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# Levels of depression symptoms and consumption of ultra-processed foods in university students

## Niveles de síntomas de depresión y consumo de alimentos ultraprocesados en estudiantes de Ciencias de la Salud.

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**ABSTRACT**

Depression is a common mental disorder characterized by a depressed mood or loss of interest and pleasure in daily activities over prolonged periods. This condition can influence basic decisions such as eating habits. Currently, the high availability of ultra-processed foods (UPF) and fast-paced lifestyles have encouraged their consumption due to their quick preparation and extended shelf life. The increase in the intake of these products has generated significant health repercussions by contributing to inadequate nutrition and a higher risk of obesity, hypertension, and vascular and metabolic diseases. The objective of the present study was to analyze the relationship between the levels of depressive symptoms and the consumption of UPF among university

students in the health sciences field. This was a descriptive, observational, cross-sectional, and correlational study. It was conducted with a population of 179 students from the Nutrition and Nursing academic programs, considering the following variables: sex, age, depressive symptoms —assessed using the DASS-21 scale—, depression level, and consumption of ultra-processed foods in kilocalories, based on the NOVA classification. Dietary intake was evaluated through a food and beverage diary. As a result, a positive relationship of moderate strength was observed between the score of depressive symptoms and UPF consumption (rho = 0.493, with a 99% confidence level), indicating a higher consumption of UPF as depressive symptom scores increased.

**RESUMEN**

**Keywords:**
Depresión, ultraprocesados, NOVA, universitarios.

La depresión es un trastorno mental común caracterizado por un estado de ánimo deprimido o por la pérdida del interés y el placer en las actividades cotidianas durante periodos prolongados. Este trastorno puede influir en decisiones básicas como la alimentación. En la actualidad, la alta disponibilidad de alimentos ultraprocesados (AUP) y los estilos de vida acelerados han favorecido su consumo, debido a su rápida preparación y prolongada vida de anaquel. El incremento en la ingesta de estos productos ha generado importantes repercusiones en la salud, al contribuir a una alimentación inadecuada y al aumento del riesgo de padecer obesidad, hipertensión y enfermedades vasculares y metabólicas. El objetivo del presente estudio es analizar la relación de los niveles de síntomas de depresión y del consumo de los AUP en estudiantes universitarios del área de ciencias de la salud. Es un estudio descriptivo, observacional, de tipo transversal y correlacional. Se llevó a cabo con una población de 179 estudiantes del programa educativo de nutrición y enfermería, teniendo como variables: sexo, edad, los síntomas de depresión - evaluados mediante la escala DASS-21-, nivel de depresión y el consumo de alimentos ultraprocesados en kcals, basándose en la clasificación NOVA. Se evaluó mediante Diario o registro de alimentos y bebidas. Como resultados, se observó una relación positiva con una fuerza moderada, de la relación entre el puntaje de síntomas depresivos y el consumo de AUP, ya que obtuvo rho= 0.493 con un nivel de confianza del 99%, aprecia un mayor consumo de AUP conforme aumenta la puntuación en los síntomas de depresión.

## Introduction

A balanced and adequate diet that meets the macro and micro needs of students and youth is necessary to maintain good health and physical activity for a variety of daily activities. On the contrary, an unbalanced diet can lead to malnutrition, either by caloric shortage or excess, manifesting itself in the form of underweight or obesity (1). The latter can lead to weight loss and obesity. Adolescence and youth represent key stages for the acquisition of healthy habits, and it is during this period that eating patterns can be consolidated or, on the contrary, deteriorate due to multiple factors. Academic demands, fast-paced lifestyles, social pressure, and easy access to products of low nutritional value have led to an environment in which dietary decisions are driven more by convenience than by well-being (2). This reality has generated a growing concern in the scientific community, especially when observing the correlation between the type of food ingested and the impact it can have on mental health (3).

