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ORIGINAL ARTICLE

Factors associated with ultra-processed food consumption among higher education students

Factores asociados al consumo de alimentos ultraprocesados en estudiantes de educación superior

Fatores associados ao consumo de alimentos ultraprocessados em estudantes do ensino superior

María de Lourdes Rojas Armadillo[I], Edgar Fernando Peña Torres[II]*, Nissa Yaing Torres Soto[I], Beatriz Martínez Ramírez[I], Ángel Gabriel Montero Lara[I], Kevin Omar Polanco Tzek[I]

[I] Universidad Autónoma del Estado de Quintana Roo. México.
[II] Universidad del Caribe. México.

***Corresponding author:** epena@ucaribe.edu.mx

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ABSTRACT

Introduction: ultra-processed food consumption has become a common practice among university students worldwide, despite widespread awareness of its adverse health effects. **Objective:** to identify factors associated with the frequency of ultra-processed food consumption in higher-education students. **Method:** descriptive, cross-sectional, observational study of 636 students from three universities in Quintana Roo, Mexico. A self-administered questionnaire assessed sociodemographic characteristics, ultra-processed food consumption, perceptions of the university food environment, sleep quality, nighttime eating, and emotional symptoms. Bivariate associations used Fisher's exact test with Monte Carlo estimation for small expected counts (α=0.05). **Results:** 39.6% of students consumed ultra-processed foods many times per week. The frequency of ultra-processed food consumption was significantly associated with self-perception of the degree of food processing (p<0.001), few hours of sleep (p<0.001), night awakening with appetite (p<0.001), a strong desire to eat between dinner and bedtime (p<0.001), and overeating related to stress/anxiety/depression (p=0.008). **Conclusions:** ultra-processed food consumption in students is determined rather by sociodemographic profile than by emotions, and sleep related factors embedded in a permissive food environment. In this sense, it is necessary to promote strategies that combine nutrition education with environmental and psychosocial interventions, needed to promote healthier eating habits among university students.

Keywords: ultra-processed food; feeding behavior; students; sleep duration; psychological stress; health knowledge, attitudes, practice

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RESUMEN

Introducción: el consumo de alimentos ultraprocesados se ha convertido en una práctica común entre estudiantes universitarios de todo el mundo, a pesar de la conciencia generalizada sobre sus efectos adversos para la salud. **Objetivo:** identificar factores asociados con la frecuencia de consumo de alimentos ultraprocesados en estudiantes de educación superior. **Método:** estudio observacional, descriptivo y transversal de 636 estudiantes de tres universidades de Quintana Roo, México. Se aplicó cuestionario que evaluó características sociodemográficas, consumo de alimentos ultraprocesados, percepciones del entorno alimentario universitario, calidad del sueño, alimentación nocturna y síntomas emocionales. Las asociaciones bivariadas se analizaron con la prueba exacta de Fisher con estimación de Monte Carlo para recuentos esperados pequeños (α=0,05). **Resultados:** el 39,6 % de los estudiantes consumía alimentos ultraprocesados muchas veces por semana. La frecuencia de consumo de alimentos ultraprocesados se asoció significativamente con la autopercepción del grado de procesamiento de los alimentos (p<0,001), pocas horas de sueño (p<0,001), despertar nocturno con apetito (p<0,001), fuerte deseo de comer entre la cena y la hora de acostarse (p<0,001) y comer en exceso relacionado con estrés/ansiedad/depresión (p=0,008). **Conclusiones:** el consumo de alimentos ultraprocesados en los estudiantes está determinado más por el perfil sociodemográfico que por las emociones, y por factores relacionados con el sueño inmersos en un entorno alimentario permisivo. En este sentido, es necesario promover estrategias que combinen educación nutricional con intervenciones ambientales y psicosociales, necesarias para promover hábitos alimentarios más saludables entre los estudiantes universitarios.

