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Original article

Association between psychological stress and body mass index of the physiotherapy students at the University of Colombo, Sri Lanka: A cross-sectional study

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ABSTRACT

Background & Aim: Stress is the body's response to external or internal demands. University students encounter different types of psychological stressors during their academic life, and they use different mechanisms for coping. Multiple factors, including lifestyle habits, stress-related behaviours, and eating disorders, can influence changes in body mass index (BMI). Similar types of associations have been found among university students. This study aimed to determine the association between psychological stress and BMI among physiotherapy students at the University of Colombo, Sri Lanka.

Methods: A descriptive cross-sectional study was conducted among 105 physiotherapy students at University of Colombo. Convenience sampling was used. Information on stress scores, related stressors and stress reactions was collected using the Student-life Stress Inventory, which is a validated self-administered questionnaire. Self-reported height and weight measurements were taken for this study. BMI was calculated from the height and weight of the participants and was categorised according to the standard World Health Organisation guidelines. The association between psychological stress score and BMI was analysed using the Pearson's correlation test.

Results: The sample size was 105 and consisted of 78 (74%) females. The mean age of the participants was 23.85 years (SD=1.25). The mean total stress score was 25.35 (SD=7.869). The mean BMI was 21.882 kg/m^2 (SD=4.211). The self-imposed stressors were the most prevalent category of stressors (79% above the midpoint), and frustrations were the least common category of stressors among participants (64% above the midpoint). Cognitive responses were the most prevalent reactions, being 73% above the midpoint. The correlation coefficient between total stress score and BMI was 0.121 (p=0.231).

Conclusions: The mean BMI of the population falls under the normal weight category. No correlations were found between psychological stress and BMI among the participants.

Keywords: *psychological stress, body mass index, Students-life Stress Inventory*

Introduction

Among various contributing factors, psychological stress is recognised as an important determinant of weight changes. Research suggests that psychological stress can impact body mass index (BMI) through behavioural and physiological mechanisms. Occupational stress, for instance, has been identified as a risk factor for weight gain (1), and similar associations have been found in university students (2,3). However, the association between psychological stress and BMI among university students, particularly physiotherapy students in Sri Lanka, remains unexplored.

Stress is defined as an individual's physiological and psychological response to environmental demands and is regulated by the parasympathetic and sympathetic networks (4). University students often face academic pressures, financial concerns, and social challenges, all of which contribute to psychological stress (5). As a result, they may engage in maladaptive coping behaviours, such as emotional eating and reduced physical activity, which can negatively impact their BMI (6). Additionally, many students adopt sedentary lifestyles due to the demanding nature of academic work, further increasing their risk of weight-related health issues.

Body mass index is a widely used anthropometric measure for assessing nutritional status and health risks. It is calculated as a person's weight in kilograms divided by the square of their height in meters (7). Based on BMI values, individuals are categorised as underweight, normal weight, overweight, or obese. Since BMI is an indicator of certain non-communicable diseases, fluctuations in BMI can have significant health implications. Other anthropometric measures, such as waist circumference and skinfold thickness, are also used to assess body composition and health risks (8). Standardised anthropometric assessment methods, as recommended by the International Society for the Advancement of Kinanthropometry, ensure accurate and reliable measurements (9).

The association between psychological stress and BMI is complex and often bidirectional. Research suggests that psychological stress may contribute to weight gain, while excess weight can, in turn,

increase stress levels. A study conducted in Saudi Arabia found that stress-induced dietary behaviours could lead to weight fluctuations, with variations based on sex and baseline BMI (6,10). Additionally, chronic stress has been shown to alter eating patterns, potentially leading to long-term health issues such as obesity or malnutrition (6).

The biopsychosocial model suggests that stress influences BMI through behavioural and physiological pathways. Prolonged exposure to stress mediators like cortisol can contribute to weight gain, while stress-related behaviours, such as emotional eating and reduced physical activity, further exacerbate the issue (11). Longitudinal studies indicate that chronic stress predicts weight gain over time (12).

Dietary behaviours also play a crucial role in psychological stress-induced weight changes. Studies have found that chronic stress can lead to increased carbohydrate consumption, which may contribute to obesity (13). However, psychological stress responses vary among individuals, with some gaining significant weight, while others maintain or even lose weight under psychological stress (6).

Further evidence suggests that the association between psychological stress and BMI is influenced by sex and body weight status. For example, a study on psychological stress, race, and body weight found that overweight and obese men were more likely to gain weight under stress, whereas no similar association was observed in women (14). However, findings on psychological stress and BMI remain inconsistent. Some studies have reported a

significant correlation, while others have found no clear associations between psychological stress and BMI classifications (15–17).

