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Research Article

Association between Food Choice and Mental Health Status among Undergraduate Students in a Public University, Health Campus in Malaysia

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ABSTRACT

This study aimed to identify the association between food choice and mental health status among undergraduate students in a public university, health campus in Malaysia. A quantitative cross-sectional study was conducted among undergraduate students aged 18–25 years old using a convenience sampling method. A self-administered questionnaire included 12-item food frequency questionnaires and Depression Anxiety and Stress Scale (DASS-21) was used to collect data from176 participants. The data were analysed using SPSS version 26. Results indicated not all food groups had significant association with depression, anxiety and stress. No association were found between food groups and depression for both genders. Fish/seafood (p=0.016) and cereal/cereal products (p=0.031) consumption significantly associated to anxiety for male student while cereal/cereal products (p=0.038) consumption was significantly associated with anxiety among female students. Furthermore, a significant association was found between snacks consumption (p=0.001) and stress level among male students, while consumption of fresh fruits (p<0.001), dairy/dairy products (p=0.023) and cereal/cereal products (p=0.035) was significantly associated with stress levels among female students. In conclusion, certain food choices do have some association to mental health status. Further investigations are needed to improve our understanding of the complex pathways through which food choices can influence mental health status, particularly the frequent intake of sugar-rich, fatty, and processed foods may contribute to adverse mental health outcomes, while healthier food choices like fruits and dairy products appear to offer a protective effect.

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INTRODUCTION

Mental health is widely recognised as an integral dimension of overall health and well-being. It encompasses an individual's capacity to realise their potential, cope with everyday life challenges, work productively, and participate meaningfully in society (World Health Organization (WHO) 2022). Importantly, mental health should not be understood solely as the absence of mental illness or disability, but rather as a dynamic state influenced by multiple determinants. In Malaysia, mental health-related conditions contribute substantially to the national burden of disability, accounting for an estimated 37% of total disability-adjusted life years, with this proportion continuing to rise in recent years (Ministry of Health Malaysia 2020).

Mental well-being is shaped by a complex interaction of social, psychological, and biological factors. Lifestyle-related behaviours, work-related stressors, and reduced social connectedness have been identified as important contributors to poor mental health outcomes (WHO 2022). In recent years, increasing attention has been directed toward the role of diet and nutritional status in mental health, with accumulating evidence suggesting that suboptimal diet quality may be associated with an increased risk of psychiatric symptoms and disorders (Lim *et al.* 2016).

Stress represents one of the most influential psychosocial factors affecting mental health and has been consistently shown to shape eating-related behaviours. Individuals experiencing higher stress levels are more likely to make less optimal food choices, which may contribute to adverse health outcomes (El Ansari *et al.* 2014). Stress has also been associated with changes in appetite regulation and food intake, with eating behaviours often altered as part of emotional or behavioural coping responses during periods of psychological pressure (Mohamed Yassin *et al.* 2016). Previous research indicates that mental health conditions, particularly elevated stress and depressive symptoms, are linked to poorer dietary patterns, characterised by greater consumption of energy-dense and nutrient-poor foods, including sweets, snack foods, and fast food items (El Ansari *et al.* 2014; Mohamed Yassin *et al.* 2016). In contrast, diets that emphasise fruits, vegetables, and other nutrient-rich foods have been found to be associated with lower perceived stress and fewer depressive symptoms among both men and women (Tajik *et al.* 2017). Taken together, these findings suggest that compromised mental health is commonly accompanied by reduced overall diet quality.

Food choice behaviour is influenced by a complex interplay of factors, encompassing nutritional attributes of foods, sociocultural contexts, and individual psychological characteristics such as health-related beliefs, anxiety, stress, and depressive states (Leng *et al.* 2017). While a number of studies have examined these determinants among university student populations in both developed and developing settings (El Ansari *et al.* 2014; Mohamed Yassin *et al.* 2016), empirical evidence from many developing countries remains limited. In particular, data exploring these relationships within the Malaysian undergraduate population are still scarce.

Given the growing concern regarding mental health among young adults, the present study seeks to examine the association between determinants of food choice and mental health status among undergraduate students. The findings are expected to provide evidence to support the design of targeted nutrition education and dietary intervention strategies, thereby contributing to broader efforts aimed at addressing mental health challenges among youth in Malaysia and in other countries with similar socioeconomic contexts.