Palabras clave: alimentos ultraprocesados; conducta alimentaria; estudiantes; duración del sueño; estrés psicológico; conocimientos, actitudes y práctica en salud

RESUMO

Introdução: o consumo de alimentos ultraprocessados tornou-se uma prática comum entre estudantes universitários de todo o mundo, apesar da conscientização generalizada sobre seus efeitos adversos à saúde. Objetivo: identificar fatores associados à frequência de consumo de alimentos ultraprocessados em estudantes do ensino superior. **Método:** estudo observacional, descritivo e transversal de 636 estudantes de três universidades de Quintana Roo, México. Foi aplicado um questionário que avaliou características sociodemográficas, consumo de alimentos ultraprocessados, percepções do ambiente alimentar universitário, qualidade do sono, alimentação noturna e sintomas emocionais. As associações bivariadas foram analisadas com o teste exato de Fisher com estimação de Monte Carlo para contagens esperadas pequenas (α=0,05). **Resultados:** 39,6% dos estudantes consumiam alimentos ultraprocessados muitas vezes por semana. A frequência de consumo de alimentos ultraprocessados associou-se significativamente à autopercepção do grau de processamento dos alimentos (p<0,001), poucas horas de sono (p<0,001), despertar noturno com apetite (p<0,001), forte desejo de comer entre o jantar e a hora de dormir (p<0,001) e comer em excesso relacionado a estresse/ansiedade/depressão (p=0,008). **Conclusões:** o consumo de alimentos ultraprocessados nos estudantes está determinado mais pelo perfil sociodemográfico do que pelas emoções, e por fatores relacionados ao sono imersos em um ambiente alimentar permissivo. Nesse sentido, é necessário promover estratégias que combinem educação nutricional com intervenções ambientais e psicossociais, necessárias para promover hábitos alimentares mais saudáveis entre os estudantes universitários.

Palavras-chave: alimentos ultraprocessados; comportamento alimentar; estudantes; duração do sono; estresse psicológico; conhecimentos, atitudes e prática em saúde

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INTRODUCTION

Ultra-processed food (UPF) consumption is increasingly considered a global public health concern, especially among young people, whose eating habits are often influenced by convenience and affordability. A 2024 umbrella review analyzing more than 45 meta-analyses found that frequent UPF consumption was associated with at least 32 negative health outcomes, including cardiovascular disease, obesity, type 2 diabetes, impaired mental health, asthma, gastrointestinal disorders, and various forms of cancer. All these effects increased according to the quantity and frequency of consumption, even after accounting for other dietary and lifestyle factors.[1]

The worldwide increase in UPF consumption cannot be attributed solely to personal choice; it is also driven by structural transformations in food systems, such as industrialization, the globalization of food markets, the aggressive growth of transnational food companies, and the lack of effective public policies designed to promote and protect healthy eating habits.[2]

Additionally, it is known that socioeconomic and cultural conditions also influence UPF consumption; in vulnerable households headed by women, sociodemographic, economic, and sociocultural factors interact to make UPF consumption a normalized part of both everyday meals and celebrations. This trend became more pronounced after the COVID-19 lockdown period, when many households substituted homemade ingredients with ultra-processed products. This shift reflected food insecurity in settings where such products are inexpensive, widely available, and simple to prepare.[3]

In Mexico, ultra-processed foods (UPF) provide approximately 30% of daily energy intake, a dietary pattern linked to reduced dietary diversity and insufficient consumption of micronutrients, including vitamins B, C, and E, calcium, and magnesium.[4] Mexico's National Institute of Public Health (INSP) has adopted the NOVA system as an important tool for examining dietary patterns and their relationship with public health.[8] NOVA divides foods into four groups:

1) Unprocessed or minimally processed foods: natural foods such as fruits, vegetables, legumes, meat, fish, eggs, and grains that have undergone no or only minimal transformation (washing, cutting, fermentation, refrigeration, or freezing).
2) Processed culinary ingredients: substances derived directly from group 1 foods or from nature, such as oils, butter, sugar, salt, and refined flours, used to prepare food rather than consumed on their own.
3) Processed foods: products made by combining group 1 foods with group 2 ingredients through methods such as canning, cooking, fermentation, or preservation (e.g., cheeses, simple breads, canned vegetables, fruit in syrup).
4) Ultra-processed foods: industrial formulations made mainly from substances extracted or derived from foods, combined with additives such as flavorings, colorings, emulsifiers, and sweeteners, producing highly palatable, long-shelf-life products such as soft drinks, packaged snacks, sugary cereals, cookies, instant soups, and ready-to-heat meals.

