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SHORT REPORT

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Ultra-processed food and homemade fried food consumption is associated with overweight/obesity in Latin American university students during COVID-19

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Abstract

Objective: We estimated the association between the consumption of select ultra-processed food (UPF), homemade fried food and overweight/obesity in Latin American university undergraduate students during the COVID-19 pandemic.

Methods: We conducted an analytical cross-sectional study. 4539 university students (73.6% female, mean age 22.5 ± 4.4) from 10 Latin American countries completed a self-administered online survey. UPF eating habits and homemade fried food were measured according to a validated survey. Height and body weight were self-reported. Body mass index (BMI) was calculated. A BMI ≥25 kg/m^2 was categorized as overweight/obesity. Ordinal logistic regression models were applied.

Results: Snacks (36.2%) and homemade fried food (30.2%) had a higher prevalence of consumption than sugary drinks (22.5%) and fast food (7.2%). The greatest strength of association was found between fast food consumption [odds ratio (OR) = 2.16; 95% confidence interval (CI): 1.63–2.85], sugary drinks [OR = 2.05; CI: 1.63–2.59] and homemade fried food [OR = 1.46; CI: 1.16–1.85] with overweight/obesity.

Conclusion: Latin American university undergraduates present risky eating behaviors associated with overweight and obesity. Effective policies to promote healthy eating should be incorporated and issued from universities to reduce the consumption of UPF and promote homemade, healthier and more natural food.

1 | INTRODUCTION

Obesity has reached epidemic proportions in Latin America in the last few decades. In addition, these countries have been harshly affected by the coronavirus disease of 2019 (COVID-19) pandemic, mainly due to less prepared healthcare systems and fragmented social safety nets. Current evidence has shown that outcomes are worse in those who have obesity. Likewise, a significant proportion of patients with obesity need intensive care and are at high risk of mortality from COVID-19 infection. Several obesity-related morbidities, such as diabetes mellitus, hypertension, metabolic syndrome, and other cardiovascular risk factors are associated with greater risk of death from COVID-19 (Balboa-Castillo et al., 2021).

University students are a vulnerable population due to an increase in risky behaviors, especially due to the transition to independence from late adolescence to emerging adulthood. Likewise, during this period university students need to adapt to different social contexts (Stok et al., 2018). It is a very challenging time in and of itself characterized by a higher academic demand that can affect students' health status (Deforche et al., 2015; Kritsotakis et al., 2016). They are also at a critical stage for the development of their eating habits, characterized by a high consumption of unhealthy foods, which contribute to a high intake of risk nutrients (sugars, sodium, saturated and trans fats) and an excessive caloric intake, mainly from ultra-processed foods (UPF) and homemade fried food. In addition, highly sedentary lifestyles foster an environment that promotes obesity and its related comorbidities (Benaich et al., 2021), which will have an impact on the future trajectory of health problems.

The objective was to estimate associations between the consumption of select UPF (three categories: sugary drinks, fast food and snacks) and homemade fried food with obesity in Latin American university students during the COVID-19 pandemic.

2 | METHODS

2.1 | Study design

A cross-sectional and multicenter study was carried out with 4985 university undergraduate students enrolled in 10 Latin American countries (Argentina, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Mexico, Panama, Paraguay, and Peru). Nonprobability sampling was used to select the sample in each country. The inclusion criteria were: (i) 18 years of age or older; (ii) active enrollment in a higher education institution in Latin America. Those students who partially answered the survey were excluded. However, the final sample size was 4539 university students. They were invited to participate in the study (between November and December 2020) through institutional social networks, and then had to complete a voluntary and self-administered online digital survey, applied only once, during the COVID-19 pandemic.

2.2 | Measurements

A validated eating habits survey was administered (Durán et al., 2014). For assessment of select UPF, three questions about unhealthy foods were used to evaluate the intake of sugary drinks, salty and sweet snacks; for example: Do you consume sugary drinks or juices? (serving: 200 cc glass): (a) Do not consume; (b) Less than once a day; (c) 1 serving a day; (d) 2 servings a day; (e) 3 servings a day. Furthermore, homemade fried food consumption was also included.