Accumulating evidence suggests that low-quality diets, particularly those rich in ultra-processed foods, are not only associated with adverse metabolic conditions (4) but also with impaired affective states (3). This link can be explained from a physiological perspective: a diet rich in simple sugars, trans fats and additives can trigger chronic low-grade inflammatory processes, alter the hypothalamic-pituitary-adrenal axis and affect the intestinal microbiota, all mechanisms associated with the onset of depressive symptoms (7). In view of this, consumption of ultra-processed foods represents a quarter in developing countries and more than half in high-income countries. According to the Pan American Health Organization (PAHO) health Organization (PAHO) (2)in 13 Latin American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Mexico, Peru, Uruguay and Venezuela, between 2000 and 2013, sales of Ultraprocessed Foods (AUP) has grown rapidly by 26.7%. In Peru, per capita consumption of ultraprocessed foods grew by approximately 22% between 2009 and 2014**,** an increase that has been associated with increased body weight and higher prevalence of obesity and arterial hypertension in the population, especially in children and young people (4).

For some years now, the relationship of UPA consumption with risk factors such as obesity, hypertension, vascular and metabolic disease has been documented (5). At the societal level, it is also important to note that the food environment has evolved into an industry-dominated model, where advertising messages and misleading labeling significantly influence consumer choices, especially among younger consumers (2, 6). This phenomenon, known as "obesogenic environment", has been widely described as a structural factor that hinders access to and preference for healthier options, favoring the perpetuation of UPA consumption and its consequences (5, 6).

These foods are subjected to industrial processes in order to modify their natural conditions, allowing their preservation and improving their appearance, with the purpose of prolonging their shelf life and making available to the consumer a wide variety of products throughout the year, regardless of seasonality. The application of these processes varies their nature and alters their nutritional profile (4, 6).

The term "ultra-processed," according to Monteiro (6) is defined as; "Formulations of various ingredients that, in addition to salt, sugar, oils and fats, include food substances not used in culinary preparations, in particular, flavorings, colorings, sweeteners, emulsifiers and other additives used to imitate the sensory qualities of unprocessed or minimally

processed foods and their culinary preparations, or to mask undesirable qualities of the final product".

In addition, changes in lifestyle have modified the dietary pattern of society. The increase in the production of industrialized foods has also favored the growth of marketing and the greater availability of beverages and ultra-processed foods. This group of products contributes the highest amount of calories, saturated fats, sugars and preservatives to the diet, contributing to the development of metabolic diseases (7). Recent research also suggests a possible association between its consumption and the presence of depressive symptoms (3). In this sense, ultra-processed foods can not only affect the metabolism in a negative way, but also be related to mood states such as depression.

In general, emotions play an important role in the choice, quality and quantity of food eaten, which affects the increase or decrease in body weight. The relationship between emotions and eating behavior is bidirectional and depends on the context, the variability of emotions in terms of valence, arousal and intensity, as well as the physiological variability of the subject. There are also differences in food intake. This is related to the intensity of emotions; human beings ingest more food in the presence of positive or negative emotions than in the presence of neutral emotions, which explains why the greater the intensity of the emotions experienced, the greater the food inhibition. Control that is often found even in people who have dietary restrictions or strict diets (8).

According to the American Psychiatric psychiatric Association (9) defines depression as: "A mood disorder, where the main characteristic is an alteration of mood and, according to its temporality and symptomatic origin, has a particular classification; in this way, major depressive disorder, dysthymic disorder and bipolar disorders are distinguished as the main ones. The World Health Organization (WHO) (10)refers to depression as: "a common mental disorder. It involves a depressed mood or loss of pleasure or interest in activities for long periods of time." Therefore, depression does not always occur in the same way and is not always considered in the same context for all people, therefore, there are multiple types of classifying depression depending on the symptomatology according to the National Institute of Mental Health (NIMH) (11).

