

A Cross Sectional Study on Association of Anxiety Disorder and Emotional Eating on Sweet Cravings Among Medical Students in Malaysia

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Abstract

Taste is a term that signifies the most precious information about the environment and it is stupefying that sweetness is the most universally accepted. Sweet craving portrays the desire towards consumption of food rich in sugar. This study explores the effect of anxiety disorders and emotional eating on sweet craving among medical students. There were 155 medical students from Melaka Manipal Medical College (MMMC) were recruited into this study. Hence, DASS-42 which is Depression, Anxiety and Stress Scoring was used in this study to measure the association between depression among medical students and sweet cravings. Moreover, TFEQ-18 Revised which is the Three Factor Eating Questionnaire-18 was used to measure the association between emotional eating and sweet cravings based on emotional eating, cognitive restraint and uncontrolled eating among medical students where an additional question was attached regarding their preference towards sweet craving. The results showed that females has significantly higher sweet cravings among medical students compared to males ($p=0.002$). Based on ethnicity, Indians showed significantly higher sweet cravings ($p<0.001$) than Chinese. It was also shown that those whom are normal and obese showed higher sweet cravings compared to others among medical students. Based on depression, it was found that there is no significant association between depression and sweet craving. Furthermore, those with anxiety showed significantly higher sweet craving compared to those without anxiety ($P=0.002$). Those with stress showed significantly higher sweet craving compared to those without stress ($p=0.001$). However, there were no association between total emotional eating (TEE), total cognitive restraint (TCR), total uncontrolled eating (TUE) and sweet craving among the students.

Keywords

Sweet Craving, Anxiety, Emotional Eating, Medical Students

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1. Introduction

The sense of taste gives us the most precious information about the nature and quality of food, and of all the basic taste qualities, it has been found that sweetness is the most universally preferred and in fact showed of greatest dominance value. Moreover, the human appetite for refined

sugar and for sweet foods and drinks has been strong that it has got a great impact on the course of human history, and the recent and tremendous rise in the consumption of sugar may be unpredictable [1]. Sweet craving (SC), defined as a strong desire for sweet foods, seems to have a close association with negative emotions, such as anxiety and unhealthy eating behaviors [2]. In fact it was reported that

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higher sugar consumption was linked to higher depression prevalence in recent cross-sectional study conducted [3]. It is rather astonishing and surprising that according to the recent study conducted it has been proven rather there is a strong prospective association of sweet food and beverage intake with depression. Furthermore, it was found that there is an increased risk of depression with higher baseline consumption of added sugars, soft drinks, juices and pastries, however none examined the role of 'reverse causation' in producing the observed association [4]. Reverse causation refers, in this context, to the possibility that a mood disorder may lead to higher sugar intake, so that the diet-mental health association is totally or partly the result of poor mental health rather than of high sugar intake [5].

Moreover, research has found that high consumption of sugar sweetened beverages is associated with higher blood-pressure which can then lead to hypertension [6]. It has also been found that the number of dopamine receptors in the brain is increased by recurrent bingeing of sugar, as sugar bingeing causes intermittent and excessive dopamine to be released in the brain which in turn triggers opioid stimulation [7]. Depression is a common mental illness which affects over 300 million people in the world. The most serious consequence of depression is suicide. A common comorbid disorder of depression is anxiety, which affects 250 million people worldwide [8]. Based on the seriousness of mental disorders, data on the subject of the correlation between sugar consumption and mental health are immensely scarce and hence should be given of utmost importance for the betterment of the mental health settings [9]. In terms of sugars, it was reported that students with increased appetite showed significantly more interest towards types of sweet foods like desserts, chocolate/candy bars, and ice cream [10]. In fact, a diet high in refined sugars is common in depressive illness [11].