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From the INSP's perspective, this classification helps identify the role of food processing in the development of noncommunicable chronic diseases such as obesity, type 2 diabetes, and cardiovascular disease, and underpins public policies and educational strategies aimed at reducing UPF consumption.[5]

Research consistently identifies flavor, low cost, availability near university campuses, and appealing packaging as key drivers of ultra-processed food (UPF) consumption among university students.[6] Public policies promoting healthy and equitable food environments remain inadequately implemented in universities, on-campus vending regulation is limited, incentives for affordable healthy alternatives are lacking, and nutrition education does not always change established habits or perceptions.[7]

Fast-food outlets are also common in teaching hospitals, with 69.2% of surveyed medical schools reporting at least one fast-food franchise on hospital grounds—most commonly Starbucks, Subway, Chick-fil-A, Au Bon Pain, and McDonald's—despite nearly 28% of students disagreeing that such outlets belong in a hospital setting.[8] Academic stage matters, as first-year students show higher convenience-snacking and fast-food patterns than final-year students, while healthy-snacking patterns are more common among students from higher-income and more food-secure households[9]; among Latin American university students, this has the strongest association with overweight/obesity, and although self-reported GPA was unrelated to weekly intake of milk, vegetables, salad, or fruit, breakfast consumption was positively associated with GPA and fast-food consumption negatively associated with it, although sleep habits may be an even stronger determinant of academic outcomes.[10]

In short, UPF consumption is consistently associated with poorer diet quality and multiple adverse outcomes beyond weight gain; a review of 43 healthy-population studies found 37 reporting at least one adverse association and none beneficial[11], with specific links to visceral fat, prostate cancer risk, hypertension, shorter exercise duration, reduced muscle strength/frailty, and dose-dependent kidney-function decline.[12,13,14,15,16] Junk-food/UPF intake is also associated with stress, anxiety, and depression[17,18,19,20,21], while sleep appears bidirectional: shorter sleep is linked to fatty/sugary food preference, longer sleep to lower UPF intake[22], and UPF intake shows a dose-dependent association with insomnia, especially in adolescents[23], with night eating, digital addiction, and UPF co-occurring in university years.[24]

Taken together, this literature indicates that UPF consumption among university students is shaped by an interacting set of individual (knowledge, taste preference, time constraints), environmental (campus food availability, marketing, proximity to fast-food outlets), and psychosocial (stress, anxiety, depression, sleep) factors, with documented consequences for both physical and mental health. However, there are limited studies that have jointly examined behavioral, environmental, and sleep-related determinants in university population. The objective of the present study was to identify the factors associated with the frequency of UPF consumption in higher education students in the state of Quintana Roo, Mexico.

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METHOD

This study was observational, descriptive, cross-sectional conducted in undergraduate students from three universities in Quintana Roo, Mexico. The target population comprised undergraduate students from the three institutions. A non-probability convenience sampling method was used; and the sample size was 636 students, calculated for a 95% confidence level and a 5% margin of error.

Data were collected using a structured questionnaire with the following evaluations: (a) sociodemographic characteristics (age, sex, semester, institution, academic discipline, and living arrangement); (b) knowledge of UPFs and their health risks; (c) frequency and type of UPF consumption, (d) perceptions of the university food environment and of advertising/marketing influence; (e) self-perceived quality of own diet; (f) sleep duration and difficulty initiating sleep; (g) nighttime eating behaviors (nocturnal awakening with appetite and a strong desire to eat between dinner and bedtime); and (h) stress, anxiety, or depressive symptoms perceived by participants related with their food intake.