Literature suggests that stress leads to overeating or undereating depending on several factors, including coping styles, gender, and BMI (18). Chronic stress is related to emotional eating habits, which in turn contribute to increased adiposity, based on a study on obese women. This suggests that managing stress may be crucial in reducing obesity (19). In line with research studies carried out on young adults and adolescents, dietary behaviours like consuming more high-fat and sugary foods are linked with daily stress levels (20). This pattern highlights the significance of stress management strategies for younger populations.

Despite extensive research on the association between psychological stress and BMI in various populations, studies have primarily focused on working adults (21), general adult populations (22), and school children (23). Limited research has explored this association among university students, particularly in Sri Lanka.

The present study aimed to investigate the association between psychological stress and BMI among physiotherapy students at the University of Colombo. The research question guiding this study was: "Is there an association between psychological stress and body mass index among physiotherapy students at the University of Colombo?" No previous studies have examined this association in Sri Lankan university students; hence, identifying potential associations between psychological stress and BMI in this population provides useful information for promoting a healthier lifestyle among university students.

Methods

Study design and setting

This cross-sectional descriptive study was conducted at the Department of Allied Health Sciences, Faculty of Medicine, University of Colombo, Sri Lanka. The target population included physiotherapy students from the university.

Sample selection

Participants were recruited purposively from four academic years. From each academic year, 25-30 students were recruited randomly. A simple random sampling technique was used with a final sample size of 105. Only the students who provided informed consent were included.

Study variables and data collection

The independent variable was psychological stress, measured using the Student-life Stress Inventory (SLSI), a validated tool used in previous studies (17,24,25). The SLSI assesses psychological stressors and reactions to stress through 51 items categorised into stressor-related (frustrations, conflicts, pressures, changes, and self-imposed stress) and reaction-related (physiological, emotional, behavioural, and cognitive) subscales. The questionnaire was translated into Sinhalese and Tamil and then back-translated into English for accuracy, followed by pilot testing. The dependent variable was BMI, calculated as weight (kg)/height^2 (m^2) using World Health Organisation (WHO) standards (7).

Height was measured in centimetres using a wall-mounted ruler and converted to metres. Participants stood barefoot with proper posture, and three readings were averaged for accuracy (8). Weight was measured using calibrated scales on a level surface, with minimal clothing. Discrepancies prompted re-measurement to ensure accuracy (26).

Ethical clearance was obtained from the Ethics Review Committee, Faculty of Medicine, University of Colombo, Sri Lanka (ERC reference number: UCP/AL/16/368). Permission for data collection was granted by the Dean, Faculty of Medicine, University of Colombo, and the Head of the Department of

Allied Health Sciences.

Descriptive statistics (frequencies, means, standard deviations) were used to summarise categorical and qualitative variables. Inferential statistical tests were applied to determine associations between psychological stress and BMI.

A total of 124 students were invited, with the first 105 responses considered. After applying the eligibility criteria, 100 physiotherapy undergraduates (26 males, 74 females) were included in the final analysis. The mean age of participants was 23.85 years (SD=1.25) years with a range of 22–26 years. All the academic years were equally represented.

Results

Table 1. Descriptive data of the demographic and anthropometric characteristics (N=100)

Variable	No. (%)
Age, mean (SD)	23.85 (1.25)
Gender %	
Female	74.0
Male	26.0
Year of study%	
1st year	23.0
2nd year	25.0
3rd year	27.0
4th year	25.0
Weight in kg, mean (SD)	55.85 (10.34)
Height in m, mean (SD)	1.60 (0.09)
BMI, in kgm^{-2} mean (SD)	21.88, (4.21)

Abbreviations: BMI-Body Mass Index

Table 2. Mean and standard deviation of stressors and reactions to stressors based on SLSI

	Mean	Standard deviation	Number of items	Score range	Midpoint of scores	% above midpoint
Stressor						
Self-imposed stressors	4.54	1.267	6	0-6	3.5	79%
Pressures	3.07	1.094	4	0-4	1.5	70%
Conflicts	1.99	0.916	3	0-3	2	67%
Changes	1.99	1.020	3	0-3	1.5	65%
Frustrations	4.17	1.793	7	0-7	3	64%
Reaction type						
Cognitive	1.59	0.726	2	0-2	7	73%
Emotional	3.03	1.058	4	0-4	2	72%
Behavioural	3.05	1.760	8	0-8	4	27%
Physiological	5.10	±2.830	14	0-14	1	17%

Abbreviations: SLSI- Student-Life Stress Inventory

The Student Life Stress Inventory was used to evaluate stress

Self-imposed stressors had the highest mean score, 4.54 (SD=1.27), while conflicts had the lowest, 1.99 (SD=0.92). Among reactions to stressors, physiological reactions had the highest mean, 5.10 (SD=2.83), while cognitive reactions were the most prevalent (73% above the midpoint).