METHODS

Design, location, and time

This study adopted a cross-sectional quantitative design and was carried out at a public university on the East Coast of Malaysia from September 2022 to January 2023. The target population consisted of undergraduate students enrolled in Years 1 to 5 across all academic schools within the Health Campus, namely the School of Medical Sciences, the School of Dental Sciences, and the School of Health Sciences.

Students were eligible to participate if they were Malaysian citizens, aged 18–30 years, able to access the online questionnaire, and willing to provide informed consent. Students were excluded if they were international or postgraduate students enrolled in the International Medical Programme (IMP) or declined to participate. The IMP cohort was excluded because most of their academic training is conducted overseas, primarily in India, and these students are not physically based at the Health Campus, unlike students enrolled in the standard medical programme under the School of Medical Sciences. Similarly, postgraduate students were excluded to maintain a homogeneous sample in terms of age group and academic experience, as their lifestyle patterns and academic demands differ substantially from those of undergraduate students. These exclusions were made to minimise potential confounding factors and enhance the internal validity of the study. Ethical approval for this study was obtained from the Human Research Ethics Committee of Universiti Sains Malaysia (USM) [JEPeM], in accordance with the ethical principles outlined in the Declaration of Helsinki. The study was reviewed and approved under the reference number USM/JEPeM/22060407.

Sampling

This study employed convenience non-probability sampling, and the formula proposed by Naing was utilised to determine the sample size (Bujang 2021), $n=[Z/\Delta]^2) p (1-p)$ (n=sample size, z=value representing the desired confidence level, p=anticipated population proportion and Δ=precision (0.07). For this study, the level of confidence is set to be 95%. The Z-score value for 95% confidence level is 1.96. According to Yun *et al.* (2018), estimated prevalence of unhealthy food choices is 20% among university students. P-value represents the prevalence of

unhealthy eating in students 0.20 based on a research study conducted at Malaysian university students engage in unhealthy eating behaviors. Meanwhile, the precision rate is set at 7%. The study was based on a 20% drop-out rate. As a result, a total of 158 undergraduate health sciences students are needed in this study.

Data collection

Data collection was conducted using a structured, close-ended questionnaire distributed via Google Form. Recruitment was conducted using a digital invitation poster that provided a brief overview of the study together with a QR code and a direct link to the online questionnaire. With prior permission from group administrators, the invitation was disseminated through WhatsApp and Telegram student groups. To maximise visibility and participation, the survey link was shared repeatedly over three months, with postings scheduled primarily during weekends and weekday evenings, when students were more likely to be available. Participants were also informed that a summary of the study results could be requested upon completion of the survey.

Data collection was primarily carried out using online survey platforms. In the event that the target sample size was not reached within the initial two months, printed questionnaires were prepared for face-to-face distribution to conveniently selected students on campus, particularly after scheduled classes. The survey instrument was adapted from previously validated questionnaires and further refined based on an extensive review of relevant literature. Upon completion, all responses were checked for completeness and accuracy before being organised using Microsoft Excel 2019 and analysed using IBM SPSS Statistics version 26. Throughout the study, strict measures were implemented to ensure participant anonymity and confidentiality during data collection, analysis, and reporting, in accordance with established ethical research guidelines (Allen 2017).

Data for this cross-sectional study were collected using a structured, close-ended questionnaire, which served as the primary research instrument. The questionnaire was developed based on a review of prior validated studies (El Ansari *et al.* 2014; Mohamed Yassin *et al.* 2016; Tajik *et al.* 2017; Afolabi *et al.* 2020; Cheng & Kamil 2020; Hassan *et al.* 2022) and comprised three sections.

