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Impact of Academic Stressors on Eating Behaviour Among University Students: Application of Socio-Ecological Model

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Academic stressors can hinder the wellbeing of students and impact their eating habits. In this study, we apply the socio-ecological model to academic stressors and explore the influence they have on eating behaviour among university students. This cross-sectional study was set in a private health sciences university in Malaysia among a sample of 183 pre-university students, which was obtained using systematic random sampling technique. The academic stressors of the participants were assessed using the Academic Stress Questionnaire while eating behaviour was determined using The Three Eating Factor Questionnaire Revised-18 Items. Significant association ($p \leq 0.05$) was found between academic stressors and eating habits. The increase in academic stressors increased the unhealthy eating behaviours: Cognitive Restraint, Uncontrolled Eating, and Emotional Eating. The findings illustrate that academic stressors should be taken into consideration for future university health interventions to promote healthy eating behaviour.

Keywords: *socio-ecological model, academic stressors, eating behavior, student*

Introduction

In 2018, Malaysia was recognised as the fattest nation in Asia and had the second-highest childhood obesity rate among children in ASEAN countries.[1] In less than two decades, the prevalence of overweight and obesity has increased by 80% and 70% in Malaysia,[2] with the prevalence of obesity in teenagers climbing over the last decade from 9.5% in 1997 to 19.6% in 2007.[3] One of the factors that may be contributing to this problem is stress.

Students of the current generation face a plethora of stressors including family, academics, finances and social.[4] Academic stressors in particular, have been linked to affecting eating habits through various pathways.[5] Stress is defined as the negative process which affects an individual's emotions, cognitive behavioural and physiological function to adjust with certain stressors which occur in their life.[6] Stressors are events or situations which can disturb, interfere, or even threaten an individual's function in their daily life. Stressors will affect a person's daily function in order to make adjustments to accommodate to the stress or strain faced by the individual.[7] Academic stress is the response of the body towards academic-related demands when a student is no longer able to adapt to these demands.[8] Academic stressors are factors that lead to academic stress. Eating behaviours refers to patterns of food consumption which include a variety of food choices and it may relate to obesity or malnutrition.[9] University students are considered to have more stressful lives than other people in their various stages of life.[10] Academic stressors can include finance, peers, exams, time management, study methods, lecturers and environment.[11,12] High academic stress can have a negative impact on a student's health, including cardiovascular health.[13] In addition, high academic stress has been correlated with lower well-being, anxiety, depression, changes in appetite, sleeping problems, and reduced academic performance.

One of the most important characteristics determining an individual's health is what is being used to nourish and maintain the body. This is determined by the eating behaviours of individuals. One study on nutrition-related factors and binge eating behaviour

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among Malaysian university students showed that 10 percent of the participants had binge-eating behaviour. [14] In a study by Steptoe *et al*, in 2012, it was found that people who recorded more events of annoyance, irritation, concern, or disappointment ate fast food more often.[15] In a cross-cutting analysis by university students from three European countries, Mikolajczyk concluded that the relationship between stress, depression symptoms and unhealthy food was very different for each country.[15] This implies that the association between stress and food choice can differ based on the country the individual resides in.

Students tend to eat an unbalanced meal or have diets consisting of too much starch, sugar and fat.[16] Unbalanced nutrition due to stress can contribute to the development of diseases, affecting general wellbeing and cognitive abilities. In 2013, a systematic review on stress and eating behaviours among animals indicated that stress influences food habits, with foods rich in fat and sugar being preferred when participants become either physically or emotionally stressed.[17] Stress has been related to "comfort eating," which is overeating high-sugar, high-fat foods and this can contribute to weight gain.[18] Cortisol increases appetite which may cause an individual to eat more in situations causing anxiety.[10] During those times, stress triggers the body to release the hormone cortisol.