We determined nutritional status according to the body mass index (BMI; kg/m^2) from self-reported weight and height. Other covariates assessed were: sociodemographic data (age, gender, socioeconomic status [SES]), area of study, years of university, physical activity, tobacco consumption and country.

2.3 | Statistical analysis

We used a logistic regression analysis to determine if the nutritional status was associated with UPF consumption, where nutritional status was the outcome. The model was adjusted by co-variates. Results are presented as odds ratios (OR) with their respective 95% confidence interval (CI) and *p*-value. The statistical package STATA version 16.0 was used to perform all the analyses. A p value of <.05 was considered significant.

3 | RESULTS

Table 1 shows the baseline characteristics. Briefly, 4539 participants were included in the analysis. Most had a normal body weight, 24.7% were overweight, and 9.3% were obese. Most of the participants were women (73.6%). However, more men were overweight and obese. Mexico, Argentina, and Costa Rica were the countries with the most participants. Most of the students were in quarantine (60.2%) and studying in health-related areas (64.1%). Students with obesity were less active than the other groups and there were fewer smokers. Snacks ≥1 serving per day (36.2%) and homemade fried food ≥1 serving per week (30.2%) had a higher prevalence of consumption than sugary drinks ≥1 serving per day (22.5%) and fast food ≥1 serving per week (7.2%) (data not shown).

People who had at least one serving per week of fast food were 2.16 times more likely to be overweight/obese [odds ratio (OR) = 2.16; 95% confidence interval (CI): 1.63–2.85]. Likewise for sugary drink consumption, those who had ≥2 servings were 2.05 times more likely to be overweight/obese [OR = 2.05; CI: 1.63–2.59]. Meanwhile, people who had a consumption of 2 or more servings per week of homemade fried food were 1.46 times more likely to have overweight/obesity [OR = 1.46; CI: 1.16–1.85] (Figure 1).

4 | DISCUSSION

We found the greatest strength of association was between fast food consumption, sugary drinks and homemade fried food with overweight/obesity. UPF consumption has been associated with a higher risk of overweight and obesity (Mendonça et al., 2016) and other cardiovascular risk factors (Lavigne-Robichaud et al., 2018). Likewise, in the PREDIMED-PLUS study, higher consumption of UPF was associated with greater age-related visceral adiposity, android-to-gynoid fat ratio and total fat (overall adiposity accumulation; Konieczna et al., 2021).

The undergraduate period is characterized by a higher academic demand, stress and boredom and could be linked to the increased consumption of sugary drinks and pastries, high in carbohydrates and fats. These foods are well known for being a source of pleasure, and have been called foods that are "craved," a term that refers to an intense desire to consume food with high caloric content, promoting overweight and obesity (Rodríguez-Martín & Meule, 2015).

The consumption of UPF in Latin America is high, and sales are steadily rising, representing 28.6% of the calories consumed in Chile (Cediel et al., 2018) and 15.9% in Colombia (Khandpur et al., 2020). We found a 22.5% prevalence of sugary drinks (≥1 serving p/d). This is worrying because the sustained consumption of sugary drinks promotes the increase in body weight due to their caloric load, particularly of large bottles, and has an effect on postprandial glucose and insulinemia (Pereira, 2014). UPF are available throughout the world, not discriminating between low-income and high-income countries.

The preparation of fried foods at home is a common practice, since it is a part of Latin American cuisine (Popkin & Reardon, 2018). We found a high prevalence of homemade fried food (30%, ≥1 serving per week). Furthermore, fried foods, even if they are homemade, are hypercaloric, high in saturated fats and sodium, and have been associated with greater risk of obesity and other cardiovascular diseases (Qin et al., 2021).

Among the strengths of this study, we used a food survey specifically designed for the group of university students from 10 countries of Latin America; the survey was validated by experts in nutrition and public health. In addition, this is a group that has access to the Internet and social networks, a fact that contributed to the high response rate.