Against this background, there have been studies that have analyzed the relationship between consumption of UPAs and depression in different population groups, such as the one that examined the association between high consumption of ultra-processed foods (UPAs) and recurrence of depressive symptoms (DepS) in a British population group, in general relationship between diet and depression, with the result that high consumption of ultra-processed foods is associated with increased likelihood of recurrent depressive symptoms, and contribute to the overall association between diet quality and depressive symptoms(12). Scientific evidence has been accumulating that frequent and excessive consumption of UPA not only has implications for physical health, but is also associated with the development of mental disorders, particularly depression (7). Depression, previously considered a purely psychological disorder, has been progressively recognized as a multifactorial disease in which genetic, environmental, emotional and also dietary aspects converge. Some recent studies have identified dietary patterns based on ultra-processed products as an important risk factor in the onset or recurrence of depressive symptoms, especially in youth and young adults (12, 7).

Therefore, understanding the relationship between the consumption of ultra-processed foods and the mental health of university students in the Health Sciences area is

fundamental, not only because of its clinical implications, but also because of the impact it may have on their academic performance and quality of life. In addition, this group represents the future food educators and promoters, whose own well-being and nutritional habits will be decisive for the formation of healthy behaviors in the population they will guide in their professional practice. This population group represents a critical transition stage, in which factors of emotional vulnerability and food autonomy are combined, which makes students a key population for the implementation of prevention and health promotion strategies. The objective of this study was to determine the relationship between the level of depressive symptoms and the consumption of AUP foods in new students of the health sciences area of a university in southeastern Mexico.

## Method

### *2.1. Type of study*

It is a descriptive and correlational study, oriented towards the collection and analysis of numerical data to examine the proposed hypothesis, based on the interrelation between the level of depressive symptoms and the consumption of AUP. Using statistical analysis techniques, with the objective of determining the relationship between the level of depressive symptoms and the consumption of ultraprocessed foods in new university students.

This study was evaluated and approved by the Ethics Committee of the Universidad Internacional Iberoamericana, in its session of March 31, 2023.

### *2.2. Sampling*

The study was conducted with a population of 179 first-year students of the nutrition education program (PEN) and the nursing education program (PEE) at the Faculty of Health Sciences of a public university in Ciudad del Carmen. Stratified probability sampling was used, taking the educational program as the stratum. The sample size was calculated using nQuery Advisor Version 4.0 software, based on a confidence level of 95% and a margin of error of 5%. A sample of 118 participants was determined, distributed among 80 nursing students and 38 nutrition students.

The inclusion criteria were: students enrolled in the first semester of the Educational Programs of Nutrition and Nursing, who wished to participate voluntarily in the study, without previously diagnosed chronic degenerative pathologies, and who were not taking medications that could affect blood pressure. Exclusion criteria: students who were not present during data collection, students who were in advanced semesters, students from other educational programs. And as elimination criteria; surveys with incomplete data, students who did not want to continue in the study, inconsistent or contradictory data in the answers provided.

### *2.3. Variables and their measurement*

The variables that were analyzed were: sex, age, symptoms of depression and level of depression. For the latter, the abbreviated version called Depression, Anxiety and Stress Scales - 21 (DASS-21) was used, which fulfills the objective of evaluating the presence of negative affect of depression and achieving maximum discrimination between these conditions (13), applying it to each of the participants in the study, and using the cut-off

points indicated by the same scale for depression: 5-6 pts. mild depression, 7-10 pts. moderate depression, 11-13 pts. severe depression, 14 pts. or more extremely severe depression (14).

The consumption of ultra-processed foods was evaluated by means of a food and beverage diary or register, requesting the completion of the form provided to the participants, during three days, including a weekend day, using for the estimation of portions; photographic models with reference to objects of daily life (15). Calories from ultraprocessed foods were estimated using the Nutrein software, free of charge and freely available on the Internet, which manages the Mexican food equivalents system, and counts calories and nutrients consumed from the foods recorded (16).