Descriptive statistics were used to characterize the sample and describe consumption frequencies, perceptions, sleep, and emotional symptoms. Also, to identify factors associated with frequency of UPF consumption, bivariate analyses were performed using contingency tables. To compare means between groups, Fisher's test was applied, with Monte Carlo simulation. Statistical significances were analyzed at $p<0.05$. All analyses were conducted using the software SPSS v27.

All the procedures were approved by the Ethics Committee of the Autonomous University of the State of Quintana Roo.

RESULTS

Sociodemographic characteristics:

A total of 636 higher education students were included (Table 1). Most participants ranged from 17 to 20 years old (74.1%), followed by those aged between 21–24 years (19.5%); 5.0% were 25–28 years old and 1.4% were older than 28. Regarding sex, 57.9% of participants were female, 41.5% were male, and 0.6% identified with another gender. Concerning academic progress, 78.9% were enrolled between the first and third semesters, 15.1% between the fourth and seventh, 4.7% between the eighth and tenth, and 1.3% beyond the tenth semester.

Most participants were enrolled at the Autonomous University of the State of Quintana Roo (83.3%), followed by the University of the Caribbean (13.7%) and Universidad Modelo (3.0%). By academic discipline, 39.2% belonged to disciplines grouped as "other," 20.6% to Business and Administration, 12.7% to Humanities, 9.1% to Health Sciences, 6.6% to Engineering and Technology, 4.4% to Natural Sciences and Mathematics, 3.8% to Legal Sciences, 3.5% to Social Sciences, and 0.2% to Arts and Architecture. Regarding living arrangements, 88.2% lived with family, 8.5% lived alone, and 3.3% lived with non-relatives.

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Table 1. Sociodemographic characteristics of the participants (n=636)

Characteristic	No.	%
Age (years)		
17–20	471	74.1
21–24	124	19.5
25–28	32	5.0
More than 28	9	1.4
Sex		
Female	368	57.9
Male	264	41.5
Other	4	0.6
Semester		
1st–3rd	502	78.9
4th–7th	96	15.1
8th–10th	30	4.7
More than 10th	8	1.3
University		
Autonomous University of the State of Quintana Roo	530	83.3
University of the Caribbean	87	13.7
Universidad Modelo	19	3.0
Academic discipline		
Other disciplines	249	39.2
Business and Administration	131	20.6
Humanities	81	12.7
Health Sciences	58	9.1
Engineering and Technology	42	6.6
Natural Sciences and Mathematics	28	4.4
Legal Sciences	24	3.8
Social Sciences	22	3.5
Arts and Architecture	1	0.2
Living arrangement		
With family	559	88.2
Alone	54	8.5
With non-relatives	21	3.3

Note: Percentages are calculated on the valid responses for each item (living arrangement n=634).

Patterns of ultra-processed food consumption:

Most participants (88.2%) reported knowing what UPF are. Regarding frequency of consumption, 39.6% reported consuming UPFs several times per week, 30.3% rarely, 17.3% once daily, and 12.4% several times daily; only 0.3% reported not consuming them at all. The UPFs reported most frequently were sugar-sweetened beverages and fast food (26.7% each), followed by salty or fried snacks (21.8%), processed meat products (16.5%), and industrial desserts (8.2%). For fast food specifically: 68.9% reported consuming it only on weekends, 18.9% every other day, 7.1% daily, and 5.0% reported not consuming it. For sugar-sweetened beverages: 33.1% reported weekend-only consumption, 28.5% every other day, 28.2% daily, and 10.2% never. The most frequently reported reasons for UPF consumption were lack of time to prepare food (35.8%) and taste (27.8%), followed by ease of access (13.9%), other reasons (9.8%), lower price (7.1%), proximity to home (3.9%), and promotional offers (1.7%); these frequencies are presented in Table 2.

