha C *et al.*<sup>23</sup> conducted a cross-sectional study of medical students from a private medical school in Chennai concluded that the prevalence of obesity in the population is very high.

M. Alhashemi *et al.*<sup>24</sup> investigated the prevalence of obesity and some daily habits in 514 medical students from the University of Aleppo in a cross-sectional study. Of these, 22.1% were overweight or obese (BMI > 25). Stress eaters were significantly associated with being overweight, of whom 70.8% had a history of being overweight.<sup>13</sup> In a cross-sectional study by Sonawane S *et al.*, the prevalence of overweight and obesity among Dinero University medical students was 36.8% (184) and 11.1% (55), respectively. Overweight (17.8%) and obese (8.6%) students were also found to be more stressed. In a cross-sectional study conducted at Narayana Medical College, Nellore, done by Krishna *et al.*<sup>25</sup>, it was found that among 170 first year medical students, the prevalence of overweight and obesity was 18.2% and 8.2% respectively. There was a slightly positive correlation between BMI and stress level.

Ahmed A *et al.*<sup>26</sup> conducted a cross-sectional study on 114 medical students at Shakra University in Saudi Arabia, found that according to their BMI data, 8.8% of his students were underweight, 46.5% were normal weight, 25.4% were overweight, and 19.3% were obese. A cross-sectional study by Sravani *et al.*<sup>7</sup> of medical students at the Sharda University School of Medicine in Greater Noida found that out of 166 respondents, 9.6% had a low BMI and 30.1% had a high BMI and 60.3% students were within the normal range. They also found that overweight and obese students faced greater social pressure.

W. Y. Abdel Wahed<sup>27</sup> found a significant association between obesity and stress in a cross-sectional study conducted on medical students of Fayoum University in Egypt. Overweight and obese students have higher stress levels than normal weight students. Higher stress levels were associated with female sex and a body mass index greater than 25 kg/m<sup>2</sup>. A cross-sectional

study of first-year medical students by Chitnis P *et al.* found that 12.87% were underweight, 54.39% were normal weight, 23.4% were overweight, and 9.36% were obese. People who are overweight are at higher risk of stress than people of normal weight. Perceived stress appears to be highly prevalent among medical students, affecting not only their academic performance but also various aspects of their health. The frequency of stress appears to be significant, with little difference from Babar TS *et al.*<sup>28</sup> There were differences between men and women. A study by Sani M *et al.*<sup>29</sup> showed that Body mass index was significantly correlated with stress levels among Saudi Arabian medical students.<sup>23</sup>

Another study by Gupta *et al.*<sup>30</sup> among male medical students in Calcutta helped establish a correlation between BMI and PSS-I that proved to be statistically significant. According to Sharma BK *et al.*, girls experience more stress than boys, and academics and exams are the biggest sources of stress for medical students.<sup>31</sup> In a systematic study of depression, anxiety and stress among Indian medical students, Sarkar S *et al.*<sup>32</sup> found that female students were more likely to experience depression and stress than male students. In a systematic review and meta-analysis, Okati-Aliabad H.<sup>33</sup> found combined estimates of the prevalence of obesity and overweight in the Middle East to be 21.17% and 33.14%, respectively.

Table 6: Showing Prevalence of Obesity in various studies

Name of study and Year	Prevalence	
	Overweight (%)	Obesity (%)
Okati-Aliabad H <i>et al.</i> <sup>33</sup> (2022)	21.17	33.14
Krishna <i>et al.</i> <sup>25</sup> (2021)	18.2	8.2
Sonawane S <i>et al.</i> <sup>20</sup> (2021)	36.8	11.1
Ahmad A <i>et al.</i> <sup>26</sup> (2020)	25.4	19.3
W Y Abdel Wahed <sup>27</sup> (2015)	23.5	14.5
Manojan KK <sup>34</sup> (2014)	24.57	25.71
Chitnis P <i>et al.</i> <sup>8</sup> (2013)	23.4	9.36
Present Study (2022)	25.4	20.6

Table 7: Showing Positive correlation between obesity and stress seen in various studies

Name of study and Year	Positive correlation between obesity stress seen	
	Yes	No
M. Alhashemi <i>et al.</i> <sup>24</sup> (2022)	Yes	--
Krishna <i>et al.</i> <sup>25</sup> (2021)	Yes	--
Sonawane S <i>et al.</i> <sup>20</sup> (2021)	Yes	--
Sravani <i>et al.</i> <sup>7</sup> (2016)	Yes	--
W Y Abdel Wahed <sup>27</sup> (2015)	Yes	--
Chitnis P <i>et al.</i> <sup>8</sup> (2013)	Yes	--
Sani M <i>et al.</i> <sup>29</sup> (2012)	Yes	--
Gupta <i>et al.</i> <sup>30</sup> (2009)	Yes	--
Present Study (2022)	Yes	--

Table 8: Showing Comparison of High stress in Overweight and Obese Medical students

Study	Percentage of High stress in Overweight and Obese Medical students
Present study	22.2%
Sonawane S <i>et al.</i> <sup>20</sup>	26.4%

## CONCLUSION

- The prevalence of obesity is high among medical students.
- Stress is one of the bio-determinant of obesity. Academic pressure is the major stressor for the students. There is positive correlation between BMI and Stress level amongst the students. Medical students who perceived high level of stress were more likely to be overweight or obese.
- Early screening and diagnosis of stress can be a modifiable risk factor for obesity. Lifestyle modification programs would help students to overcome stress and prevent obesity related health hazards.
- In early years of medical schooling, students should focus on improving time management skill, improvement in dietary habits, also they need to be motivated to participate in physical exercise, especially sports, athletics, yoga and other outdoor activities.

- Medical students are the future of the healthcare system of any nation. It is of utmost importance to evaluate their physical and mental well-being, to improve their quality of life and productivity.

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