The total stress score ranged from 5 to 44; mean=25.35, (SD=7.87). Most participants (67%) perceived their stress levels as moderate, while 6% reported severe stress. Out of the study sample, 64% had normal BMI (18.5–24.9 kg/m²), 20% were underweight (<18.5 kg/m²), 13% were in the pre-obesity range (25.0–29.9 kg/m²), and 3% were classified as obese (≥30.0 kg/m²). There was no significant association between BMI and age (p=0.523) or gender (p=0.815), though males had a slightly higher mean BMI, 22.05 kg/m^2 (SD=4.10), compared to females, 21.82 kg/m^2 (SD=4.28). Pearson's correlation showed no significant association between stressor categories and BMI (r values: 0.035–0.132, p> 0.05).

Table 3. Correlation between stressors and BMI

Stressor	r value	*p* value
Frustrations	0.108	0.287
Conflicts	0.132	0.191
Pressures	0.035	0.726
Changes	0.036	0.723
Self-imposed	0.118	0.243

Abbreviations: BMI-Body Mass Index

Table 4. Correlation between reaction to stressors and BMI

Reaction type	r value	*p* value
Physiological	0.053	0.600
Emotional	**0.226**	**0.024***
Behavioural	0.040	0.694
Cognitive	-0.063	0.534

*Abbreviations: BMI-Body Mass Index, *<0.05, statistically significant*

According to our findings, students who were twenty-six years old showed the highest mean stress score, 27.18 (SD=9.119), among all age groups, and those who were twenty-three years old reported the lowest mean stress score, 22.71 (SD=6.154). There was no significant mean difference in stress scores among age groups (p=0.341, p>0.05). Based on the analysis, it was found that male students had a lower mean stress score, 23.23 (SD=9.369), compared to female students, 26.09 (SD=7.194). However, there was no significant difference in stress scores between male and female students (p=0.111, p>0.05). Third-year students showed the highest mean stress score, 27.33 (SD=7.550), among the four study years, and first-year students reported the lowest mean score for stress, 24.17 (SD=6.336).

A weak but significant correlation was found between emotional reactions and BMI (r=0.226, p=0.024). No other reaction categories showed a significant association. Pearson's correlation analysis between total stress score and BMI showed no significant association (r=0.121, p=0.231).

Discussion

The present study found that self-imposed stressors were the most prevalent, followed by pressures and frustrations. These findings are consistent with the previous research on stress among university students (27,28), where self-imposed stressors were also the

most frequently reported. However, some studies contrast with these findings, identifying pressures as the dominant stressor (29), suggesting that the most salient stressor may vary by setting, academic culture, or year of study.

Regarding reactions to stress, physiological responses were the most pronounced, though cognitive reactions were the most frequently reported. This might indicate the academic setting in which students are mentally overworked with assignments and due dates. While our findings are consistent with some literature (27), some studies suggest emotional reactions are more common (29), indicating that personal coping mechanisms and emotional intelligence could affect the experience and expression of stress.

The majority of participants (67%) reported moderate stress levels, similar to a previous study (30). This suggests that stress is a considerable part of student life in health-related fields. Students who perceived their stress as severe had higher stress scores across subscales, consistent with previous findings (31).

There was no significant difference in psychological stress scores across age groups, though students aged 26 years had the highest psychological stress levels. The narrow age range in the sample (22–26 years) might be the cause of the lack of statistical significance. This is similar to the findings by Al-Garni et al. (32). However, another study indicates that university students, regardless of age, experience high psychological stress levels (6), possibly due to academic and personal burdens that they encounter.

Although female students had higher stress scores than males, the difference was not statistically significant. This aligns with previous studies (6,17) but differs from a longitudinal study conducted in China (33), which reported significantly lower psychological stress levels among females. Studies suggest that females use emotional coping strategies more frequently than males, who tend to be more detached (34). Gender-specific coping methods may explain these differences to a certain extent. While males may use more avoidant or problem-focused approaches, women are more likely to practise emotion-focused coping, which could increase perceived stress.