Part A captured participants' sociodemographic information, including age, gender, and school affiliation. Part B assessed food choice determinants using a Food Frequency Questionnaire (FFQ) adapted from existing literature (El Ansari *et al.* 2014; Mohamed Yassin *et al.* 2016; Cheng & Kamil 2020). The FFQ measured the frequency of consumption for 12 food groups, within 1 month ago with responses captured on a 5-point Likert scale ranging from "never" to "several times a day." The FFQ measured the frequency of consumption across 12 distinct food groups: sweets, cakes/cookies, snacks, fast food/canned food, fresh fruits, salads/raw vegetables, cooked vegetables, soft drinks, meat/sausage products, fish/seafood, dairy/dairy products, and cereal/cereal products

Part C evaluated mental health status using the Depression, Anxiety, and Stress Scale 21 Items (DASS-21), each comprising seven items, a validated and widely used tool (Isha *et al.* 2023; Lovibond & Lovibond 1995). The scale assesses depression, anxiety, and stress levels across three subscales, with responses rated on a 4-point Likert scale. Responses are rated on a 4-point Likert scale ranging from 0 ("Did not apply to me at all") to 3 ("Applied to me very much or most of the time"). Final scores were calculated by doubling raw scores and categorized into severity levels according to standard DASS-21 guidelines. Each subscale score is then categorized based on severity levels: a) Depression: Normal (0–9), Mild/Moderate (10–20), Severe/Extremely Severe (≥21); b) Anxiety: Normal (0–7), Mild/Moderate (8–14), Severe/Extremely Severe (≥15), and c) Stress: Normal (0–14), Mild/Moderate (15–25), Severe (≥26)

Data analysis

The data were analysed by using Statistical Package for Social Sciences (SPSS) software, version 26.0. The categorical data was presented as frequency (percentage) whereas numerical data is presented as mean (SD) based on normality distribution. Descriptive statistics were used to calculate mean, percentage, standard deviation and frequency of the variables. The association between food choice and mental health are tested by using Pearson's Chi-Square if expected count <5 is less than 20% of the cells or Fisher's Exact if the expected count <5 is more than 20%. The statistical significance is set at p-value less than 0.05 (two tailed) at 95% confidence level.

RESULTS AND DISCUSSION

The sociodemographic characteristics of the respondents were presented in Table 1. A total of 176 participants completed the survey, exceeding the minimum required sample size of 158. The majority of respondents were female (71.%), 22 years old (36.4%) and students from School of Health Sciences (60.8%)

Table 2 presents the distribution of food frequency consumption across 12 food groups, stratified by gender. The majority of both female and male students reported consuming sweets (46.4% and 39.2%, respectively), snacks (53.6% and 47.1%), fresh fruits (47.2% and 43.1%), and salads/raw vegetables (34.4% and 37.3%) several times per week.

For soft drink consumption, 39.2% of male students and more than half of female students (54.4%) reported intake of 1–4 times per month. Cooked vegetables were consumed several times per week and daily by 32.8% of female students, whereas 43.1% of male students reported consumption several times per week. Only a small proportion of students consumed cooked vegetables several times per day—8.8% among females and 11.8% among males.

The majority of both genders consumed cake/cookies, fast food/canned food, and cereal/cereal products 1–4 times per month. While less than half of female students reported consuming meat/sausage products 1–4 times per month, the majority of male students reported consumption several times per week. For fish/seafood (43.4% of females and 39.2% of males) and dairy/dairy products (40.0% and 43.1%, respectively), both genders showed a tendency to consume these items several times per week. Cereal/cereal products were more frequently consumed 1–4 times per month by both female (38.4%) and male (45.1%) students.

Table 1. Demographic characteristics of respondents

Variables	n=176 (n (%))
Gender	
Female	125 (71)
Male	51 (29)
School	
School of Health Science	107 (60.8)
School of Medical Science	38 (21.6)
School of Dental Science	31 (17.6)
Age	
18	1 (0.6)
19	22 (12.5)
20	36 (20.5)
21	27 (15.3)
22	64 (36.4)
23	19 (10.8)
24	3 (1.7)
25	4 (2.3)

Table 3 displays the mean comparison of food group consumption between genders. Female students were more likely to consume sweets, cakes/cookies, fish/seafood, dairy products, and cereal products. Male students reported higher intake of fast food and canned products, fresh fruits, salads or raw vegetables, cooked vegetables, soft drinks, and meat or sausage products. Among these, soft drink consumption differed significantly between male and female students, with higher intake observed among males ($p<0.05$).

Female students demonstrated a greater tendency to consume sweets, cakes or cookies, and cereal-based products compared with their male counterparts. This pattern is consistent with findings in earlier studies involving university populations (El Ansari *et al.* 2014; Mohamed Yassin *et al.* 2016). Previous research has suggested that food preferences may differ by gender, particularly in relation to cravings, with females more likely to favour sweet-tasting foods and males showing a preference for savoury or salty options (Hallam *et al.* 2016). In the present study, female students also reported higher consumption of fish or seafood and dairy products.