TABLE 1 Baseline characteristics according to nutritional status

Variables	Nutritional status[a]			
	Overall	Normal	Overweight	Obesity
n (%)	4539	2996 (66.0)	1123 (24.7)	420 (9.3)
Age, mean (*SD*)	22.5 (4.4)	22.1 (3.9)	22.9 (5.1)	23.8 (5.4)
Gender, *n* (%)				
Female	3341 (73.6)	2333 (69.8)	723 (21.6)	285 (8.5)
BMI, mean (*SD*)	24.4 (4.8)	21.94 (1.7)	26.94 (1.3)	35.09 (7.1)
Country, *n* (%)				
Argentina	473 (10.4)	323 (68.3)	104 (22.0)	46 (9.7)
Colombia	245 (5.4)	183 (74.7)	56 (22.9)	6 (2.4)
Costa Rica	541 (11.9)	391 (72.3)	107 (19.8)	43 (7.9)
Chile	371 (8.2)	249 (67.1)	99 (26.7)	23 (6.2)
Ecuador	636 (14.0)	451 (70.9)	152 (23.9)	33 (5.2)
Guatemala	332 (7.3)	197 (59.3)	73 (22.0)	62 (18.7)
Mexico	1157 (25.5)	720 (62.2)	329 (28.4)	108 (9.3)
Panama	251 (5.5)	146 (58.2)	59 (23.5)	46 (18.3)
Paraguay	253 (5.6)	159 (62.8)	59 (23.3)	35 (13.8)
Peru	280 (6.2)	177 (63.2)	85 (30.4)	18 (6.4)
SES, *n* (%)				
Low	1227 (27.0)	851 (69.4)	280 (22.8)	96 (7.8)
Middle	2166 (47.7)	1425 (65.8)	538 (24.8)	203 (9.4)
High	1146 (25.2)	720 (62.8)	305 (26.6)	121 (10.6)
Area of study, *n* (%)				
Health-related	2908 (64.1)	2040 (70.2)	667 (22.9)	201 (6.9)
Non-health-related	1631 (35.9)	956 (58.6)	456 (28.0)	219 (13.4)
Quarantine, *n* (%)				
Yes	2734 (60.2)	1810 (66.2)	678 (24.8)	246 (9.0)
Year of university, *n* (%)				
First year	882 (19.4)	227 (25.7)	572 (64.9)	83 (9.4)
Second year	1123 (24.7)	267 (23.8)	732 (65.2)	124 (11.0)
Third year	907 (20.0)	243 (26.8)	598 (65.9)	66 (7.3)
Fourth year	717 (15.8)	168 (23.4)	488 (68.1)	61 (8.5)
Fifth year	910 (20.0)	218 (24.0)	606 (66.6)	86 (9.5)
Physical activity, *n* (%)[b]				
Yes	1547 (34.1)	1, 097 (70.9)	338 (21.9)	112 (7.2)
Tobacco consumption, *n* (%)				
Yes	338 (7.4)	174 (51.5)	122 (36.1)	42 (12.4)

Abbreviations: BMI, Body Mass Index; *SD*, standard deviation.

[a]The cutoff points for categorizing nutritional status were: normal BMI ≤24.9 kg/m^2, overweight BMI ≥25 kg/m^2 and obesity BMI ≥30 kg/m^2.

[b]Physical activity (yes) ≥150 min of moderate or >75 min of vigorous physical activity per week.

The weaknesses include the cross-sectional design, which does not ensure the causality of the results obtained between being overweight and select UPF consumption and homemade fried food. In addition, it was not possible to assess the changes in UPF consumption and homemade fried food before and after the COVID-19 pandemic. Another limitation was the lack of information on energy intake, macronutrients and a fuller