Psychological stress levels varied across study years, with third-year students reporting the highest scores. This might reflect the academic and clinical workload peak for the students in the senior years. While some studies support this variation (35,36), others indicate that first-year students experience the highest psychological stress due to transition challenges (37). However, in the present study, psychological stress differences between years were not statistically significant, consistent with findings from previous studies (33).

The mean BMI in this study falls within the normal weight range, consistent with studies conducted in other Asian populations (38,39). The majority of participants had normal BMI, while obesity was the least prevalent category (39). These findings may suggest that this population might be health-conscious or subject to fitness standards due to their training in physiotherapy.

There was no significant difference in BMI across age groups, similar to findings by Rojo-Ramos et al. (2023) (40). The highest mean BMI was reported among 26-year-olds, but age differences were not significant, likely due to the narrow age range (22–26 years). Contrastingly, studies on older populations have shown that BMI increases with age.

Males had a slightly higher mean BMI than females, but the difference was not statistically significant. This aligns with previous findings (40), which found no significant gender-based BMI differences. However, other studies report that men generally have a higher BMI than women. No significant correlation was found between overall stress scores and BMI, consistent with findings from another study (41). This might point out that stress may not have a

direct or linear impact on body weight, especially in young, educated populations with relatively stable routines.

A weak but significant positive correlation was observed between emotional reactions to stress and BMI. These findings contrast with studies showing a positive correlation between psychological stress and BMI in females and males. As per the findings of the present study, no association was found between the stressors and BMI. These results are consistent with the study of Kolehmainen and Sinha (2014) (18). However, several authors have identified that there is an association between stressors and BMI (19, 20). Some studies have reported that individuals with a higher BMI tend to gain weight under psychological stress, while those with a lower BMI tend to lose weight. Other studies have found weak associations between work stress and body mass index (BMI), although academic and occupational stress may differ.

This study examined the association between psychological stress and BMI among physiotherapy students at the University of Colombo and found no significant correlation between the two. Similar findings have been reported by previous literature stating that there is no such association (42,43), whereas contrasting evidence has been identified by Zhuhan et al. (2025), reporting a positive association between stress levels and BMI among university students (44). According to the present study, self-imposed stressors were the most common. This aligns with the results of a similar study, where the same findings were obtained (45). The present study also found that frustrations were the least reported. Some authors have reported similar results, stating that frustrations are the least common category of stressors in their study (46). Cognitive reactions were the most frequent, while physiological responses were the least. Similarly, a group of authors found that students identified cognitive responses as the most common reactions to stressors (46). However, some studies present contrasting findings. According to certain literature, emotional stressors were the most prevalent among university students (45,47). Most students perceived their psychological stress as moderate, consistent with findings from a similar South Asian study (48). Female students had higher stress scores than males. A study conducted in Kuwait showed similar results (49), although some studies have reported opposing findings (50).

The mean BMI fell within the normal weight range, and males showed slightly higher BMI values than female students. These findings are consistent with similar studies that have identified links between stress and BMI among medical students (51,52). A weak positive correlation was observed between emotional reactions to stress and BMI, but no significant associations were found with other stressors. Similarly, a study of Malaysian secondary school students found a positive correlation between perceived stress and emotional responses (53). Even though these participants were younger than those in the present study, the pattern supports the concept.

The potential confounding factors, such as physical activity levels, dietary habits, sleep patterns, alcohol and caffeine consumption, and smoking habits, can independently affect both psychological stress and BMI. This represents a major limitation because, without adjusting for these factors, it is challenging to isolate the direct association between the two main variables. Future research should consider using the validated scale in its original form or revalidating any adapted version. Additionally, the relatively smaller sample size used in the study may limit the generalizability of the findings. It is advisable to conduct studies with larger sample sizes to enhance statistical power.

Conclusions

While there was no significant association between stress and body mass index among physiotherapy students at the current setting, the most prevalent group of stressors was those related to self-imposed stressors, and the least common stressors were those related to frustrations. Moreover, the most

frequently reported category of reactions to stressors was cognitive, and the physiological category was the least prevalent category. Our study could show that the majority of the participants perceived their stress level as moderate and that the level of stress score varies according to age, gender and years of study. Furthermore, third-year students showed the highest mean scores of stress among all the study years, and male students showed a lower mean stress score compared to female students.

The mean BMI value of the population falls under the normal weight category, and the male students showed slightly higher mean BMI, compared to females. Although there was no significant correlation between any of the stressors and BMI, a weak, positively significant association was observed between emotional reactions and BMI. However, none of the other reactions to stressors indicate any significant relationship with the mean BMI in the selected sample.

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Author Declarations

Competing interests: The authors declare no conflicts of interest related to this research.

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