

Night eating and its relationship with BMI, stress, sleep quality and duration of study among university students

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ABSTRACT

Introduction: Night eating is a very common dietary behaviour among university students. This study aims to investigate the relationship between night eating and BMI, stress, sleep quality and duration of study among university students.

Materials and Methods: A total of 385 university students including foundation and undergraduate students took part in this study. Self-administered online surveys were used to obtain sociodemographic data, and anthropometry measurements including weight and height, night eating during studying, duration of the study, opinion on eating and academic performance, sleep quality, level of depression, anxiety, and stress of the respondents. Questionnaires were validated and IBM SPSS Statistics Software version 26.0 was used to analyse categorical and continuous variables.

Results: The findings showed that there was an association between night eaters and coffee consumption with BMI ($p < 0.001$) and sleep quality ($p < 0.05$). However, there was no association ($p > 0.05$) found between the types of food eaten during night studying and the mean duration of the study. The results showed drinking coffee had an association with depression, anxiety, and stress ($p < 0.05$) among Malaysian university students.

Conclusion: Coffee consumption was common among undergraduate students during studying. Awareness of the risk of overconsumption of caffeine intake should be implemented in the future. However, this study did not include all types of food choices and drinks. Thus, frequency of eating energy dense food during night studying among students should be conducted in the future.

KEYWORDS:

Night eating, sleep quality, body mass index, university students, stress, coffee

INTRODUCTION

Night eating among university students is very common because they need something to help them stay awake while

doing assignments and studying for upcoming tests. The definition of night eating varies because many studies have concentrated on Night Eating Syndrome (NES) rather than night eating. Three definitions had been examined based on the previous study. According to Striegel-Moore et al.,¹ night eating was defined as the consumption 25% of daily total calories between 7.00pm and 4.59am. Another definition of night eating was the consumption of energy 50% of the daily total calories from 7.00pm to 4.59am.¹ Striegel-Moore et al.,¹ also defined night eating as the consumption of any food from 11.00pm to 4.59am without sticking to how many calories were consumed. Night eating or evening hyperphagia is defined as the consumption of meal after evening meal that is more than 25% calories per total daily calorie which was one of the main criteria of NES.² However, this current study was mainly focused on night eating among university students, not on NES.

Night eating was often linked to weight gain due to the nature of people's eating behaviour at night such as snacking.² In the study aimed to investigate the relationship between night eating and body mass index (BMI), many studies found that night eating had no associations with BMI. However, Kwan et al.³ stated there was a positive association between night eating and BMI among private university students in Malaysia. The previous studies regarding the associations between night eating and BMI were not in line, therefore, this study aimed to determine the direction and association between night eating and BMI among Malaysian university students.

Conversely, sleep quality refers to the degree to which one is satisfied with sleep experience, considering aspects such as sleep initiation, sleep maintenance, sleep quantity, and feeling refreshed upon waking.⁴ Several previous recent studies have shown that night eating had an association with poor sleep quality.^{3,5} The consumption of high-sugar beverages and junk foods at night was associated with sleep disruption.⁵

Thus, this study aimed to determine the association between foods, energy drinks, and coffee or decaffeinated coffee at night and the sleep quality of the students. Also, diet and

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nutrition were highly affected by focus and concentration. This study will examine the night eating of Malaysian university students and the relationship with BMI, sleep quality, and duration of study.

MATERIALS AND METHODS

Study Design

A cross-sectional online survey was conducted among Malaysian public university students from May 2021 to August 2021.

Sample Size

The sample size of this study was calculated using the Cochran formula (1977). A total of 385 students were required in this study.

Data Collection

This study was conducted online through Google Form platform on a self-reporting basis. A set of questionnaires was used, which consists of seven parts: (1) sociodemographic data, (2) anthropometry measurements, (3) type of food and beverages consumed during night studying, (example: 'Do you prefer junk food while studying?', 'Do you prefer to drink coffee/ decaffeinated coffee while studying?', 'Do you prefer energy drink while studying?') (4) opinion on eating and academic performance and (example: 'Do you think what you eat has any role in your academic performance?') (5) duration of study, (6) sleep quality (Pittsburgh Sleep Quality Index), and (7) the scale of depression, anxiety, and stress (DASS-21).

Statistical Analysis

IBM SPSS Statistics Software version 26.0 (IBM Corp., Armonk, NY, USA) was used to analyse all the collected data. The categorical variables were described as frequency and percentage, while the continuous variables were described as mean and standard deviations. Independent Sample T-Test was used to determine the relationship of night eating and BMI. Pearson Chi-square test was used to determine the relationship of night eating and sleep quality status. Independent Sample T-test was used to analyse the association between the type of food consumed during night studying and BMI. An Independent Sample T-test was also used to determine the relationship between the type of food consumed during night studying and sleep quality. Independent Sample T-test was carried out to determine the difference in duration study among university students on different types of food eaten at night.