Besides, the potential effects of sweet beverages on depression, however, are largely unknown. Furthermore, in several cross sectional studies, it was reported that frequent drinking of sweetened beverages were associated with higher prevalence of depression, suicidal thoughts and acts, and other mental stress [12-14]. In conjunction to this, the relationship could be bidirectional and cross sectional analyses cannot rule out the reverse causality. On the other hand, a few prospective studies suggest that eating sweet foods lowers the risk of suicide [15-17] and depression [18-20]. Furthermore, it has been analysed that there are numerous associations between multiple mood states for instance depression, frustration, anxiety, anger and coping by emotional eating [21]. Besides, Emotional Eating (EE) is characterized by carbohydrate craving and is motivated by desire for the comforting effect of opioids (endorphins) to

alleviate dysphoria and other negative states. Moreover, it has been reported that craving for sweets especially chocolate has been shown to be more driven by a sense of desire for the dopaminergic rewards of consumption rather than to avoid the negative consequences of abstinence from consumption [22].

Malaysia is one of the highest intake of sugar in South East Asia. There have been researches done in Malaysia on the frequency of sugar intake among different ethnicity and gender [39]. However, there has not been any research done regarding correlation of anxiety, stress and depression on sweet cravings among young adult population. Therefore, we conducted this cross sectional study the prevalence of sweet cravings on depression, anxiety and stress.

Research objectives

1. To determine the correlation between anxiety, stress and depression with sweet craving.
2. To study the BMI of students with sweet cravings.
3. To find out craving of sweet products in different groups of gender, ethnicity, and Body Mass Index (BMI) status.

Research Questions

1. What is the correlation between anxiety, stress and depression with sweet craving?
2. What is the effect of sweet craving on the BMI of students?
3. Is there any relation between craving of sweet products on different groups of gender, ethnicity, and Body Mass Index (BMI) status?

Research Hypothesis

There is a correlation between anxiety, stress and depression to sweet cravings among medical students.

2. Methodology

2.1. Study Design

A cross sectional study was conducted on association between anxiety disorder and emotional eating on sweet cravings among medical students.

2.2. Study Place, Population, and Study Time

Melaka Manipal Medical College (MMMC) is a leading medical provider and is the single largest contributor of doctors to the Malaysian Healthcare System. They offer 3 programmes which are Bachelor of Medicine & Bachelor of Surgery (MBBS), Bachelor of Dental Surgery (BDS) and Foundation in Science (FIS). It has two campuses in Malaysia which is situated in Melaka and Muar.

The study was conducted among fourth year medical students in Melaka Manipal Medical College (MMMC) in Muar campus, Malaysia. The total medical students in Muar campus is approximately 270.

The study was conducted for 6 weeks between months on April to June 2019.

2.3. Sample Size

The sample size for this research was calculated using the formula given below.

$$n \geq \frac{NZ_{1-\alpha/2}^2 p(1-p)}{d^2(N-1) + Z_{1-\alpha/2}^2 p(1-p)}$$

Where,

n=Sample Size

N=Sample population

Z=1.96²

P=Estimated proportion α =Constant, 0.05

Level of significance, Alpha (α)=0.05

Estimated proportion of sweet craving (p): 0.423

Estimated Error (d): 0.07

Population size (N): 800

Minimum sample size needed: 155

The maximum percentage of attrition allowed in this research was 20%. To allow for non-response, the final sample size was calculated using the formula below:

Non- response

$$n_{\text{final}} = \frac{n_{\text{calculated}}}{1 - \text{non-response}(\%)}$$

$$n_{\text{final}} = \frac{155}{1 - 0.20}$$

$$n_{\text{final}} = 194$$

The minimum sample size calculated was 155. The final calculation was done to include a non-response rate of and the final sample size obtained for this study was after rounding off.

2.4. Sampling

The sampling method used in this study was purposive sampling, which is a non-probability sampling method, where we used volunteer for this study. Inclusion criteria include medical students of MMMC varying from all ages and ethnic groups.

A self-administered questionnaire was distributed among the

students who were present. Exclusion criteria included students whom were absent on the day of data collection, unwilling to participate, incomplete questionnaire submission or did not give a written informed consent.

2.5. Data Collection Method

Our study conducted was based on self-administered questionnaire adopted from previous studies. [1, 23, 24] The questionnaire was administered to 194 MMMC students selected via purposive sampling. The questionnaires consists of 3 major parts. An informed consent form was attached at the first page of the questionnaire where the participants were required to give their signature if they agreed on participating in the study. The first part of the questionnaire was to obtain demographic data for the independent variables of the study such as age, gender, races, religion, height and weight.

