

## Correlation of BMI With Educational Stress By Psychometric Analysis Via Perceived Stressed Scale In Non-State University Students

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### ABSTRACT

Overweight and Educational Stress had become two dominant problems in young population. We evaluated the effects of Educational Stress on BMI among non-state university students. Gender deference on stress and BMI, correlation between BMI and stress were determined. A google form was used for collection of data from 384 participants and stress was analyzed by Perceived Stress Scale (PSS). Majority of our study group 55.2% were female, and 44.8% were male. Mean BMI was 23.54kgm<sup>-2</sup> (Overweight) and it was 24.70kgm<sup>-2</sup> (overweight) in male and 22.60kgm<sup>-2</sup> (normal) in female. As per the PSS, 52% of male participant showed moderate stress and 48% male showed high perceived stress. In female population, 50% showed moderate stress, 47% showed high perceived stress and 3% showed minimum stress. Results show that >90% of students suffer from moderate to high perceived stress and it was positively correlated with BMI (p=0.01, r=0.239) seen in both genders. Educational stress can increase the students BMI and this finding is important for an institutional intervention for better outcome of the student performances. We recommend considering the program interventions to minimize the educational stress and to reduce the high BMI related non communicable diseases in future.

**Index Terms** — *Perceived Stress Scale, Body Mass Index, Psychometric Analysis, University Students*

### INTRODUCTION

Obesity is a worldwide health complication and leading to many cardiovascular and other non-communicable diseases. In Obesity, body fat is synthesized to simple carbohydrates such as glucose and has been linked to an increase in lipid biosynthesis and, as a result, an increase in weight. Glucose is also responsible for the synthesis of fatty acids, which compose the body's fat content.

An increase in blood glucose levels leads to an increase in body weight hence the obesity through increased biosynthesis. Therefore, it is expected that obesity, and body mass index (BMI) are related to the blood sugar levels probably via the activity of insulin, which conserves energy while signaling the body to produce fat. This conservative anabolic activity of insulin can be impaired in high BMI in which the insulin receptor is covered ending up with potential insulin resistance, resulting in impaired blood sugar homeostasis [1-4]. Considering all relevant data, our research group investigated a possibility of using RBS as a predicting test to detect obesity in young generation.

#### **Stress among undergraduate students;**

Numerous worldwide studies had been conducted to assess the level of perceived stress among university students. [5-8] Mental deviation among university students had been identified with numerous impacts on the individual, family, and community. Undiagnosed or untreated mentally ill students have been identified at a high risk of dropouts from the academic program, losing their interest in studies, and depression, raising the unemployment rate that leads to extra burden on the families, society, and community as a whole [8]. Further, previous evidence had also demonstrated that academic stress decreases the student's academic performance that hinders the ability to study efficiently and better time management [11]

The Perceived Stress Scale (PSS) is a classic stress assessment instrument (6) and this tool was originally developed in 1983, remains one of the choice for researchers to study the effects of different situations affect feelings and our perceived stress. Therefore this scale was used in our study and investigated the level of feelings and thoughts. Participants were asked to indicate how often they felt or thought. BMI has been considered to measure the obesity in population [1-5]. Person's body fat composition has been changed with age. It has been found out that correspondence between BMI and body fat composition differs for both men and women [5]. For example, a man and

woman of the same height and weight may have the same BMI but women have higher body fat composition compared to men. Several studies with long term interventions, have shown that individuals who are overweight by BMI, had the same or better health profile when compared to participants with normal BMI [6]

Further, another research has indicated that academic stress impaired self-control and deteriorate health and food habit behaviors [7], and it had increased the risk of overweight and obesity. Another laboratory study has reported that college students had taken more carbohydrates, and sugars during the stress. [8]. Another study at different universities had revealed that academic stress had negative correlation with student's academic performance. [9] one interesting research had found out that academic stress is significantly higher among junior students than senior students. Factors had been justified as junior students are less experienced, have a low maturity level, and are more victimized by academic stress of university as compared to the seniors who are not only mature and experienced but also well adapted and well-adjusted to academic stress. [10, 13]