Although there are plenty of previous studies on the impact of stress among university students, there are just a handful that explore the relationship of factors of stress and their impact on eating behaviours of an individual.[19] This is especially important in the global context of rising obesity prevalence, where causes of obesity need to be identified and addressed through appropriate intervention and policy measures.[20] This study seeks to determine the effect of academic stress factors on the eating behaviour of university students. By identifying stressors that can result in a shift in eating behaviour, proactive steps can be taken to avoid detrimental health issues.[21]

Materials and Methods

This research employed a cross-sectional quantitative study design. The target population were students enrolled in a science-based pre-university course in a private medical university in Kuala Lumpur, Malaysia. The sampling frame was 353 students and a total sample size of 183 students was derived using the formula derived from the work of Krejcie and Morgan.[36] A random sampling technique was employed for recruiting participants, and data was collected over three months, between 28th August 2020 to 25th November 2020. Participants were at least 18 years old and Malaysian citizens. This targeted population was chosen as this population has just progressed from school to university environment, where the focus is on independent self-management and learning.

Conceptual framework

The social ecological model (SEM) behaviour theory was used as the theoretical framework basis for this research study because the model explores how an individual is connected with and interacts in their environment and society. This model has been previously used for childhood obesity interventions.[22,23] In this study, we have developed a conceptual framework (Figure I) based on this theory, where academic stressors are categorised into various levels of the SEM, all of which influence eating

behaviours. The levels of academic stressors include: I. Individual (gender, age, ethnicity, household income, individual behaviour such as sleeping habits, smoking, and alcohol consumption); II. Interpersonal (relationship with family, friends, housemates, students, and teachers); III. Institutional (academic factors: hours of studying, examinations, missing lectures, and number of assignments); IV. Community (environmental factors: living conditions, moving to new city, and unfamiliar circumstances).

Exposure variables

The exposure variables are sociodemographic factors and academic stressors. Sociodemographic factors include sex, ethnicity, family household income, smoking status, and alcohol consumption. The categories of academic stressors are based on four environmental structures with which an individual can interact, which are: I. Relating to other people (interpersonal); II. Scholarly; III. Personal; IV. Environmental. Each of these variables can have an impact on change in eating behaviour.

Outcome variable

The outcome variable is eating behaviour, which is categorised into three types: cognitive restraint, uncontrolled eating, and emotional eating. Cognitive restraint refers to when an individual consciously restricts and controls their food intake without using physiological cues such as hunger. Eaters in this category will consume food less than what the body requires.[24] Uncontrolled eating is a form of binge eating behaviour where an individual has a tendency to overeat with no self-control.[24] Emotional eating is a form of eating behaviour where an individual tends to eat in response to their negative emotions.[24] These three eating behaviours have the potential to be unhealthy.

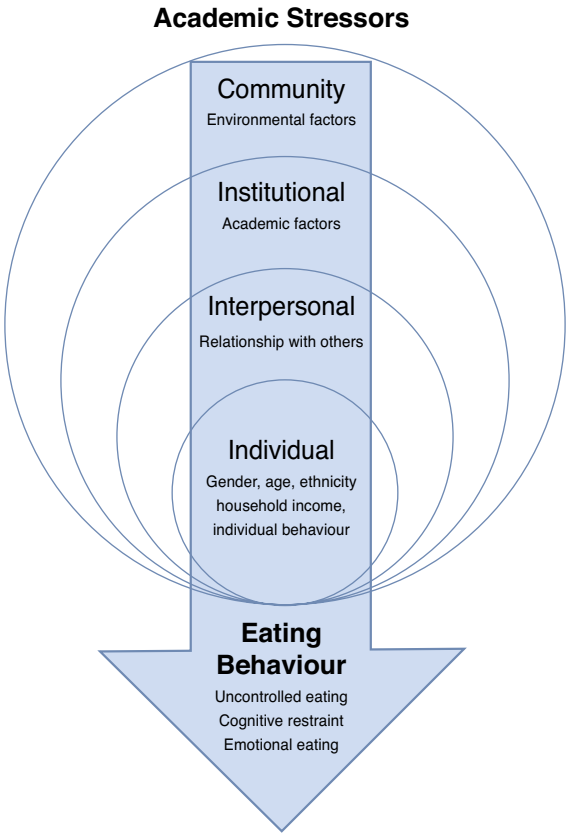

Figure I. Conceptual framework: Application of Socio-Ecological Model (SEM) to academic stressors and their influence on eating behaviour among students.