Ethical Consideration

This study was approved by the Faculty Ethics Review Committee of UiTM (FERC/FSK/MR/2022/0125). Prior to the data collection, an online consent form was obtained from each of the participants. The respondents had been informed they could withdraw at any time before or during the study. All the information answered by the respondents was kept confidential.

Ethics Approval and Informed Consent

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RESULTS

Characteristics of Night Eaters and Non-Night Eaters

Table I shows the respondents' characteristics of night eaters and non-night eaters. Analysis showed that 79.5% of female respondents appeared to be night eaters but no significant relationship ($p=0.302$) was found between night eaters and non-night eaters regarding gender.

Furthermore, based on the analysis, characteristics such as age, race, faculty of study, year of study, weekly allowance, dieting to lose, physical activity, and stress rate showed no significant relationship ($p>0.05$) towards night eating.

Association of Consumption of Coffee or Decaffeinated Coffee during Night Studying and BMI

An Independent Sample T-test was carried out to compare the mean BMI in coffee. Based on Table II, there was a significant difference ($p<0.001$) in the mean BMI for coffee drinkers ($M=23.16$, $SD=4.87$) and non-coffee drinkers ($M=21.32$, $SD=3.91$) conditions; $t(383)=3.99$, $p<0.001$. Coffee drinkers had an overweight BMI of above $23\text{kg}/\text{m}^2$.

Association of Consumption of Coffee or Decaffeinated Coffee during Night Studying and Sleep Quality Score

Based on Table III, there was a significant difference in the sleep quality score between students who consumed coffee or decaffeinated coffee during night studying and who did not consume coffee during night studying. For coffee and non-coffee drinkers, there was a significant difference ($p<0.05$) in the mean sleep quality score between both groups.

Association of Consumption of Coffee or Decaffeinated Coffee during Night Studying and Duration of Study

As shown in Table IV, there was no statistical difference ($p=0.294$) in the mean of study duration between coffee drinkers ($M=2.02$, $SD=0.89$) and non-coffee drinkers ($M=1.93$, $SD=0.91$) conditions; $t(382)=1.05$, $p=0.294$.

Association of Depression between Coffee Drinkers and Non-Coffee Drinkers

There was a significant difference ($p=0.020$) found in the depression score for coffee drinkers ($M=8.52$, $SD=5.80$) and non-coffee drinkers ($M=7.15$, $SD=5.46$) conditions; $t(383)=2.34$, $p=0.020$ (Table V).

DISCUSSION

Night eaters are defined as a person who consumes more than 25% of their daily energy intake at night or consumed anything from 11pm to 5am. regardless of the amount of calorie intake. Based on this present study, the prevalence of night eaters was higher among females (79.5%) compared to male students (74.0%). However, there was no significant

Table I: Sociodemographic characteristics of the respondents by night eating status

Characteristics	Night-eaters, n (%)	Non- night eaters, n (%)	p-value*
Age (Mean±SD)	(22.2±1.9)	(22.0±1.9)	0.331 ^a
Gender			0.302 ^b
Male	54 (74.0)	19 (26.0)	
Female	248 (79.5)	64 (20.5)	
Race			0.829 ^b
Malay	156 (77.2)	46 (22.8)	
Chinese	50 (76.9)	15 (23.1)	
Dusun	28 (82.4)	6 (17.6)	
Others	68 (81.0)	16 (19.0)	
Faculty of study			0.107 ^b
Health sciences	73 (70.2)	31 (29.8)	
Business and Accountancy	43 (87.8)	6 (12.2)	
Engineering	37 (84.1)	7 (15.9)	
Psychology	19 (79.2)	5 (20.8)	
Others	130 (79.3)	34 (20.7)	
Year of study			0.498 ^b
Year 1	90 (75.6)	29 (24.4)	
Year 2	61 (84.7)	11 (15.3)	
Year 3	116 (77.3)	34 (22.7)	
Year 4	35 (79.5)	9 (20.5)	
Weekly allowance			0.445 ^b
≥RM 200	74 (81.3)	17 (18.7)	
≤RM 200	228 (77.6)	66 (22.4)	
Dieting to lose weight			0.603 ^b
Yes	126 (79.7)	32 (20.3)	
No	176 (77.5)	51 (22.5)	
Physical activity			0.343 ^b
Active (≥5 times/week)	81 (81.8)	18 (18.2)	
Inactive (≤5 times/week)	221 (77.3)	65 (22.7)	
Self-reported stress rate			0.191 ^b
Normal	133 (73.9)	47 (26.1)	
Mild	42 (80.8)	10 (19.2)	
Moderate	14 (77.2)	13 (22.8)	
Severe	55 (85.9)	9 (14.1)	
Extremely severe	28 (87.5)	4 (12.5)	

*Independent Sample T-test was performed with a significant difference at p< 0.05.