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Table 2. Patterns of ultra-processed food consumption in students

Variable	No.	%
Overall frequency of UPF consumption		
Several times a day	79	12.4
Once a day	110	17.3
Several times a week	252	39.6
Rarely	193	30.3
Never	2	0.3
Type of Ultra Processed Food		
Sugar-sweetened beverages	169	26.7
Fast food	169	26.7
Snacks	138	21.8
Processed meat products	104	16.5
Industrial desserts	52	8.2
Fast food consumption		
Every week	437	68.9
Every other day	120	18.9
Daily	45	7.1
Never	32	5.0
Sugar-sweetened beverage		
Every week	210	33.1
Every other day	181	28.5
Daily	179	28.2
Never	65	10.2
Factors of consumption		
Lack of time to prepare food	227	35.8
Taste	176	27.8
Ease of access	88	13.9
Other reasons	62	9.8
Lower price	45	7.1
Near to home	25	3.9
Promotional product	11	1.7

UPF: ultra-processed food. Percentages are calculated on the valid responses for each item (n=636).

Perceived food environment and attitudes toward eating:

Most participants (78.0%) considered that UPF are attractive because of advertising or promotional activities, while 61.4% reported having received nutrition education or information on healthy eating at their university. Regarding food availability on campus, 53.7% of students reported access to both healthy and ultra-processed options, while the 35.6% reported access only to UPFs and 10.8% reported access only to healthy foods.

Only 30.3% of students considered their own diet healthy, 35.3% considered it unhealthy, and 34.4% did not know. In addition, 52.4% believed that spending more time connected to the internet via computer, tablet, or smartphone was associated with greater UPF consumption. These perceptions are summarized in Table 3.

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Sleep, night-time eating, and emotional symptoms:

Regarding sleep, 73.6% of students reported sleeping between 5 and 8 hours daily, 20.6% reported sleeping less than 5 hours, and 5.8% reported sleeping more than 8 hours; 45.4% reported difficulty initiating sleep. Fifteen percent (15.2%) reported habitually waking up at night with an appetite, and 26.3% reported a strong desire to eat between dinner and bedtime.

Additionally, 43.4% reported experiencing symptoms of stress, anxiety, or depression that, in their own perception, led them to eat more than usual. Finally, 83.1% of participants reported being aware of the health risks associated with UPF consumption. Sleep, night-time eating, and emotional characteristics are also summarized in Table 3.

Table 3. Knowledge, perceived food environment, sleep, night-time eating, and emotional symptoms among higher education students (n=636)

Variable	No.	%
Knowledge, perceptions, and food environment		
Knows what UPFs are (yes)	560	88.2
Is aware of the health risks of UPFs (yes)	507	83.1
Considers UPFs attractive because of advertising or promotion (yes)	495	78.0
Has received nutrition education at university (yes)	389	61.4
Believes that more time online increases UPF consumption (yes)	333	52.4
Food available at the university		
Both healthy foods and UPFs	338	53.7
Only UPFs	224	35.6
Only healthy foods	68	10.8
Self-perceived diet healthiness		
Healthy	192	30.3
Not healthy	224	35.3
Does not know	218	34.4
Sleep, night-time eating, and emotional symptoms		
Daily sleep duration		
Less than 5 hours	131	20.6
5–8 hours	468	73.6
More than 8 hours	37	5.8
Has difficulty falling asleep (yes)	287	45.4
Habitually wakes up at night with appetite (yes)	96	15.2
Has a strong desire to eat between dinner and bedtime (yes)	166	26.3
Stress, anxiety, or depression symptoms leading to overeating (yes)	275	43.4

UPF: ultra-processed food. Percentages are calculated on the valid responses for each item (n = 610–636). For dichotomous items, only the affirmative response is shown.

Factors associated with frequency of ultra-processed food consumption:

Bivariate analyses using Fisher's exact test (with Monte Carlo estimation where indicated) examined associations between frequency of UPF consumption and sociodemographic, cognitive, environmental, sleep-related, and emotional variables. Results are summarized in Table 4.

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Sociodemographic factors:

No statistically significant association was found between frequency of UPF consumption and age (p=0.056), sex (p=0.216), semester (p=0.282), academic discipline (p=0.177), university (p=0.103), or living arrangement (p=0.524). None of the sociodemographic characteristics evaluated was significantly associated with frequency of consumption.