Data collection procedure

Participants were asked to complete an online, English language, self-administered questionnaire on Google Form platform. A systematic random sampling technique was used with an adaptation of a replacement method to select the students. The first student was selected by an electronically generated random number with the updated list of pre-university course students from the student affairs department of the selected university. After

that, every second student was selected from the list. Emails were sent that included the information sheet, consent form and link to the questionnaire. Approval for distribution of the survey was obtained from university administration after explaining the intent of the research study. Participation was voluntary and if the student did not respond within one month, the next student on the list was sent an invitation to participate. Data collection started on 28th August 2020 and was completed on 25th November 2020.

Study instrument

The questionnaire comprised of three sections: I. Sociodemographic, II. Academic stress, and III. Eating behaviour. Two existing validated questionnaires were used in Section 2 and 3.

Academic stress questionnaire was previously used in an analysis of undergraduate student academic stress in Sweden.[29] It is an open-source self-reported questionnaire that consists of 32 items, grouped into four categories of academic stressors, which include: sources relating to the relationships of the pre-university students with others, scholarly variables, personal variables, and environmental variables. There is an equal number of eight items in each category. For evaluating the degree of stress for each category, the respondents are evaluated based on a 5-point Likert scale, from 1 as not all stressful to 5 as extremely stressful. They were also provided the option of don't know, which was categorised as missing value during data analysis.

The Three-Factor Eating Questionnaire (TFEQ-R18) was used to investigate eating behaviours.[25] The original source of the questionnaire was from the Stunkard Messick TFEQ with 51 items.[26] However, it was revised to produce the Three-Factor Eating Questionnaire Revised-18 item version (TFEQ-R18), which is a self-reported questionnaire measuring three different eating behaviours, which are cognitive restraint (6 items), emotional eating (3 items) and uncontrolled eating (9 items).[25] The revised version (TFEQ-R18) has been widely used in several countries including Malaysia.[27] Respondents are evaluated based on a 4-point Likert scale; whereby higher values would indicate more of the eating behaviours.[25] The internal consistency and reliability coefficient,[24] for all these three scales are: uncontrolled eating is 0.85, emotional eating is 0.87, and cognitive restraint is 0.75. Permission to use the questionnaire is mentioned to be unrestricted use provided the original work is cited properly.[24]

Statistical Analysis

The data obtained was analysed and tabulated using Statistical Package for Social Science (SPSS) (IBM Statistics Version 25 by IBM Corporation, NY, USA). Frequency tables were obtained to check missing data, out of range values and to assess distributions of continuous variables. Mean scores for academic stressors and eating behaviours were calculated based on responses on the Likert scale questionnaires. Pearson correlation test was used for determining association between academic stressors and eating behaviours. The correlation was observed collectively as a group (mean score) and as separate individual categories.

Results

In this study conducted online, 290 surveys were sent out and the response rate was 63.7%, where 183 participants participated in the survey. Normality testing using Kolmogorov-Smirnov normality test, was done for each category of academic stressors and eating behaviours. The results were found to be normally distributed.

The population demographic profile is represented in Table I, which illustrates that 22.4% were males while 77.6% were females. Among the respondents of this study, the majority of the respondents were Chinese (71.6%), followed by Indian (13.7%), Malay (10.4%) and Others (4.4%). The majority of the respondents did not smoke (97.8%) and did not consume alcohol (86.9%).

Table I - Demographic Profile

Demographic	Frequency (N = 183)	Percentage (%)
Gender		
Male	41	22.4
Female	142	77.6
Ethnicity		
Malay	19	10.4
Chinese	131	71.6
Indian	25	13.7
Others	8	4.4
Family Household Income		
≤RM 6000	79	43.2
>RM 6000	104	56.8
Smoking Status		
Yes	4	2.2
No	179	97.8
Alcohol Consumption		
Yes	24	13.1
No	159	86.9

An independent T-Test was conducted to compare the mean of academic stressors which are relating to other people, personal factors, academic factors and environmental factors to the mean sociodemographic/ socioeconomic factors. A significant association was not observed apart from emotional eating to family household income [t (181) = -2.45, p = 0.015] and ethnicities [p<0.05 level F (4, 179) = 8.09, p = 0.000].