The second part was measures of depression, anxiety and stress (DASS-42) [24]. In this part of the questionnaire, there was a total of 42 items each where participants were required to choose from a scale of 0-3 (0=did not apply to me at all, 1=Applied to me to some degree or some part of time, 2=Applied to me to a considerable degree or a good part of time, 3=Applied to me very much or most of the time). There are 28 question on depression, 28 questions for anxiety and 28 questions for anxiety. Although there are 42 questions, some variables share the common question. The way to interpret the data is by calculating the scores for depression, anxiety and stress using DASS-42 score sheet.

Table 1. Depression, Anxiety and Stress Scales (DASS-42).

	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34+

The third section consist of 18 questions which focused on eating behaviour. The Three Factor Eating Questionnaire R-18 (TFEQ-R18) [23] is a self-assessment questionnaire to measure cognitive and behavioural components of eating. It contains 18 items which comprises of a 1-4 response scale (1=definitely false, 2=mostly false, 3=Mostly true, 4=definitely true) and one vertical rating (question number 18). All item responses are dichotomized and aggregated into three scales. Cognitive Restraint, Disinhibition and Hunger. A yes or no question was addressed regarding sweet cravings in the beginning of the questionnaire. The analysis includes the cognitive restraint scale which was composed of items 2, 11, 12, 15, 16, and 18. The uncontrolled eating scale was composed of items 1, 4, 5, 7, 8, 9, 13, 14 and 17. The emotional eating scale was composed of items 3, 6 and 10.

2.6. Data Processing and Analysis

The raw data was entered in Microsoft Excel. The data from Microsoft Excel was then analysed by using Epi info version 7.2.2.6. Frequency and percentage of gender, races, body mass index (BMI), eating behaviour, anxiety, depression and stress were calculated. Quantitative data such as age, BMI, and depression, anxiety and stress were calculated by mean, standard deviation, range. Odds ratio was calculated in this study.

Association

Independent variable	Dependent variable	Statistical Tests
Gender		
Races		
BMI	Sweet Craving	Chi Square
Anxiety, depression and stress		
Eating behaviour	Sweet Craving	Binary Logistic Regression

2.7. Ethical Consideration

This study was reviewed and approved by the Research Ethics Committee, Faculty of Medicine, Melaka Manipal Medical College (MMMC).

To ensure this study was ethically conducted throughout, the objectives of the study were clearly indicated to the participants on each questionnaire and they were given the reassurance that their participation is completely voluntary and they were free to refuse or withdraw their participation at any point. The participants had given their written acceptance for participation in the research through a signed informed consent form. The participants information was kept confidential and used only for the purpose of the particular research. Their anonymity and privacy were well maintained.

3. Results

Table 2. Socio-Demographic characteristics of the participants (n=155).

Variables	n (%)
Age	
<22	25
>25	5
22-25	125
Mean (SD)	22.47 (1.21)
Min-Max	19-29
Gender	
Male	63 (40.65)
Female	92 (59.35)
Ethnicity	
Chinese	42 (27.10)

Variables	n (%)
Indian	62 (40.00)
Malay	21 (13.55)
Others	30 (19.35)
Sweet craving	
Yes	87 (56.13)
No	68 (43.87)
BMI	
Underweight	15 (9.68)
Normal	71 (45.81)
Overweight	24 (15.48)
Obese	45 (29.03)

A total of 155 students participated in the study. Table 2 shows the mean, age of the participants was 22.4. The range for the age among the participants were from age 19-29. Based on gender, majority of our participants were female as there were 92 females (59.3%) and 63 males (40.65%). Among these participants, there were 42 Chinese (27.10%), 62 Indians (40.00%), 21 Malays (13.55%) and others are 30 (19.35%). 87 (56.13%) participants have sweet cravings whereas the other 68 (43.87%) do not have sweet cravings. Based on BMI, there are 45.81% of the participants are within the normal category, however there 9.68% are underweight, 15.48% are overweight and 29.03% are obese.

Table 3. Depression, Anxiety and Stress distribution among participants.