Knowledge, university environment, and perceptions:

Knowledge of what UPFs are was not significantly associated with frequency of consumption (p=0.262), nor were the perception that advertising makes UPFs attractive (p=0.319), having received nutrition education at university (p=0.396), or the food options available on campus (p=0.506). The perceived influence of internet connectivity on UPF consumption was likewise not significantly associated with actual reported frequency of consumption (p=0.266). In contrast, a significant association was found between self-perceived diet healthiness and frequency of UPF consumption (p<0.001): among students who consumed UPFs several times daily, only 15.4% considered their diet healthy, compared with 48.2% among those who consumed UPFs rarely. Awareness of the health risks of UPF consumption was not significantly associated with frequency of consumption (p=0.214).

Sleep and frequency of consumption:

A significant association was found between daily sleep duration and frequency of UPF consumption (p<0.001). Among students who consumed UPFs several times daily, 40.5% reported sleeping less than five hours, compared with 16.1% among those who consumed UPFs rarely; conversely, 58.2% of frequent (several-times-daily) consumers slept between 5 and 8 hours, compared with 76.7% of infrequent consumers. Difficulty initiating sleep, however, was not significantly associated with frequency of UPF consumption (p=0.336).

Nighttime eating and frequency of consumption:

Nighttime awakening with appetite was significantly associated with frequency of UPF consumption (p<0.001): 33.3% of students who consumed UPFs several times daily reported this symptom, compared with 11.0% among those who consumed UPFs rarely. Similarly, a strong desire to eat between dinner and bedtime was significantly associated with frequency of consumption (p < 0.001), present in 51.3% of students who consumed UPFs several times daily versus 15.3% of those who consumed them rarely.

Emotional symptoms and frequency of consumption:

A significant association was found between self-reported stress-, anxiety-, or depression-related overeating and frequency of UPF consumption (p=0.008): 50.0% of students who consumed UPFs several times daily reported this pattern, compared with 33.9% among those who consumed UPFs rarely.

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Table 4. Factors associated with frequency of ultra-processed food consumption among higher education students (n=636)

Evaluated factor	p-value*	Result
Age	0.056	Not significant
Sex	0.216	Not significant
Semester	0.282	Not significant
Academic discipline	0.177	Not significant
University	0.103	Not significant
Living arrangement	0.524	Not significant
Knowledge of UPFs	0.262	Not significant
Perceived advertising/promotional influence	0.319	Not significant
Nutrition education received at university	0.396	Not significant
Food availability at university	0.506	Not significant
Self-perceived diet healthiness	<0.001	Significant
Perceived influence of internet connection time	0.266	Not significant
Daily sleep duration	<0.001	Significant
Difficulty initiating sleep	0.336	Not significant
Nighttime awakening with appetite	<0.001	Significant
Strong desire to eat before bedtime	<0.001	Significant
Stress/anxiety/depression-related overeating	0.008	Significant
Knowledge of health risks	0.214	Not significant

*Fisher's exact test; Monte Carlo simulation used for p-value estimation where indicated.

Overall, bivariate analyses identified five variables significantly associated with frequency of UPF consumption: self-perceived diet healthiness, daily sleep duration, nighttime awakening with appetite, a strong desire to eat before bedtime, and stress-, anxiety-, or depression-related overeating. No significant associations were identified for sociodemographic characteristics, UPF-related knowledge, perceived advertising influence, nutrition education, on-campus food availability, perceived influence of internet connection time, difficulty initiating sleep, or knowledge of health risks. Table 5 compares the proportions of students presenting each significant factor between those who consumed UPFs several times a day and those who consumed them rarely.

Table 5. Percentage of students presenting each factor significantly associated with frequency of ultra-processed food consumption, by consumption category

Factor	Several times a day (n=79), %	Rarely (n=193) %	p-value*
Considers own diet healthy	15.4	48.2	<0.001
Daily sleep duration			<0.001
Less than 5 hours	40.5	16.1	
5–8 hours	58.2	76.7	
Nocturnal awakening with appetite	33.3	11.0	<0.001
Strong desire to eat between dinner and bedtime	51.3	15.3	<0.001
Stress, anxiety, or depression symptoms leading to overeating	50.0	33.9	0.008

*Fisher's exact test; Monte Carlo simulation used for p-value estimation where indicated. Only the two extreme categories of consumption frequency are shown; the categories "once a day" and "several times a week" were included in the analysis. For dichotomous items, only the affirmative response is shown.