An independent T-Test was conducted to compare the mean of academic stressors which are relating to other people, personal factors, academic factors and environmental factors to the mean sociodemographic/ socioeconomic factors. A significant association was not observed apart from personal factors with ethnicities [p<0.05 level F (4, 179) = 2.98, p = 0.03] and environmental factors with ethnicities [p<0.05 level F (4, 179) = 3.55, p = 0.016].

A Pearson product-moment correlation coefficient was computed to assess the association between academic stressors (relating to other people, personal factor, scholarly factor and environmental factor) and eating behaviours (cognitive restraint, uncontrolled eating and emotional eating). The results of the Pearson correlation test in Table II reveal the overall mean of grouped academic stressors to be 3.48 and overall mean of grouped eating behaviour to be 2.23. There was a positive correlation and high significance between these two variables (r = 0.455, p= 0.000). Hence, the increase in academic stressors increases potentially unhealthy eating behaviour patterns.

Table II - Means and association of academic stressors and eating behaviours.

Mean of Academic Stressors	Mean of Eating Behaviours	Pearson Correlation (*r-value*)	*p-value*
3.48	2.23	0.455	0.000

Table III - Association of each academic stressor with each eating behaviour.

FACTORS	Cognitive Restraint		Uncontrolled Eating		Emotional Eating	
	Pearson Correlation	*p-value*	Pearson Correlation	*p-value*	Pearson Correlation	*p-value*
Relating to Other People	0.208	*0.005	0.208	*0.002	0.230	**0.000
Scholarly	0.271	**0.000	0.375	**0.000	0.351	**0.000
Personal	0.361	**0.000	0.392	**0.000	0.396	**0.000
Environmental	0.221	*0.003	0.350	**0.000	0.294	**0.000

**p-value* <0.005 – significant ***p-value* <0.001 – highly significant

Associations between each academic stressor and each eating behaviour were assessed using Pearson correlation and are depicted in Table II. The results show a significant ($p<0.001$) weak to medium strength positive correlation, where correlation of 0.10 to 0.29 indicates weak correlation, and 0.30 to 0.49 indicate medium strength correlation.

There was a significant and positive correlation between "relating to other people" (academic stressor) with cognitive restraint ($r = 0.208$, $p = 0.005$), uncontrolled eating ($r = 0.208$, $p = 0.002$) and emotional eating ($r = 0.230$, $p = 0.000$). There was a significant and positive correlation between "scholarly factor" with cognitive restraint ($r = 0.271$, $p = 0.000$), uncontrolled eating ($r = 0.375$, $p = 0.000$) and emotional eating ($r = 0.351$, $p = 0.000$). There was a significant and positive correlation between "personal factor" with cognitive restraint ($r = 0.361$, $p = 0.000$), uncontrolled eating ($r = 0.392$, $p = 0.000$) and emotional eating ($r = 0.396$, $p = 0.000$). There was a significant and positive correlation between "environmental factor" with cognitive restraint ($r = 0.221$, $p = 0.003$), uncontrolled eating ($r = 0.350$, $p = 0.000$) and emotional eating ($r = 0.396$, $p = 0.000$).

Discussion

The results of this study are significant as there is evidence of an association between academic stressors in university students and their corresponding eating behaviours. Specifically, increase in academic stressors increases potentially unhealthy eating behaviours: cognitive restraint, uncontrolled eating, and emotional eating. Other studies have explored the health impacts of stress and its association with dietary habits. However, these studies focus on stress as a general component, rather than specifying academic stressors. It is pivotal to specify academic stress and eating behaviours so that health promotion interventions can be designed particularly for the high-risk group of young adults in an educational environment.