Male students, showed higher consumption of snack foods, fast food or canned items, soft drinks, and processed meat products such as sausages. These findings are in line with existing literature, which has consistently reported higher intake of sugar-sweetened beverages and processed meats among male students (El Ansari *et al.* 2014; Papier *et al.* 2015). The observed gender difference in soft drink consumption supports previous local findings indicating that male students are more frequent consumers of these beverages compared with females (Cheng & Kamil 2020). While both genders may experience preferences for sweet foods, males more inclined toward sugar-sweetened beverages and females more likely to choose confectionery items such as chocolate (Hallam *et al.* 2016).

Interestingly, this study found that male students reported more frequent consumption

Table 2. The distribution of respondents based on different food groups

Food group	Female n (%)					Male n (%)				
	Never	1–4 times a month	Several times a week	Daily	Several times a day	Never	1–4 times a month	Several times a week	Daily	Several times a day
Sweets (chocolate, candy, etc.)	5 (4.0)	44 (35.2)	58 (46.4)	13 (10.4)	5 (4.0)	3 (5.9)	18 (35.3)	20 (39.2)	10 (19.6)	0 (0)
Cake/Cookies	4 (3.2)	66 (52. 8)	48 (38.4)	5 (4.0)	2 (1.6)	4(7.8)	29 (56.9)	13 (25.5)	4 (7.8)	1 (2.0)
Snacks	2 (1.6)	42 (33.6)	67 (53.6)	11 (8.8)	3 (2.4)	2 (3.9)	16 (31.4)	24 (47.1)	8 (15.7)	1 (2.0)
Fast food/Canned food	6 (4.8)	61 (48.8)	53 (42.4)	4 (3.2)	1 (0.8)	5 (9.8)	20 (39.2)	22 (43.1)	4 (7.8)	0 (0)
Fresh fruits	7 (5.6)	37 (29.6)	59 (47.2)	14 (11.2)	8 (6.4)	4(7.8)	13 (25.5)	22 (43.1)	10 (19.6)	2(3.9)
Salad/Raw vegetables	20 (16.0)	39 (31.2)	43 (34.4)	17 (13.6)	6 (4.8)	5(9.8)	16 (31.4)	19 (37.3)	7 (13.7)	4 (7.8)
Cooked vegetables	4 (3.2)	28 (22.4)	41 (32.8)	41 (32.8)	11 (8.8)	2 (3.9)	8 (15.7)	22 (43.1)	13 (25.5)	6 (11.8)
Soft drinks	31 (24.8)	68 (54.4)	16 (12.8)	9 (7.2)	1 (0.8)	10 (19.6)	20 (39.2)	17 (33.3)	3 (5.9)	1 (2.0)
Meat/Sausage products	7 (5.6)	50 (40.0)	43 (34.4)	20 (16.0)	5 (4.0)	5 (9.8)	14 (27.5)	15 (29.4)	16 (31.4)	1 (2.0)
Fish/Seafood	5 (4.0)	42 (33.6)	54 (43.2)	19 (15.2)	5 (4.0)	6 (11.8)	14 (27.5)	20 (39.2)	7 (13.7)	4 (7.8)
Dairy/Dairy products	3 (2.4)	35 (28.0)	50 (40.0)	27 (21.6)	10 (8.0)	3 (5.9)	12 (23.5)	22 (43.1)	13 (25.5)	1 (2.0)
Cereal/Cereal products	13 (10.4)	48 (38.4)	47 (37.6)	14 (11.2)	3 (2.4)	8 (15.7)	23 (45.1)	13 (25.5)	5 (9.8)	2 (3.9)

of fresh fruits, salads or raw vegetables, and cooked vegetables compared with female students. This observation contrasts with several earlier studies that reported higher fruit and vegetable intake among females (Papier *et al.* 2015; Mohamed Yassin *et al.* 2016; Cheng & Kamil 2020), suggesting that dietary patterns among Malaysian undergraduates may differ from those observed in other populations and warrant further investigation. These inconsistencies may be attributed to various uncontrolled factors such as environmental exposure, lifestyle differences, or socio-cultural influences. Furthermore, determinants such as food prices, time constraints, lifestyle patterns, and health consciousness factors highlighted in a study among undergraduates at another public university in Kelantan could also contribute to variations in food choices across gender groups (Faris *et al.* 2021). As such, the present findings may not entirely align with previous literature, possibly due to contextual and demographic differences within the study population.