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DISCUSSION

Although the majority of students recognized UPFs (88.2%) and were aware of their health risks (83.1%), frequent consumption remained high, and neither variable was significantly associated with consumption frequency (p=0.262 and p=0.214, respectively). This disconnect between knowledge and behavior aligns with findings from other nursing and university student populations, where social and cultural determinants, rather than awareness, accounted for most of the variance in consumption.[7,25] These results indicate that nutrition education interventions focused solely on risk information are unlikely to alter consumption patterns unless combined with environmental and behavioral supports.

Supporting this interpretation, receiving nutrition education at university was not significantly associated with lower consumption frequency in this sample (p=0.396), reinforcing the conclusion that content-only education has limited impact when structural barriers to healthy eating persist.[7] Self-perceived diet healthiness, rather than objective knowledge, was strongly associated with consumption frequency (p<0.001): only 15.4% of students who consumed UPFs several times daily rated their diet as healthy, compared with 48.2% of infrequent consumers.

This finding suggests that students possess meaningful awareness of their dietary quality, even when this awareness does not lead to behavioral change. This pattern is consistent with broader literature describing UPF consumption as primarily influenced by environmental and habitual factors rather than lack of time to prepare food (35.8%) and taste (27.8%). The primary reasons for UPF consumption, reflecting findings from Portuguese, Saudi, and South Asian university student samples, were convenience and palatability, consistently outweighing price or health considerations as consumption drivers.[6,26,27,28] The campus food environment further compounds this issue: over one-third of students (35.6%) reported that only UPFs were available at their university, and 78.0% identified advertising as a factor increasing product appeal. Although neither on-campus food availability (p=0.506) nor perceived advertising influence (p=0.319) reached statistical significance in bivariate analysis likely due to the near-universal exposure in this sample, their high prevalence is informative.

When most students report a food environment saturated with UPFs and their marketing, the environment acts as a structural constraint on food choice rather than as a variable distinguishing higher from lower consumers. This aligns with evidence that weak enforcement of university food policies and limited incentives for affordable healthy options allow UPFs to remain the default choice regardless of individual attitudes.[6,7,8,29]

Self-reported stress, anxiety, or depression-related overeating was significantly associated with UPF consumption frequency (p=0.008), with half of the most frequent consumers reporting this behavior compared to approximately one-third of infrequent consumers. This result is consistent with meta-analytic and cohort evidence linking junk food and fast-food consumption to increased odds of stress, anxiety, and depression[17,18,19], as well as studies indicating that emotional eating is a plausible behavioral pathway connecting psychological distress to UPF intake specifically, rather than to overall food intake.[20,21]

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Given the cross-sectional design of this study, the directionality of this association cannot be determined: emotional distress may lead to increased UPF consumption, but frequent UPF consumption has also been associated with poorer mental health outcomes in longitudinal research, suggesting a potentially bidirectional or self-reinforcing relationship[17,19] that warrants further prospective research in this population, and appetite-related variables, short sleep duration, nighttime awakening with appetite, and a strong desire to eat between dinner and bedtime were among the strongest correlates of UPF consumption frequency identified in this study ($p<0.001$).

Among students consuming UPFs several times daily, 40.5% slept fewer than five hours, compared with 16.1% of infrequent consumers, and roughly half (51.3%) reported a strong urge to eat before bedtime, compared with 15.3% of infrequent consumers. These findings correspond with longitudinal evidence that shorter sleep duration is associated with greater UPF consumption in adolescents[22] and with systematic review evidence of a dose-dependent association between UPF intake and insomnia risk.[23]

Taken together with evidence linking night eating syndrome and digital media use to UPF consumption during the college years[24], these results point to a cluster of circadian and appetite-regulation disturbances: short sleep, nocturnal hunger, and evening food cravings that may reinforce one another and drive UPF intake, independent of nutrition knowledge or campus food availability. Notably, difficulty initiating sleep was not itself significantly associated with consumption frequency ($p=0.336$), suggesting that it is not sleep-onset difficulty *per se*, but rather short sleep duration and nocturnal appetite that are most relevant to this behavior, a distinction future studies should examine using objective sleep measures.