Variables	n (%)
Depression	
Normal	54 (34.84)
Mild	17 (10.97)
Moderate	26 (16.77)
Severe	9 (5.81)
Extremely Severe	49 (31.61)
Mean (SD)	22.52 (15.51)
Min-Max	0-70
Anxiety	
Normal	58 (37.42)
Mild	24 (15.48)
Moderate	24 (15.48)
Severe	13 (8.39)
Extremely Severe	36 (23.23)
Mean (SD)	22.09 (17.69)
Min-max	0-72
Stress	
Normal	74 (47.74)
Mild	11 (7.10)
Moderate	19 (12.26)
Severe	18 (11.61)
Extremely Severe	33 (21.29)
Mean (SD)	20.05 (17.21)
Min-Max	0-71

Table 3 shows percentage of depression, anxiety and stress among the participants. Those with depression are 34.84%, mild depression are 10.97%, moderate are 26%, severe depression are 5.81% and those with extremely severe depression are 31.61%. The mean for those who are depressed are 15.51% with a range of 0-70. Those without anxiety are 37.42%, mild and moderate anxiety are 15.48% each respectively, severe anxiety are 8.39% and extremely

severe anxiety are 23.23%. The mean of those with anxiety are 17.69% with a range of 0-72. Those without stress are 47.74%, mild stress are 7.10%, moderate stress are 12.26%, severe stress are 11.61% and extremely severe stress are 21.29%. The mean of those with stress are 17.21% with a range of 0-71.

Table 4. Different eating patterns among participants.

Variable	N (%)
Total Emotional Eating (3-12)	
Mean (SD)	7.16 (2.57)
Min-max	3-12
Total Cognitive Restraint (6-24)	

Variable	N (%)
Mean (SD)	14.08 (3.39)
Min-max	6-22
Total Uncontrolled Eating (9-36)	
Mean (SD)	21.82 (5.40)
Min-Max	10-33

Table 4 shows different eating patterns among participants. The total emotional eating has a mean of 2.57% with a range of 3-12. Those with total cognitive restraint has a mean of 3.39% with a range of 6-22. Those with total uncontrolled eating has a mean of 5.40% with a range of 10-33.

Table 5. Shows the association between gender, ethnicity, BMI, DASS and sweet craving among participants.

Independent Variables	Sweet Craving		OR (95% CI)	Chi-square	P value
	Yes n (%)	No n (%)			
Gender					
Female	61 (66.3)	31 (33.7)	2.80 (1.44-5.43)	29.51	0.002
Male	26 (41.27)	37 (58.73)			
Ethnicity					
Chinese	11 (26.19)	31 (73.81)	REF.	REF.	
Malay	13 (61.90)	8 (38.10)	4.58 (1.50-14.00)	7.57	0.006
Indian	42 (67.74)	20 (32.26)	5.92 (2.50-14.12)	17.30	<0.001
Others	21 (70.00)	9 (30.00)	6.58 (2.32-18.62)	13.60	<0.001
BMI					
Normal	41 (57.75)	30 (42.25)	REF.	REF.	
Obese	26 (57.78)	19 (42.22)	1.00 (0.47-2.13)	0	0.997
Overweight	10 (41.67)	14 (58.33)	0.52 (0.20-1.34)	1.87	0.172
Underweight	10 (66.67)	5 (33.33)	1.46 (0.45-4.73)	0.41	0.5228
Depression					
Normal	34 (62.96)	20 (37.04)	REF.	REF.	
Mild	7 (41.18)	10 (58.82)	0.41 (0.14-1.25)	2.52	0.113
Moderate	15 (57.69)	11 (42.31)	0.80 (0.31-2.08)	0.21	0.650
Severe	6 (66.67)	3 (33.33)	1.18 (0.26-5.23)	0.05	0.831
Extremely Severe	25 (51.02)	24 (48.98)	0.61 (0.28-1.35)	1.50	0.221
Anxiety					
Normal	23 (39.66)	35 (60.34)	REF.	REF.	
Mild	14 (58.33)	10 (41.67)	2.13 (0.81-5.60)	2.39	0.122
Moderate	14 (58.33)	10 (41.67)	2.13 (0.81-5.60)	2.39	0.122
Severe	10 (76.92)	3 (23.08)	5.07 (1.26-20.43)	5.93	0.015
Extremely Severe	26 (72.22)	10 (27.78)	3.96 (1.61-9.72)	9.44	0.002
Stress					
Normal	31 (41.89)	43 (58.11)	REF.	REF.	
Mild	7 (63.64)	4 (36.36)	2.43 (0.65-9.01)	1.8317	0.176
Moderate	13 (68.42)	6 (31.58)	3.01 (1.03-8.78)	4.27	0.039
Severe	11 (61.11)	7 (38.89)	2.18 (0.76-6.26)	2.16	0.142
Extremely Severe	25 (75.76)	8 (24.24)	4.33 (1.73-10.88)	10.50	0.001