Table 3. Mean of food groups consumption by gender

Consumption of food groups (Times per month)	Female n= 125	Male n= 51	*p**
Sweets (chocolate, candy, etc.)	2.75	2.73	0.997
Cake/cookies	2.48	2.39	0.310
Snacks (chips, peanuts, etc.)	2.77	2.8	0.725
Fast food/Canned food	2.46	2.49	0.713
Fresh fruits	2.83	2.86	0.684
Salad/Raw vegetables	2.60	2.78	0.332
Cooked vegetables	3.22	3.25	0.870
Soft drinks	2.05	2.31	0.045*
Meat/Sausage products	2.73	2.88	0.247
Fish/Seafood	2.82	2.78	0.822
Dairy/Dairy products	3.05	2.94	0.702
Cereal/Cereal products	2.57	2.41	0.209

*: p-values obtained using Mann-Whitney U Test

Table 4 presents the perception on depression, anxiety and stress among respondents based on DASS-21. Majority of male and female was in normal level for depression symptoms (49%, 53.6%) and stress symptoms (56.9%, 64.8%). About half of male respondent (51%) was normal in anxiety symptoms level compared to female students who were mostly in severe/ extremely severe level (39.2%). Despite the result, no significant difference was found in perception of mental health status between gender of respondents ($p>0.05$).

A study conducted among university students in Southeast Asian countries, including Malaysia, reported median point prevalences of 29.4% for depression, 42.4% for anxiety, and 16.4% for stress (Dessauvagie *et al.* 2022). In comparison, the present study demonstrated higher prevalence rates, with 47.7% for depression, 58.5% for anxiety, and 37.5% for

Table 4. Distribution of perception on depression, anxiety, and stress based on DASS-21 among respondents

Perception	Depression			Anxiety			Stress		
	Male n (%)	Female n (%)	**p (Across levels)	Male n (%)	Female n (%)	**p (Across levels)	Male n (%)	Female n (%)	**p (Across levels)
Normal	25 (49.0)	67 (53.6)	0.850	26 (51.0)	47 (37.6)	0.223	29 (56.9)	81 (64.8)	0.458
Mild/Moderate	17 (33.3)	37 (29.6)		11 (21.6)	29 (23.2)		16 (31.4)	28 (22.4)	
Severe/Extremely severe	9 (17.6)	21 (16.8)		14 (27.5)	49 (39.2)		6 (11.8)	16 (12.8)	
*Means	10.45	11.45		12.40	10.08		12.48	12.08	

*DASS-2: Mean score indicate higher perceived depression, anxiety and stress; **p-values represent differences between male and female mean scores (independent samples t-test)

stress. The proportion of students reporting stress in the present study was lower than the levels reported in earlier investigations, where prevalence rates of 40% and 52.9% were observed (Cheng & Kamil 2020; Papier *et al.* 2015). Differences in prevalence estimates across studies may reflect variations in study design, sample characteristics, and the instruments used to assess stress. In addition, differences in sample size and population context may have contributed to the lower prevalence observed in the current study.

Differences by gender were also evident in how mental health symptoms were reported. A greater proportion of male students fell within the mild to moderate and severe to extremely severe categories for depressive symptoms when compared with female students. In contrast, anxiety symptoms were more commonly reported by female students across both severity levels. With respect to stress, male students were more likely to report symptoms within the mild to moderate range, whereas a higher proportion of female students reported stress at severe to extremely severe levels. Similar gender-related patterns in stress perception have been documented in previous research (Papier *et al.* 2015).

Although variations in symptom severity were observed between male and female students, statistical analysis did not demonstrate a significant association between gender and the prevalence of depression, anxiety, or stress, consistent with prior study (Teh *et al*. 2015).

Table 5 presents the associations between food consumption behaviour and symptoms of depression, anxiety, and stress among undergraduate students, separated by gender. The analysis was conducted using Fisher's exact test. The table shows the p-values for each food group in relation to mental health symptoms, with significant associations ($p<0.05$) highlighted. Significant findings were observed for several food groups indicating possible gender differences in how dietary habits relate to mental health outcomes.