This program was used to obtain the total kcal consumed on each of the recording days, as well as the kcal from the UPAs, which were identified from a list of regional UPAs based on the NOVA system (17) which defines the categories and criteria for classifying foods and beverages according to the degree of industrial processing of the food. The program was also used to calculate the sodium consumption in mg and sugars in g per day by the participants. These calculations were carried out by an expert in dietary calculations, the same person who was in charge of receiving the food records and verifying with the participants whether what was recorded in the food diary forms was correct.

### *2.4. Code of Ethics*

The study adhered to the provisions of the regulations of the Regulations of the General Health Law on Health Research 1987, considering the latest reform (Ley General de Salud en Materia de Investigación para la Salud, 2014)(18). Also to the Mexican Official Standard NOM-012-SSA3-2012, which establishes the criteria for the implementation of research projects for health in humans, so that there was informed consent of the subjects who participated in the research, which included the aspects required to provide the necessary information, the data collection was carried out by health professionals, with knowledge and experience to care for the integrity of the human being (19).

### *2.5. Type of data analysis.*

The Statistical Package for the Social Sciences (SPSS) version 23.0 for Windows was used for data analysis. Descriptive and correlational statistics were used. Descriptive analysis was performed using frequencies, proportions, measures of central tendency and variability. The Kolmogorov-Smirnov normality test was performed to determine the normality of the variables. Simple ordinal regression using Sperman's correlation statistical test was used to evaluate the association between the level of depression as an independent variable and the possible associated factor as a dependent variable, consumption of UPA in kcal, with a 95% confidence interval. As well as Student's t-test, to analyze the statistical difference in the means of UPA consumption and depression levels, between the nutrition and nursing educational programs.

## Results

The study population was 179 students and the sample obtained from incoming students (n=118), being 80 Nursing students and 38 Nutrition students. Obtaining as a result 78 % (n=92) of females and 22 % (n=26) of males in the study, with an average age

of 20±4 years, both in the general sample and in the PEE that registered a SD±5 years, and in the PEN it was 19±2.5 years showing a lower SD, indicating that the age of the PEN students is more homogeneous than that of the PEE students.

Of the total kcal consumption in the global registry, the mean was 1618±551 kcal, in the nursing students it was 1641±565 kcal and in the nutrition students it was 1569±525 kcal, it is worth mentioning that no statistically significant difference was identified between the two educational programs p=0.510. By sex in men the mean was 1732±564 kcal, and in women it was 1586±547 kcal, the analysis shows that there is no statistically significant difference p=0.235 between sexes as shown in Table 1.

**Table 1**
**Overall caloric intake by educational program and sex**

| Variable | Ẋ | DE | *p* |
|---|---|---|---|
| Overall consumption | 1.618 | 551 | - |
| *Educational program* | | | |
| Nursing | 1.641 | 565 | *p* = .510 |
| Nutrition | 1.569 | 525 | |
| *Sex* | | | |
| Men | 1.732 | 564 | *p* = .235 |
| Women | 1.586 | 547 | |

**Note.** Values correspond to the mean (Ẋ) and standard deviation (SD) of the overall calorie intake. Statistical significance was determined by Student's *t* test for independent samples.

In the Table 2 it can be observed that the average consumption of total kcal from AUP in the overall consumption was 750±401, in nursing students it was 745±360 kcal and in nutrition students it was 761±480 kcal, it is worth mentioning that no statistically significant difference was identified between both educational programs p=0.839. By sex in men the mean was 783±419 kcal, and in women it was 741±397 kcal, the analysis shows that there is no statistically significant difference p=0.644 in kcal consumption from AUP between both sexes

**Table 2**
**Overall consumption of calories from ultra-processed foods by educational program and sex**

| Variable | Ẋ | DE | *p* |
|---|---|---|---|
| Overall consumption | 750 | 401 | - |
| *Educational program* | | | |
| Nursing | 745 | 360 | *p* = .839 |
| Nutrition | 761 | 480 | |
| *Sex* | | | |
| Men | 783 | 419 | *p* = .644 |
| Women | 741 | 397 | |

**Note.** Values correspond to the mean (Ẋ) and standard deviation (SD) of the consumption of calories derived from ultra-processed foods. Statistical significance was determined by Student's *t* test for independent samples.