Table 5 shows the association between gender, ethnicity, BMI, Depression Anxiety and Stress (DASS) and sweet craving among participants. Females are 2.80 times more likely to have sweet craving and it is significant (OR 2.80; P value of 0.002). As for ethnicity, Malay is 4.58 times more likely than Chinese to have sweet craving and is significant. (OR 4.58; P value of 0.006). Indian is 5.92 times more likely to have sweet craving compared to Chinese and is significant. (OR 5.92; P value of <0.001). Other ethnicity is 6.58 times more likely to have sweet craving compared to Chinese and is significant. (OR 6.58; P value of <0.001).

Based on BMI, there is no association between obese and

normal BMI and it is insignificant. (OR 1.00; P value of 0.997). Overweight is less likely to have sweet craving compared to normal and it is insignificant (OR 0.52; P value of 0.172). Underweight is more likely to have sweet craving compared to normal but is insignificant (OR 1.46, P value of 0.5228).

Mild, moderate and extremely severe depression is less likely to have sweet craving with odds ratio of 0.41, 0.80 and 0.61 respectively as compared to normal and it is insignificant. (P value of 0.113, 0.650 and 0.221 respectively). Severe depression is more likely to have sweet craving compared to normal and is insignificant (OR 1.18, P value of 0.831).

Mild and moderate anxiety is more likely to have sweet craving compared to normal with both having Odds ratio of 2.13 but insignificant. (P value of 0.122). Severe and extremely severe anxiety is more likely to have sweet craving compared to normal with odds ratio of 5.07 and 3.96 respectively and is significant (P value of 0.015, 0.002 respectively).

Mild and severe stress is more likely to have sweet craving compared to normal with odds ratio of 2.43 and 2.18 respectively but is insignificant. (P value of 0.176 and 0.142 respectively). Moderate and extremely severe stress is more likely to have sweet craving than normal with odds ratio of 3.01 and 4.33 respectively and is significant (P value of 0.039 and 0.001 respectively).

Table 6. Binary Logistic Regression Analyses of Association between emotional eating and sweet cravings.

Variables	OR (95% CI)	p value
Total Uncontrolled Eating (TUE)	1.01 (0.10-1.03)	0.086
Total Cognitive Restraint (TCR)	1.02 (0.10-1.04)	0.097
Total Emotional Eating (TEE)	1.04 (0.99-1.08)	0.097

Table 6 shows the analysis of association between eating behaviour and sweet craving. All variables; Total Uncontrolled Eating (OR: 1.01, p: 0.086), Total Cognitive Restraint.

(OR: 1.02, p=0.097), Total Emotional Eating (OR: 1.04, p=0.097) are insignificant.

4. Discussion

This study was done to assess the effect of anxiety disorders and emotional eating on sweet cravings. Craving is defined as a consuming desire or yearning [25] whereas sweet cravings is defined as desire for sweet substance consumption. Based on our study, 56.13% of medical students have sweet craving.

For instance, based on gender, we found that there is a significant association between gender and sweet cravings. Based on our study, the evidence showed that females have higher percentage of sweet cravings as compared to males. This result is consistent with the study conducted among Spanish and American participants which showed that approximately 63% of the participants craved more for sweet foods compared to males. In fact, American females had higher sweet cravings for specifically chocolates compared to males. [26] Furthermore, a study was conducted in United States of America and it was said that 40% of women craved for chocolates compared to 15% of men. [27] There was an agreement with research of university students in Germany, Denmark, Poland, and Bulgaria that reported that more women showed frequent consumption of sweets. [28]