*Pearson Chi- square test was performed with a significant difference at p<0.05.

Table II: Association of consumption of coffee/decaffeinated coffee during night studying and BMI

Variables	Coffee/decaffeinated coffee		Mean diff (95% CI)	t-stats (df)	p-value*
BMI	Yes (n=221) Mean (SD) 23.16 (4.87)	No (n=164) Mean (SD) 21.32 (3.91)	1.84 (0.93,2.75)	3.99 (383)	<0.001

*Independent Sample T-test was performed with a significant difference at p<0.05.

Table III: Association of consumption of coffee/decaffeinated coffee during night studying and sleep quality score

Variables	Coffee/decaffeinated coffee		Mean diff (95% CI)	t-stats (df)	p-value*
Sleep quality score	Yes (n=221) Mean (SD) 8.37 (3.56)	No (n=164) Mean (SD) 7.14 (3.36)	1.23 (0.53,1.94)	3.43 (383)	0.001

*The Independent Sample T-test was performed with significant differences at p<0.05.

Table V: Association of mean depression score between coffee drinkers and non- coffee drinkers

Variables	Drink coffee/decaffeinated coffee		Mean diff (95% CI)	t-stats (df)	p-value*
Depression score	Yes (n= 221) Mean (SD) 8.52 (5.80)	No (n=164) Mean (SD) 7.15 (5.46)	1.36 (0.22,2.51)	2.34 (383)	0.020

*The Independent Sample T-test was performed with significant differences at p<0.05.

relationship ($p=0.302$) between gender and night eating. The present finding was contradictory to the previous study conducted by Kwan et al.³, which found that there was an association between gender and night eating. Furthermore, a study conducted by Gan et al.⁶ reported that males had a higher urge to eat later at night and would have NES three times highly likely compared to women. However, a low prevalence of night eaters among females was found in the study by Dzulkafli et al.⁷ The low prevalence of night eaters among females was due to concerns about body appearance, overeating, and weight gain.⁷ This previous finding was slight inconsistencies as compared to the current findings where night eaters were higher among females than males. This could be due to the low number of male university students pursuing tertiary education hence females dominated most as the respondents in this study.

The prevalence of night eaters was highest among Malay (77.2%) compared to Chinese and Dusun, respectively. This study's results were not in line with the prior study conducted by Kwan et al.,³ where Chinese university students had been involved more in night eating compared to Malay and Indian university students. This was due to the settings of the study which was conducted in Malaysia's private university where most of the students were Chinese, as opposed to the current study which involved both participants from public and private universities in Malaysia. Nevertheless, this current finding found no significant difference ($p=0.829$) in ethnicity between night eaters and non-night eaters. This result was in line with the other previous studies where ethnicity did not found to be correlated with night eating.^{1,3}

The present result found that most of the night eaters were studying courses in Health Sciences. In contrast, Gan et al.⁶ reported that most of the non-health sciences students preferred to eat late at night due to the lack of knowledge about healthy eating behaviour. However, the present study findings found that the majority of the health sciences students preferred to eat unhealthy food at night during studying ignoring the knowledge they had learned related to nutrition and healthy eating behaviour. Our results are similar to the study by Trahearn et al.,⁸ in the United Kingdom stated that found nutrition students practicing unhealthy eating behaviour despite having excellent nutritional knowledge.

Results show that there was no significant difference ($p=0.498$) between the year of study and night eating. Results were consistent with the previous study carried out by Kwan et al.³ In addition, the eating habits such as night eating among students were first developed in year-1 of the study and will be carried forward until the final year of studying.⁹ In this study, first-year students had the second highest rate of night time eating after third-year students, we can predict these night eating practices will be carried on until the students graduated.