Similarly, it is observed that, in terms of the classification of levels of depression, 71% (n=84) of the students in the general sample are classified at some level of depression, and 58% (n=69) are between moderate and extremely severe. In addition, the levels corresponding to severe and extremely severe, are higher in the Nutrition educational program 43 % (n=16), compared to Nursing 22 % (n=26) and the overall sample 35.5 % (n=42) as shown in Table 3 Table 3.

**Table 3.**

Results of frequencies of depression levels in participants.

| | **General Sample** | | **Nursing** | | **Nutrition** | |
|---|---|---|---|---|---|---|
| **Level of Depression** | ***f*** | **%** | ***f*** | **%** | ***f*** | **%** |
| **Normal (absence of depression)** | 34 | 28.90 | 21 | 26 | 13 | 34 |
| **Slight** | 15 | 12.70 | 10 | 13 | 5 | 13 |
| **Moderate** | 27 | 22.90 | 23 | 29 | 4 | 10 |
| **Severa** | 22 | 18.60 | 14 | 17 | 8 | 21.50 |
| **Extremely Severe** | 20 | 16.90 | 12 | 15 | 8 | 21.50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **TOTAL** | 118 | 100 | 80 | 100 | 38 | 100 |

Source: Own elaboration. *f*: absolute frequency, *%*: percentage.

In the Figure 1 a positive relationship with moderate strength is observed, as a result of the relationship between levels of depressive symptoms and consumption of AUP, since it obtained rho= 0.493 with a confidence level of 99%, so that a higher consumption of AUP is visualized as a higher score is obtained in the symptoms of depression levels in some of the students.