However, no study has been focused on the effects of academic stress on overweight and obesity among university students. Relationship of obesity with educational stress has not been investigated in Sri Lanka. Hypothesis was made to conduct epidemiological research to identify any association between obesity with higher educational stress. The Perceived Stress Scale (PSS) was used as psychometric evaluation tool for measuring the perception of stress in many studies. [6, 9] It measures the degree of stress, and each question has been designed to tap how unpredictable, uncontrollable, and overloaded respondents find their lives [11]. The PSS was designed for use in community samples and questions in the PSS analyze the feelings and thoughts, how often they felt [11-15]. There is no evidence in Sri Lanka in relation to the obesity with educational stress level. Therefore, this research will open the pathways to evaluating of many other research topics related to overweight and risks among young population.

Our main objective was to investigate any correlation between education stress with BMI/overweight/ obesity among young generation by using students between the ages of 20-27 years in Non-state universities, Sri Lanka.

## RESEARCH METHODOLOGY

Details of the PSS standard scale were used to detect the data related to stress evaluation. The research surveillance questionnaire was developed as a google form. The final questionnaire was designed with sections: sociodemographic characteristics and the specific analysis section by the perceived stress scale (PSS-10) with 5-point scale adaptation. Google form consists of an information sheet, consent form, and the surveillance questionnaire of PSS. Student population of more than 1000 in the nonstate sector campuses will be selected to the study population. Google link was sent to students who were identified as university students in non-state universities in Colombo district. All the compulsory details about the study such as the aims, methods and contact information of the research were mentioned in the information sheet where the participant can direct their problems related to the study through an email and the obtained the consent. Validation of the questionnaire was done by study participants by administering via email to randomly selected expertise in two fields who are outside the define study population to vali.

## METHODOLOGY

The study was approved by the Ethics review Committee on CINEC Campus. All students who gave the written consent to participate were given the google form. It provided the accurate values of Height, Weight and participants should follow the instructions below when taking their own measurements. All students who consented to the participation was recruited to the study.

### Sample size

The total student population of students between the ages of 20 – 27 years in non-state universities was found of 110000 and 384 is the calculated sample size for the study.

Students were given instruction to measure height by using stadiometer and can get a helper to do the precise measurement. They were instructed to do several attempt for training to measure the height. Three measurements of height have to be taken to the nearest 0.1cm and mean height was calculated. Students should measure weight by using the electronic scale and the reading was taken to the nearest 0.1kg by using electronic scale. Mean of the three measurements of weight should be calculated.

Body mass index was calculated by the researchers using the  $BMI = \text{Weight (kg)} / \text{Height (m)}^2$  formula. Table 1 shows the reference values of BMI for Sri Lankan guidelines.

Table 1 – shows the Sri Lankan reference values of categories of BMI.

BMI Category	Sri Lankan BMI cut off levels
Under weight	< 18.5
Normal	18.5 – 22.9
Overweight	23.0 - 24.9
Obesity class 1	25.0 – 30.0
Obesity – class 2	30.0 – 35.0
Obesity	class >35

**Stress Assessment Scale**

The scale includes a number of direct queries about current levels of experienced stress. The perceived stress scale (PSS)-10 (9) is the most widely used and validated psychological instrument for measuring the perception of stress [10]. The PSS-10 includes direct queries about current levels of experienced stress. The questions in the PSS ask about the feelings and thoughts of the last month. Scale indicates, 1 for No, 2 for relatively low, 3 for average/general, 4 for relatively high, and 5 for extremely heavy. Responses in items 4, 5, 7, & 8, was considered in reverse scoring system (e.g., 0 = 5, 1 = 4, 2 = 3, 3 = 2 & 4 = 1, 5=0) and marks were summed. Total scores were obtained by summing all the scale items with a total score range between 0 and 40. Final scores ranging from 0-13 would be considered minimum stress, 14-26 would be considered moderate stress, and 27-40 would be considered high perceived stress.