Overall, the pattern of significant and non-significant associations indicates that UPF consumption frequency in this population is influenced less by static, individual-level characteristics (such as age, sex, discipline, or knowledge) and more by dynamic behavioral and physiological states, including self-perceived diet quality, sleep, nocturnal appetite, and emotional distress, all within a food environment that provides limited support for healthier choices.

This has two practical implications. First, university-based interventions should extend beyond informational nutrition education to include environmental strategies, such as increasing the availability and visibility of healthy, affordable options on campus, regulating food advertising, and extending meal-service hours to reduce time constraints as a barrier to healthy eating. Second, given the consistent influence of sleep and emotional distress, interventions targeting UPF consumption in university settings may benefit from integrating sleep-health promotion and stress-management components, rather than addressing nutrition as an isolated behavioral target. This study is strengthened by its relatively large sample (n=636), drawn from three universities and a broad range of academic disciplines, as well as by its comprehensive assessment of sociodemographic, environmental, behavioral, sleep-related, and emotional correlates of UPF consumption within a single population. This integrative approach is uncommon in the existing literature on Mexican university students.

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Several limitations should be acknowledged. The cross-sectional design precludes causal inference; associations between sleep, emotional symptoms, and UPF consumption may be bidirectional or reciprocal. Furthermore, all data were self-reported, which may introduce recall and social desirability biases, particularly for sensitive variables such as perceived unhealthy eating and emotional overeating. Also, the use of convenience sampling limits the generalizability of findings beyond the three participating institutions. Sleep and nighttime eating were assessed using single-item, non-validated questions rather than standardized instruments (such as the Pittsburgh Sleep Quality Index), potentially reducing measurement reliability. And finally, psychological symptoms (stress, anxiety, depression) were measured as a single self-perceived construct rather than through validated screening instruments, limiting comparability with clinical or psychometric literature.

Future research should employ longitudinal or experimental designs to clarify the directionality of the associations identified in this study, incorporate validated instruments for assessing sleep quality and psychological symptoms, and evaluate the effectiveness of combined environmental and behavioral interventions (such as healthier campus food offerings paired with stress-management or sleep-hygiene programming) on UPF consumption. Qualitative approaches could further elucidate the personal barriers students encounter when attempting to change their eating habits, thereby complementing the quantitative associations reported here.

CONCLUSIONS

Ultra processed foods consumption among higher education students in this study was high despite widespread knowledge of UPFs, and awareness of their health risks, confirming that knowledge alone is insufficient to alter consumption patterns. The primary factors associated with consumption frequency were practical (lack of time), flavor, environmental (limited availability of healthy options on campus and pervasive advertising), and psychosocial (self-perceived unhealthy eating, short sleep duration, nighttime eating, and stress, anxiety, or depression-related overeating), while sociodemographic characteristics showed no significant association across universities.

The results of the present study showed the need for comprehensive strategies within the university food environment, that extend beyond nutrition education to address structural and psychosocial determinants of UPF consumption. These strategies should include increasing access to affordable healthy foods on campus, regulating food marketing, and integrating sleep-health and stress-management components into student wellness programming. Future research employing long-term designs and validated instruments is necessary to clarify the causal mechanisms linking sleep, emotional distress, and UPF consumption, and to evaluate targeted interventions in this population.

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Author contribution:
María de Lourdes Rojas Armadillo: conceptualization, data curation, investigation, supervision, validation, writing original draft, writing-revision and editing.
Edgar Fernando Peña Torres: data curation, formal analysis, methodology, writing original draft, writing-revision and editing.
Nissa Yaing Torres Soto: investigation, methodology, writing-revision and editing.
Beatriz Martínez Ramírez: validation, writing-revision and editing.
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