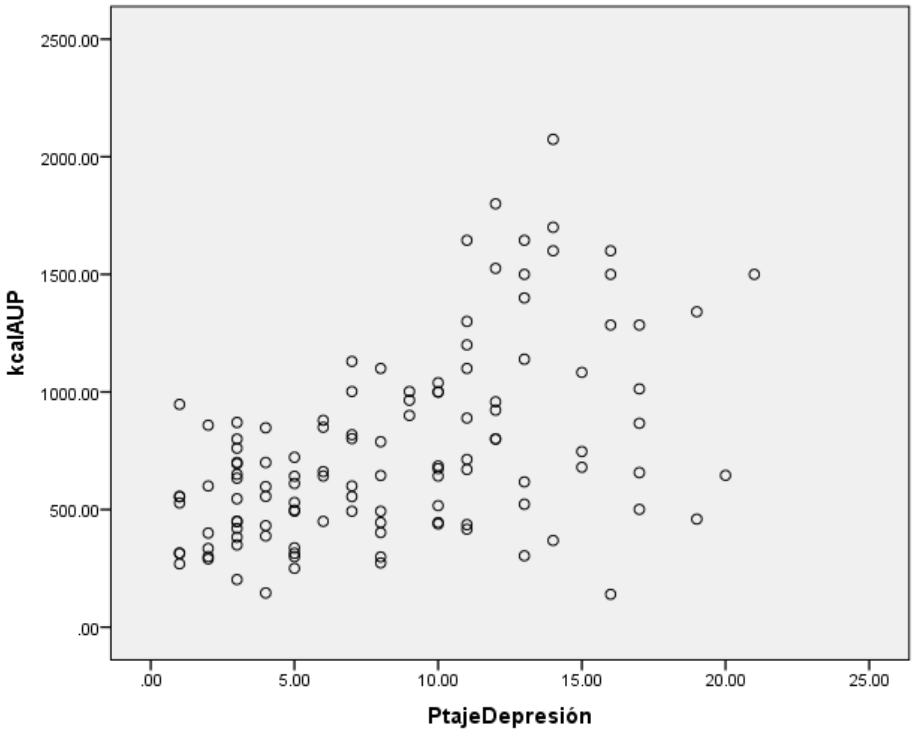


**Figure 1**. Correlation results of Kcal from AUP and depression levels.

## Discussion and Conclusions

If we consider the daily calorie intake recommendations by the WHO (20) (20) which should be between 1,600 to 2,000 kilocalories per day for women and between 2,000 to 2,500 kilocalories for men, and compared with the caloric intake recorded in this study; in the women, 1586±547 kcal and in the men an average of 1732±564 kcal, it can be seen that the averages were close to what is considered optimal for an average person; however, it is imperative to emphasize that the recommended kcal consumption is individual, therefore, it is difficult to ensure that the consumption recorded was convenient for all the participants.

The results obtained in this investigation were consistent with those reported by Detopoulou and colleagues (21), who conducted a study on the consumption of ultra-processed foods (UPA) in students from different academic areas of the University of Peloponnese, in Greece, including the field of health sciences. In that study, the authors observed that 44.3 ± 11.9 % of the daily caloric intake came from UPA. In the present work, considering an average caloric intake of 1618 ± 551 kcal and an intake of 750 ± 401 kcal derived from UPA, it was estimated that approximately 46 % of the total energy consumed by the participants came from this type of food. These findings reflect a remarkable similarity between the two populations and suggest that high consumption of UPAs is a common problem among college students, regardless of geographical or contextual differences.

The results obtained for the levels of depression exceed those obtained by Ramón and Cabrera(22) in a study carried out with university nursing students, where the levels of depression reached the following percentages: 55.2 % obtained some degree of depression where 17.6 % (n=39) present a mild level, 16.7 % (n=37) a moderate level 7.2 % (n=16) a severe level and 13.6 % (n=30) an extremely severe level, while in this study the results of depression obtained were 71.1 % some degree of depression where 15 12.7 % (n=15) presented a mild level, 22.9 % (n=27) moderate level, 18.6 % (n=22) severe level and 16.9 % (n=20) extremely severe. This may be due to several factors, the first one being that the study conducted by Ramón and Cabrera (22) this differs from the sociocultural and economic expressions of university students in Mexico, and the sample used by these researchers is almost twice the size of the one used in this study.

The results of the present study evidenced a positive and moderate relationship between the consumption of ultra-processed foods (UPA) and the presence of depressive symptoms ($\rho = 0.493$; 99 % CI), suggesting that, as depressive symptomatology increases, so does the consumption of this type of products. When contrasting these results with those reported by José and collaborators (23), relevant coincidences are observed, carried out with students from a public university in Brazil, it was identified that 38.9 % of the participants presented a high consumption of AUP, with a mean of 4.5 points (95 % CI): 4.3-4.7). Although the authors found no significant differences between UPA consumption and the presence of depressive symptoms, they did report that a higher intake of fresh or minimally processed foods was associated with a lower likelihood of depressive symptoms. In contrast, the findings of the present study show a statistically significant association between UPA consumption and depressive symptomatology, which could be explained by cultural, contextual or methodological differences, such as the instruments used for the assessment of mental health, the time of the academic cycle in which the measurement was applied or the particular psychosocial conditions of the university environment.

The moderate strength of the observed correlation reinforces the hypothesis that a diet based on ultra-processed products could be related to an increased risk of emotional disturbances. Several studies have supported this trend, indicating that a diet high in PUFAs - characterized by their low nutritional value and high content of saturated fats, sugars and additives - can negatively affect mood regulation through metabolic and inflammatory mechanisms, alterations in the intestinal microbiota and reduced availability of neurotransmitters linked to psychological well-being (24, 25).