**Data analysis**

Means and SD were calculated for each variable using descriptive statistics. Relevant descriptive statistics (frequency, central tendency, variation) will be calculated. A Chi-square test (for categorical variables) and ttests (for continuous variables) were conducted to test for the differences of perceived academic stress across gender.

**RESULTS AND DISCUSSION**

Mean age of our study population is 23 years (SD±1.18) and 55% of them were female. Mean

height was 1.63m (SD±0.095) and mean weight was 62.53 Kg (SD± 11.98)

Figure 1 shows the distribution of weight among participants.

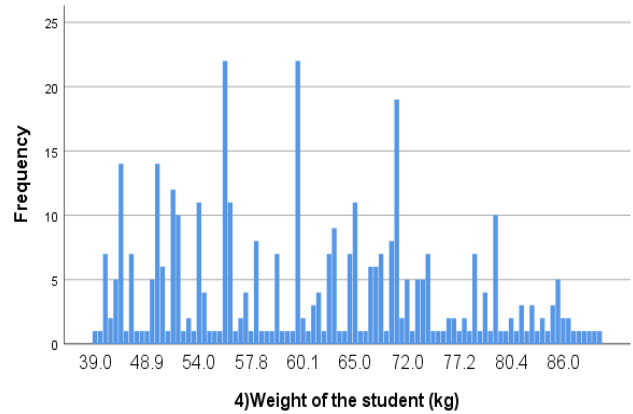


Figure 1 -Distribution of weight among participants.

Figure 1 shows the distribution of the weight from 39 Kg to 87kg. Data represents mean of three measurements.

Figure 1 shows the distribution of the weight among the participants. The mean weight of the sample was 62.5 kg (SD± 11.9413) and minimum weight was 39 kg and the maximum weight was 100 kg

**BMI category of our study population**

We analyzed the distribution of BMI group in study population as per the Sri Lankan BMI categories. Mean BMI was 23.5  $\text{Kgm}^{-2}$  ( SD±3.51) in our study population and BMI varied between 16.16–34.93  $\text{Kgm}^{-2}$  among the study population, with a mean value of 23.54  $\text{Kgm}^{-2}$  (SD ± 3.52).

Figure 2 shows 38.5% of student were in normal BMI and 32.8% of them were obesity class 1 category and interestingly we could not find participants within the Obesity class 3 ( BMI level >35).

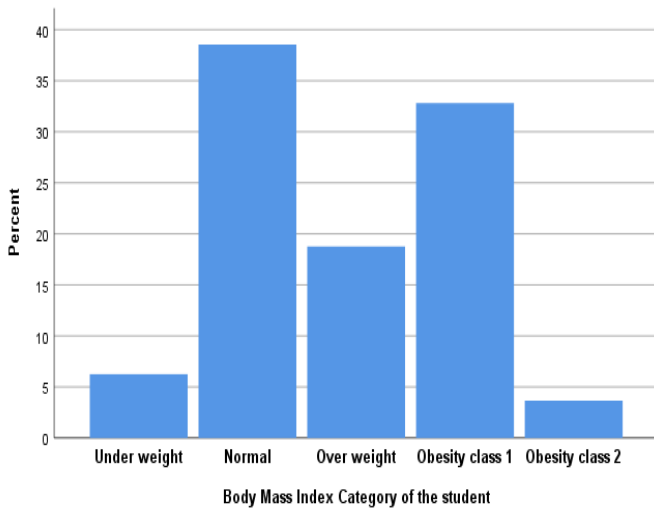


Figure 2 - percentage of our participants

Figure 2 shows the percentage of our participants belongs to the different category of BMI. 38.5% of student normal category (BMI 18.5 – 22.9); (n = 142) and 32.8% of them were obesity class 1 category (BMI 25.0 – 30.0); (n = 126). 18.8% (n=72) participants were overweight BMI category (BMI level 23.0-24.9). 6.3% of participants are underweight category (BMI level < 18.5); (n=24) and); 3.6% of them were obesity class 2 (BMI level 30-35(n=14). There were no participants within the Obesity class 3 (BMI level >35).