No significant associations were identified between any of the food groups and perceived levels of depression among both gender in the current study. This finding contrasts with a study conducted in Gaza, which reported significant associations between depression and seven food groups among females and eleven food groups among males (Mohamed Yassin *et al.* 2016). Similarly, a study in the United Kingdom found significant associations between depression and seven food groups in females and five in males (El Ansari *et al.* 2014). The two studies also reported contrasting gender-related patterns. One study identified a stronger association between the variables of interest among male participants (Mohamed Yassin *et al.* 2016), whereas the other reported more pronounced associations among females (El Ansari *et al.* 2014). Such inconsistencies highlight the possibility that gender-related differences may vary across study populations and contextual settings. In addition, while earlier studies have reported an inverse association between fruit and vegetable consumption and depressive symptoms (Baharzadeh *et al.* 2018), this relationship was not evident in the findings of the present study.

The present study identified among female students, more frequent consumption of fresh fruits, dairy products, and cereal-based foods was associated with lower perceived stress levels. Similar associations between multiple food groups and stress among female students have been reported previously (El Ansari *et al.* 2014). Notably, the association observed for dairy

Table 5. Associations between food consumption behaviour and depression, anxiety and stress symptoms among undergraduate students

Food groups	Depression		Anxiety		Stress	
	Female	Male	Female	Male	Female	Male
Sweets (chocolate, candy, etc)	0.836	0.534	0.235	0.191	0.145	0.417
Cake/cookies	0.878	0.058	0.562	0.115	0.710	0.069
Snacks (chips, peanuts, etc.)	0.695	0.057	0.530	0.750	0.141	**0.001
Fast food/Canned food	0.064	0.100	0.414	0.142	0.320	0.181
Fresh fruits	0.139	0.979	0.584	0.527	**<0.001	0.308
Salad/Raw vegetables	0.317	0.509	0.391	0.105	0.112	0.288
Cooked vegetables	0.656	0.149	0.113	0.181	0.179	0.110
Soft drinks	0.375	0.583	0.723	0.215	0.974	0.137
Meat/Sausage products	0.369	0.392	0.917	0.582	0.200	0.169
Fish/Sea food	0.825	0.431	0.566	**0.016	0.112	0.180
Dairy/Dairy products	0.292	0.216	0.463	0.084	**0.023	0.117
Cereal/Cereal products	0.213	0.738	**0.038	**0.031	**0.035	0.354

Tested using Fisher's exact test; ** $p<0.05$

products represents an additional finding that has been less frequently reported in earlier studies.

Fresh fruits are rich sources of dietary fibre, vitamins, and bioactive compounds, including polyphenols, which have been shown to support antioxidative and anti-inflammatory mechanisms relevant to emotional regulation and cognitive function (Slavin & Lloyd, 2012; Tajik *et al.* 2017; Brookie *et al.* 2018; Gehlich *et al.* 2019). Cereal-based foods similarly contribute important nutrients such as fibre and magnesium, both of which have been linked to gut microbiota composition and function, an emerging pathway implicated in mental health regulation (Gehlich *et al.* 2019; Zahedi *et al.* 2022). In addition, dairy products provide calcium and tryptophan, an essential amino acid involved in serotonin synthesis, which plays a central role in mood regulation (Du *et al.* 2022).

Fish/seafood intake was significantly associated with lower anxiety among male students. Omega-3 fatty acids, especially EPA and DHA found in fish, have been documented to exert antidepressant effects (Sánchez-Villegas *et al.* 2018). Although fish consumption did not show a significant relationship with depression in this study, prior literature supports its mental health benefits, and the absence of significant findings could be attributed to the relatively small sample size compared to studies by El Ansari *et al.* (2014) and Mohamed Yassin *et al.* (2016).

Students who reported eating fresh fruits several times per day exhibited lower levels of depressive symptoms and perceived stress compared with those who reported no fruit intake. Similar inverse associations have been reported in previous studies (Lee & Allen 2022; Baharzadeh *et al.* 2018), suggesting that more frequent fruit intake may be linked to more favourable mental health outcomes.