Our results support the association of increase in uncontrolled eating, cognitive restraint and emotional eating with increase in academic stressors (personal, interpersonal, scholarly and environmental factors). This is supported by findings from a study done in a Brazil college, which states that 43 percent of the students have a high stress level and that depressed individuals consume more.[28] Studies have also shown that overeating and a fixation with food will evolve from stress.[19,28] In addition, individuals that have high carbohydrate and high fat intakes levels are generally susceptible to stress because of their relatively low energy intake which may generate anxious feelings. Burnout and eating disorders are common among students at a private university in Malaysia.[20]

Studies indicate that stress can affect an individual's appetite which leads to either eating more or less than usual and can affect the food preferences of the person, causing him/her to consume high-fat and dense calorie "snack" candy rather than "meal type" foods, such as meat and vegetables.[29] Hyperphagia was reported by 46 percent of women and 17 percent of men under stress in a food selection study conducted among 169 undergraduate students in USA.[30] Gibson *et al*, in United Kingdom observed in their laboratory study that people under stress consumed soft, fatty food in excess of low-fat bland foods or salty foods, with

cake and chocolate as their principal favourite snacks. Physiologically, the impact of stress on the body could lead to energy-rich snacks being consumed rather than meal consumption due to the suppression of intestinal activity through sympathetic (adrenaline-promoted) excitement and easier digestion of snacks than meals.[12] Sleep deprivation has been associated with hyperphagia due to disrupted release of ghrelin and leptin, which neurotransmitters that regulate appetite.[31] That is consistent with the findings of our study, where sleep was identified as a personal factor of academic stressors.

In our study, we found that there was a significant association between emotional eating and ethnicities. This is in line with a study that assessed emotional experiences through different forms of eating patterns across Finnish, French and Pakistani cultures. It was found that there were strong differences among the groups, with some eating in social and luxurious eating pattern when in positive emotions while others eat in solitary with positive emotions.[32] There was also a significant association between emotional eating and family household income in our study. There is increasing research to suggest that youth from lower income households are at risk for loss of control eating. The inability of individuals to satisfy needs successfully may be perceived as a stressor and individuals may engage in emotional eating as an alternative to fulfill their needs.[33] This is depicted in a study among adolescents, which revealed lower household income-to-needs was positively associated with loss of control in eating at higher levels of household food insecurity.[34] Although gender was not found to be a significant factor in regard to eating behaviours in our study, another study found that in comparison with men, women constitute the majority of restricted eaters among stress-induced survivors, suggesting that when stressed, hyperphagia seems to occur for women with pre-existing restraining behaviours in terms of food.[35]

Strengths and limitations

There were several limitations of this study. Firstly, although the sample size was large enough to check for significant associations, it could be larger to improve the power of the study. Secondly, the recruitment of participants was limited to one university that was located in the capital city but not in the city centre. This might affect the generalisability of the results to other student populations due to university specific environmental differences. Future studies are recommended using a larger representative sample size from various universities to build on the knowledge database.

Conclusion

There is a paucity of research looking into perceived determinants of eating behaviours in Asian countries. This study used an ecological framework to determine whether sociodemographic and academic stressors have an association with potentially unhealthy eating behaviours (cognitive restraint, uncontrolled eating and emotional eating). Students' eating behaviours were found to be influenced by all four categories of academic stressors: personal, interpersonal, scholarly, and environmental. Students that are just transitioning from secondary school to university are at precipice, where their seemingly independent choices will determine their health outcomes.

These choices are affected not only by personal beliefs but are far ranging, including university campus food environment, social activities, time management skills and peer pressure. University administrators and researchers are recommended to provide interventions on building self-capacity through self-discipline, resilience and time management skills; providing social support; providing a curriculum that strikes a balance between rigour and healthy learning. Our study brings to the forefront the role of university setting in preparing students to make healthy food choices to life and curtailing the obesity epidemic.

Declarations

Data Availability Statement: The data that supports the findings of this study are available upon request from the corresponding author but restrictions apply to the availability of these data, which were used under license for the current study and so are not publicly available. The data are, however, available from corresponding author upon reasonable request.

Compliance with Ethical Standards Statement

Conflicts of Interest: The authors have no relevant financial or non-financial interests to disclose.

Informed Consent Statement: Informed consent was obtained from all individual participants included in the study.

Ethical Approval Statement: This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by International Medical University Joint-Committee of Research and Ethics. "(Project ID: MSPH I/2020(05), 25th June 2020)".

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