**Descriptive statistics of stress level evaluated by the Perceived Stress Scale**

Our results showed that The PSS Scale varied between 10–39 among the study population, with a mean value of 26.72 (SD±5.5). Table 2 shows that different stress level as per the perceived stress scale analysis.

Table 2 - different stress level by the PSS analysis.

Category	Frequency	Percentage
Minimum stress	6	1.6%
Moderate stress	196	51.0%
High perceives stress	182	47.4%
Total	384	100%

Table 2 shows the percentage of our study population in different level of stress analyzed using Sri Lankan figures. Majority of students had moderate stress (level 14–26); 51.0% (n=196).

47.4% of participants were under the high perceived stress (level 27–40); (n=182). Only 1.6% of students are ranged within the minimum stress level category (level 0-13); (n=6).

**Correlation between BMI and PSS Scale stress level**

Pearson correlation test was done statistically to find out the correlation between BMI and PSS level. According to our results, there is a moderate positive correlation between BMI and PSS level (r=0.24, p>0.001)

Following table 3 and the Figure 3 shows how the different MBI group participants level of stress analyzed by perceived stress scale.

Table 3 Correlation of BMI with PSS stress level

Correlations	Body Mass Index Value of the student	Perceived Stress Scale value of the student
6)Body Mass Index Value of the student	Pearson Correlation	1
	Sig. (2-tailed)	.239**
	N	.000
		384
8)Perceived Stress Scale value of the student	Pearson Correlation	.239**
	Sig. (2-tailed)	.000
	N	384
		384

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Following Figure 3 shows different stress level analyzed by perceived stress scale.

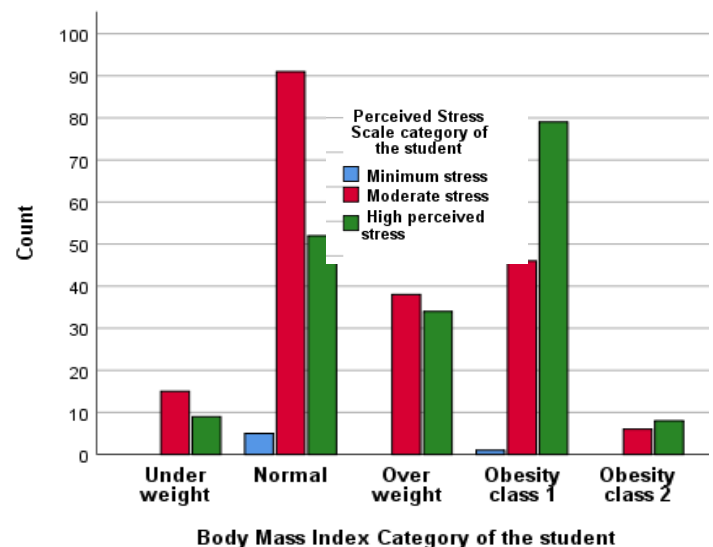


Figure 3 different stress level

Figure 3 shows 20.6% of Obesity class 1 category related with high perceived stress level. 23.7% of normal BMI category were found to have moderate stress level. 13.5% of (n=52) students were belong to normal BMI level with High perceived stress. 12.0% (n=46) of students were belong to obesity class 1 under the moderate stress.

**Gender difference with BMI category**

According to analysis, among total sample of female (n=212) majority of female; 27.6% (n=106) were belong to normal BMI Category and 30% of female (n=50) were belong to obesity class 1.

8.3% of female (n=32) were overweight and 4.9% of females (n=90) were underweight. Most importantly, 1.3% (n=5) females were belong to obesity class 2. Among total sample of male (n=172) majority of male; 19.8% (n=76) were obese class 1 and 10.9% of male (n=42) showed Normal BMI. Another 10.4% (n=40) of male were overweight. As a smaller percentage of male, 2.3% (n=9) and 1.3% (n=5) were belong to obesity class 2 and underweight respectively. Most importantly, we could not find students for class 3 obesity category.

Finally, although number of females are high in total participant sample, high number of males (n=125) were not in normal BMI range than the females. (n=87).