Similarly, the results of the present study coincide with the findings of Contreras-Rodríguez and collaborators (26), who analyzed fifty-two adults subjected to a dietary regimen, simultaneously evaluating their depressive symptoms, anatomical parameters by

magnetic resonance imaging and various biochemical indicators. These authors reported that higher consumption of ultra-processed foods (UPA) was associated with higher levels of depressive symptomatology in the total participants (r = 0.178; 95 % CI: 0.008-0.261) and, particularly, in those with obesity (r = 0.214; 95 % CI: -0.004-0.333).

In agreement, in the university population analyzed in this study, a positive and moderate relationship was observed between UPA consumption and the categories of depressive symptoms (ρ = 0.498; 99 % CI), indicating that the greater the severity of depressive symptoms, the greater the caloric intake derived from this type of food. In other words, students with severe or extremely severe levels of depression showed significantly higher consumption of UPA than those with mild symptomatology, reinforcing the evidence that diet may play an important role in the manifestation and maintenance of depressive states.

## CONCLUSIONS

The results of the present study show a direct and moderate relationship between depressive symptoms and the consumption of AUP in university students in the area of Health Sciences. This finding is particularly relevant, given that these are future professionals in charge of promoting healthy habits and lifestyles. The inconsistency between the knowledge acquired during their academic training and their own dietary practices could represent a challenge for their professional performance and for the credibility of the health interventions they carry out in the future.

In this sense, the implementation of interdisciplinary strategies, particularly in the areas of nutrition and psychology, by higher education institutions, is essential to address this problem in a comprehensive manner. Such strategies could contribute not only to improving the mental and physical health of students, but also to strengthening their role as promoters of wellness within and outside the university environment.

Among the main limitations of the study is the small sample size, which could limit the generalizability of the results. Also, the cross-sectional design precludes establishing causal relationships, and the absence of additional variables, such as academic stress or sleep habits, restricts a broader understanding of the situation.

For future research, it is recommended to include clinical diagnoses of depression confirmed by psychologists, as well as to incorporate biochemical indicators to identify possible related metabolic risks. In addition, it would be pertinent to conduct longitudinal studies to establish causal relationships between UPA consumption and depressive symptomatology, and to explore the mediating role of factors such as academic stress, physical activity and sleep patterns.

Similarly, it is suggested to continue analyzing the relationship between depression and UPA consumption in conjunction with other physiological and psychosocial indicators, in order to strengthen the evidence on the comprehensive risks that this relationship entails. This study also opens the possibility of new lines of research aimed at understanding the social, cultural and environmental factors that influence the dietary decisions of young university students.

The academic environment plays a determining role in the adoption or abandonment of healthy habits. Therefore, universities should take an active role in promoting healthy eating environments, through the regulation of eating spaces, clear nutritional education and

the provision of accessible psychological counseling. These actions can have a positive impact on the mental and physical health of students.

Furthermore, the observed relationship between PUA consumption and negative emotional states, such as depression, suggests a potentially harmful feedback loop: high consumption of these products may contribute to the development of depressive symptoms, while depression may, in turn, increase PUA consumption as an emotional coping mechanism in the face of academic or personal stress. This model strengthens a risk dynamic that must be identified and addressed in a timely manner.

Finally, this phenomenon should not be interpreted in isolation, but as part of a broader context that involves the challenges of the educational system, socioeconomic conditions, family dynamics, the media and national food policies. Therefore, the consumption of ultra-processed foods and their effects on mental health should be addressed from an approach in which the system combines interventions at the individual level with collective initiatives aimed at comprehensive wellness.

In conclusion, the present study makes visible a growing problem in the university population, particularly in those who are being trained as future health agents. Addressing the relationship between UPA use and depressive symptomatology is an essential step in building healthier, more resilient and coherent university environments where students can fully develop their professional potential without compromising their emotional and physical well-being.

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**Conflict of Interest**

The authors involved in this research declare that there is no conflict of interest.

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