Furthermore, based on our study we found that ethnicity has a significant association with sweet cravings. We found that Indians showed higher percentage for sweet cravings compared to Malays and Chinese. In fact, this result is consistent with a study conducted among Whites in UK where it was found that the rate of intake of free sugar among adults is higher compared to the WHO recommendations. However, the rate of free sugar intake of most ethnic groups in UK exceeds the goal of less than 5 percent of total energy intake. [29] According to the Defra report, people whom identify their ethnicity as Whites showed higher intake of free sugar compared to other ethnic groups in UK. [30] Moreover, we also found a significant association with BMI according to our study. Those whom are obese and normal showed higher percentage towards sweet cravings compared to others. This result is consistent with a survey conducted which showed higher frequencies of cravings for specific foods especially sweets which include M&M and jelly beans among normal and obese participants. [31]

Besides, our study also found no significant association between depression and sweet cravings. Medical students whom were depressed showed no difference in sweet cravings compared to those whom were not depressed. This result is consistent with a study conducted in Whitehall Study II that proposed that consumption of sweet food or beverages has no association towards development of depression among participants. [32] Moreover, it has been proposed in a study that the consumption towards especially sweet food among university students across several countries has no association with depression and other depressive illness. [33]

On the other hand, stress refers to processes involving perception, appraisal, and response to noxious events or stimuli. [34] According to our study, we found a significant association between stress and sweet cravings. The results showed that medical students whom are under high stress tend to consume or indulge themselves towards sweet cravings. In addition, our study result is consistent with a study conducted by Wardle. J where he proposed that Emotional Eating (EE) is a threatening and cognitively meaningful stimuli that activate the emotional nervous system, which in turn determines the fight or flight reaction. [35] According to a study conducted it was proposed that individuals whom are stress including chronic stress and anxiety have been shown to favour the consumption or cravings of hedonically rewarding foods especially towards sweet foods. [36]

Moreover, we also found a significant association between anxiety and sweet cravings among medical students. Those whom have anxiety showed higher percentage towards sweet cravings compared to those without anxiety. Anxiety is a term used to describe a normal feeling people experience

when faced with threat, danger, or when stressed where when people become anxious, they typically feel upset, uncomfortable, and tense. [37] In fact, the result is consistent with a study which proposed that sweet cravings has a great association with anxiety where most participants in the study whom experience anxiety tend to indulge in sweet cravings that in their perception induces pleasant feelings and reducing stress. [38]

Unfortunately, we were unable to get data from different colleges with clinical phase students (semester 8, 9, 10) and our study was limited to MMMC students only. There was also a time constraint as our study was done within a 6 weeks period only. Moreover, we also used purposive sampling therefore there is risk of selection bias. Hence, it resulted in a small sample size of which there were more female participants than male participants, therefore the result may not represent the general population. The self-administered questionnaires could possibly lead to response bias. Furthermore, some student might feel reluctant to fill up the questionnaires as it is time consuming making them refuse to participate or give a socially accepted answer. However, our study cannot be generalizable to different academic years among different universities. Hence, we would like to suggest that further studies conducted in further should assess a larger sample size and more diverse population to understand the relationship between anxiety disorders and emotional eating with sweet cravings. We can urge medical students to indulge in more protein-rich diets during meals which keeps them full for longer period of time to avoid snacking. This way daily sugar intake will be reduced. Substituting snacks with fruits and nuts will not only reduce hunger but also bring down the sweet cravings amongst medical students. Apart from that participation in sports activities is a good form of diversion from consuming food rich in sugar.

5. Conclusion

From our study, we concluded that there are more than half of medical students are having sweet cravings. On the other hand, based on gender, females have higher sweet cravings compared to males among medical students. As for the ethnicity, Indians have higher sweet craving followed by Malays, others ethnicity such as Sikh, Iban and Bidayuh than Chinese. Moreover, based on BMI, those whom are obese and normal have higher sweet cravings compared to others. Furthermore, based on our study there is no significant association between depression and sweet craving. Moreover, our study showed that those with anxiety tend to have significantly higher sweet cravings compared with those without anxiety. Those with stress have significantly higher

sweet cravings compared to those without stress. Moreover, based on our study, there is no significant association between total emotional eating, total cognitive restraint and total emotional eating.

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