Figure 4 shows the different values of the BMI categories both in male and female study population

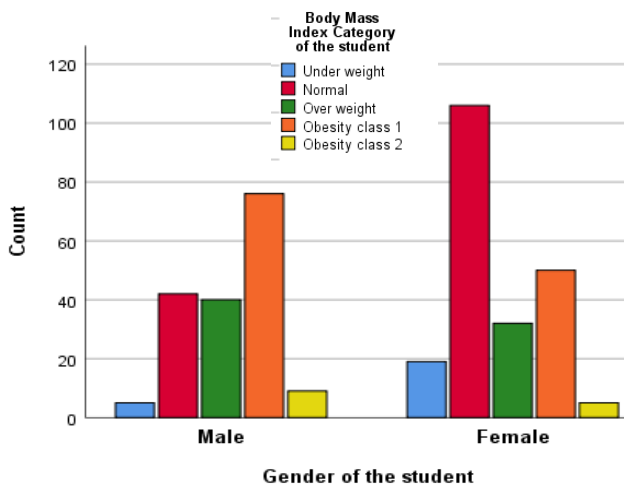


Figure 4 - the different values of the BMI categories both in male and female study population.

According to our research analysis, majority of male and female were belonging to moderate stress and high perceived stress. 27.6% (n=106) of female showed moderate stress and 26.0% (n=100) female showed high perceived stress scale.

In compared to previous results, males 23.4% (n=90) showed moderate stress and 21.4% (n=82) showed high perceived stress. No males participants showed with minimum stress but 1.65% of female (n=6) had minimum stress.

As per our comparison study, male and female result showed that both has considerable stress which was not depending on gender. (Figure 5)

Figure 5 shows female participants showing higher perceived stress compared to males in number and strength



Figure 5 – figure 5 shows the level of perceived stress both in female and male group

**BMI AND PERCEIVED STRESS SCALE CROSS TABULATION**

According to this analysis, 20.6% of Obesity class 1 category showed high perceived stress level and 23.7% of normal BMI showed moderate stress level. 13.5% of (n=52) students showed normal BMI level with High perceived stress. 12.0% (n=46) of student were belong to Obesity class 1 under the Moderate stress. This results showed that high perceived stress is observed in obesity class 1.

Table 3 - results of BMI with perceived stress level of our study population

BMI Category	Perceived Stress Level Category		
	Minimum stress (0-13)	Moderate stress (14-26)	High perceived stress (27-40)
Under weight (<18.5)	0 (0.0%)	15 (3.9%)	9 (2.3%)
Normal (18.5-22.9)	5 (1.3%)	91 (23.7%)	52 (13.5%)
Over weight (23.0-24.9)	0 (0.0%)	38 (9.9%)	34 (8.9%)
Obesity class 1 (25.0-30.0)	1 (0.3%)	46 (12.0%)	79 (20.6%)
Obesity class 2 (30.0-35.0)	0 (0.0%)	6 (1.6%)	8 (2.1%)
Obesity class 3 (>35.0)	-	-	-

## CONCLUSION

We identified majority of students have moderate to high degree perceived stress during this undergraduate period. In addition to that this perceived stress is positively correlated with the body mass index. This is an interesting finding which is very important to plan institutional level intervention program for all students who perceive higher education and needs urgent action plan for to reduce the level of stress. As institutions, we can strongly recommend considering evaluated intervention program to minimize the educational stress which can also reduce the high BMI related non communicable diseases in future.

## DECLARATIONS

### A. Study Limitations

This study was conducted only in non-state universities of the Sri Lanka and we found it as a limitation factor we expect to expand this study for all students in higher education in Sri Lanka and analyze the data.

### B. Acknowledgements

Our group acknowledge all the staff in the Faculty of Health Sciences for the extended support in this regard.

### C. Funding source if any

None.

### D. Conflict of Interests

None

### E. Human and Animal Related Study - NA

### F. Ethical Approval

Research proposal was approved by the CINEC Ethics review Committee and the approval number is

### G. Informed Consent

All participant were given the informed consent to publish this research work.

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