A further observation from this study was that students who consumed meat or sausage products one to four times per week reported lower stress scores than those with more frequent consumption. Evidence regarding meat intake and mental health remains inconsistent, and earlier research has suggested that such associations may be influenced by factors such as individual dietary preferences, food enjoyment, and overall dietary patterns rather than meat consumption alone (Gibson-Smith *et al.* 2020).

Snack food consumption showed a significant association with increased stress levels in males, a finding that is consistent with earlier work among university populations (Mohamed Yassin *et al.* 2016). Snack foods are often characterised by high levels of salt, added sugars, and unhealthy fats, which have been linked to inflammatory processes and may contribute to emotional dysregulation and poorer mental health outcomes.

Students who reported students who reported never consuming cakes or cookies exhibited higher levels of depressive symptoms. This observation differs from findings reported by El Ansari *et al.* (2014), who identified a

positive association between frequent intake of sweet foods and depression. In addition, students who consumed soft drinks several times per day reported higher levels of both depressive and anxiety symptoms. This pattern is consistent with findings reported by Kashino *et al.* (2021). Frequent consumption of sugar-sweetened beverages has been suggested to influence mental health through mechanisms involving metabolic dysregulation, inflammatory responses, and alterations in neurotransmitter pathways, which may contribute to mood disturbances.

Cereal/Cereal product intake was significantly associated with anxiety among both genders and with stress in females. While cereal is generally considered beneficial, the direction of association varied. In Mohamed Yassin *et al.* (2014), cereal products had a positive relationship with psychological problems in females but showed a negative association in males. This variation highlights the complexity of dietary influences and possible gender-specific responses.

In this study, students with higher consumption of meat and sausage products reported higher levels of depressive symptoms. Similarly, Sheikhi *et al.* (2023) suggested that frequent meat consumption may be linked to an increased risk of depression and anxiety, potentially through mechanisms involving elevated homocysteine levels and inflammatory processes.

Participants who reported consuming salads or raw vegetables several times per day exhibited higher levels of depression and stress compared with those who consumed them less frequently. Although fruit and vegetable intake is generally associated with more favourable mental health outcomes, this finding suggests that the relationship may be more complex. Factors such as overall dietary balance, food preparation methods, weight-control behaviours, or co-occurring lifestyle stressors may influence this association and warrant further investigation.

Overall, the findings of this study suggest that dietary patterns characterised by higher consumption of fruits, dairy products, fish, and moderate amounts of cereal-based foods may be associated with lower levels of psychological distress among university students. In contrast, more frequent intake of snack foods, sweets, fast food, and soft drinks was associated with greater levels of depression, anxiety, or stress. Together, these results contribute to the growing literature on diet and mental health by highlighting both consistent associations and nuanced patterns, including potential differences across food types and gender groups.

CONCLUSION

This study had the main objective of determine the association between food choice and mental health status among undergraduate students at a public university in Malaysia. The study was conducted to evaluate and report this aspect of food choice made by undergraduate students and their mental health status in public university in Malaysia. For the data collected, there were no significant difference in the consumption for each food groups except for soft drinks between genders and most of the students were likely to consume each food groups for 1-4 times a month or several times a week, suggesting a fair level of food choice in general. The mental health status of the students was quite fair in general. The findings of this study showed that not all food groups have an association with mental health status. The number of food groups that significantly associated with mental health were quite low than expected with the references from past studies. Moreover, consumption of several food groups were found to have significant association either positively or negatively toward level of depression, anxiety and stress. Even so, it is important to remember that the causes of mental health are many and varied, and they will often present and persist independently of nutrition and diet. Regardless the results, having healthy food choices should be encouraged as previous studies suggested that it can help in managing mental health problems. This message supports the idea that creating environment and developing measures that promote healthy, nutritious diets, while decreasing the consumption of highly processed and refined "junk" foods may provide benefits even beyond the well-known effects on physical health, including improved psychological well-being.

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DECLARATION OF CONFLICT OF INTEREST

The authors declare that they have no conflicting financial or non-financial interests in this study.

DECLARATION OF GENERATIVE AI IN SCIENTIFIC WRITING

During the preparation of this manuscript, the author used ChatGPT and Grammarly for editing assistance and language improvement, specifically to improve spelling, grammar, word choice, readability, and clarity. The author reviewed and revised all outputs from these tools and takes full responsibility for the final content of the work.

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