No association ($p=0.445$) was found between weekly allowance and night or non-night eaters. In contrast, previous studies stated that there was an association between weekly allowance and the risk of night eaters being engaged with NES.^{3,10} The reason may be due to having online learning at home,¹¹ the place where the availability of

unhealthy food such as junk food, coffee, and energy drinks was often in stock, especially for students from lower household incomes.¹²

Moreover, previous study also found that during home online learning, there is an increment of people ordering foods through delivery application and less people going out to buy food.¹³

Furthermore, there was no association ($p=0.603$) between dieting to lose weight and stress rate with night eating. The results of this present study were consistent with the previous study by Kwan et al.³ Corresponding to a study performed by Kinsey and Ormsbee,¹⁴ they found that consumption of 2/3 cup of cereal with low-fat milk as a snack 90 minutes after dinner helped obese men to lose 1.61kg of body weight over the course of four weeks. Therefore, this previous finding showed that someone who engaged in night eating did not necessarily gain weight. Moreover, the current study findings found that the majority of the students who opted for night eating were less active. Even so, no significant difference ($p=0.434$) was found between students who preferred night eating and the type of physical activity. According to Cheng and Kamil,¹⁵ students who experienced stress preferred to eat food that contain high fat.

Consumption of Coffee or Decaffeinated Coffee during Night Studying and BMI

Coffee was the most preferred drink choice among university students ($p<0.05$). The research finding was consistent with the previous study carried out by Solomon et al.,¹⁶ where the researcher found out that most of the medical students studying in Dominica choose coffee the most than junk foods and energy drinks to stay focused during studying. Coffee contains caffeine which was highly known as the best stimulant to stay focused and alert. Results show that there was a significant relationship ($p=0.000$) between the consumption of coffee and BMI. Higher BMI value was among the coffee drinkers compared to non-coffee drinkers. This might be due to the high sugar content in 3 in 1 coffee and the habit of drinking coffee more than once per day. The current findings were supported by the previous study by Lee et al.,¹⁷ which indicated that the higher frequency of coffee consumption was significantly associated with an increased risk of being overweight or obese among women.¹⁷ In contrast, a study by Sirotkin and Kolesarova¹⁸ found that there was no association between drinking coffee with higher BMI. The authors emphasized that the polyphenol chlorogenic acid in coffee could help to reduce fat and prevent obesity.

Consumption of Coffee or Decaffeinated Coffee during Night Studying and Sleep Quality

This current study discovered that there was a significant difference ($p=0.001$) between coffee drinkers and sleep quality with the highest mean sleep quality score of 8. The findings of this current study were in line with a previous study carried out by Ramakrishn et al.,¹⁹ which found that university students that had coffee after 8pm had sleep quality index scores of above 5. In addition, respondents who took coffee within 3 to 6 hours of bedtime had significant differences in sleep disturbance.¹⁹ Furthermore, someone who had coffee six hours before sleep was in danger of having a lower hour of

sleep duration owing to caffeine consumption.²⁰ This statement supported the current research results where a high prevalence of students sleeps for less than seven hours daily.

Consumption of Coffee or Decaffeinated Coffee and Duration of Study

Corresponding to the finding by Solomon et al.¹⁶ where there was a possible connection between consuming coffee with the duration of study (more than 3 hours). However, the current research found no significant relationship ($p=0.294$) between drinking coffee and the mean duration of study. This result was supported by a study that found no association between drinking coffee with the duration of study among medical students in Dominica.¹⁶ In this recent study findings, students who preferred night coffee or decaffeinated coffee had the longest mean duration which was 2 hours of studying compared to students who consumed junk foods and energy drinks. Caffeine, a stimulant found in coffee, interacts with adenosine receptors to prevent sleepiness and improve alertness.¹⁹

Coffee Drinkers and Non-Coffee Drinkers on Depression

Current findings indicated that consuming coffee at night had a significant effect on depression mean score ($p<0.02$). Most of the students consumed coffee to stay awake whilst studying, however, they are not aware that overconsumption of coffee could induce the risk of mental health. Similarly, a study by Jin et al.²¹ reported that the intake of coffee was positively associated with the severity of depression among Korean teenagers. Contradictory, a few studies found that the risk of depression was reduced through increased consumption of caffeinated coffee.²²⁻²⁴ The results from observational studies on the relationship between coffee intake and the risk of depression and the relationship between caffeine consumption and depression remain controversial.

CONCLUSION

To conclude, this study showed that there was an association between the consumption of coffee during night studying towards BMI, and sleep quality. However, no association was found between the consumption of junk foods, energy drinks, and coffee and the duration of study. Nonetheless, there were few limitations were detected in this study. Firstly, the researcher did not include the current cumulative grade point average (CGPA) of the students. Also, the questionnaire did not contain a variety of food options hence it was possible that some students may ate other energy dense food during night studying. Additional research about night eating with various type of food choices including healthy foods, type of coffee they preferred to drink and the frequency of eating unhealthy food during night studying among students should be conducted in the future. This current study highlighted that coffee drinkers among students were associated with depression. Thus, government, university authorities, and health professionals must play a vital role in educating students about the link between excessive coffee intake and depression. Moreover, frequent screening and assessment of depression need to be done to identify those students who need help and emotional support.

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CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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