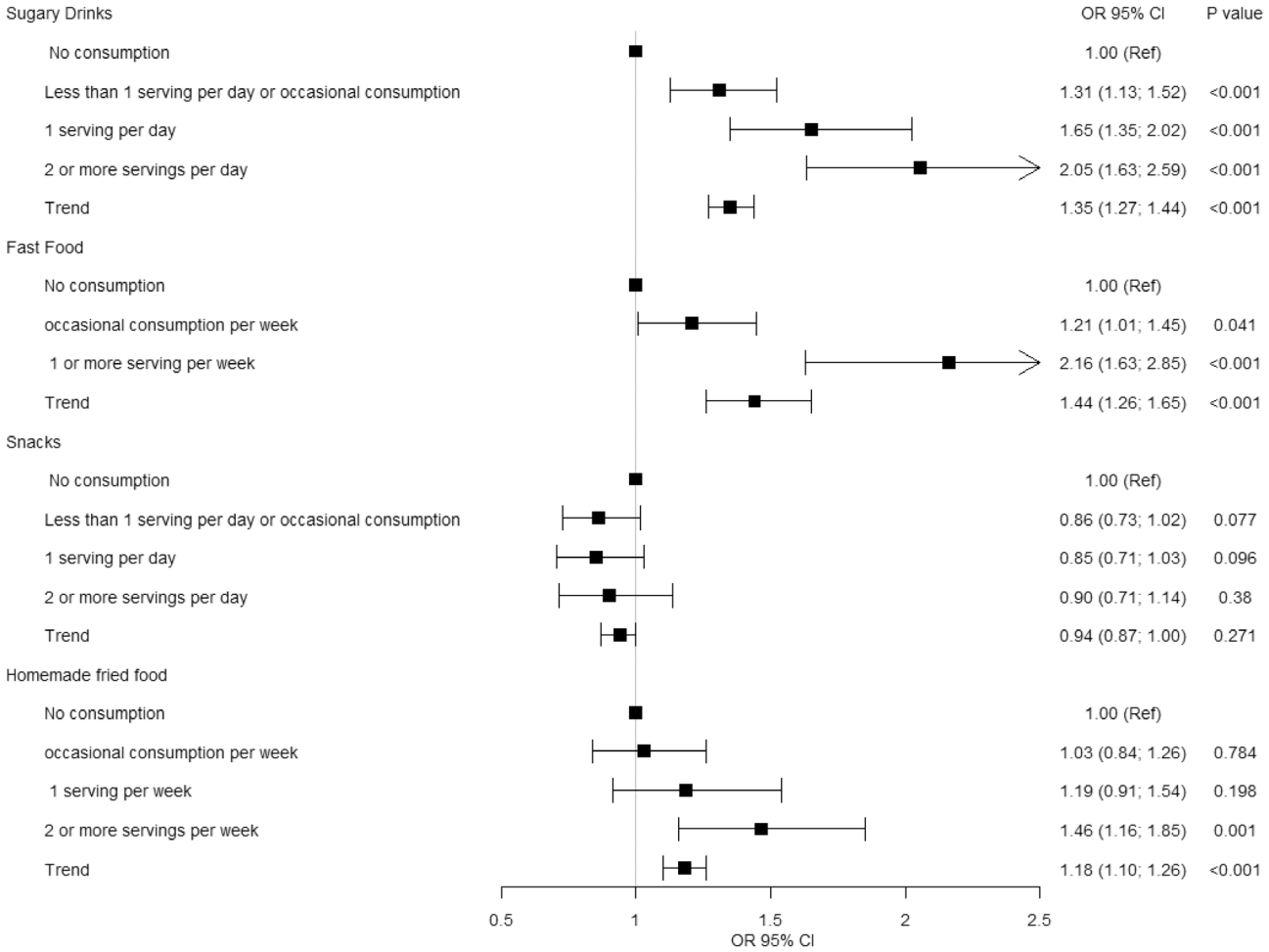

FIGURE 1 Link between ultra-processed food and homemade fried food consumption and nutritional status. Data are presented as odds ratio (OR) with 95% confidence intervals (95% CI). The reference group consisted of those with normal BMI. The model was adjusted by age, gender, years of university, area of study, quarantine, physical activity, and tobacco consumption

description of the foods included in the survey of UPF and homemade fried food due to the instrument applied. Also, participants self-reported the information about weight, height and food consumption, which can lead to memory bias and social desirability bias.

In conclusion, this study reinforces the high intake of sugary drinks and fast food as risk factors for overweight/obesity in Latin American university students. Future research should be consider cohort studies, food surveys with more details on food consumption, more precise anthropometric measurements and greater exploration on the influence of SES.

AUTHOR CONTRIBUTIONS

Samuel Durán-Agüero, Gabriela Murillo, Leslie Landaeta-Díaz, and Jacqueline Araneda-Flores: Conceptualization and design. Samuel Durán-Agüero, Leslie Landaeta-Díaz, Gabriela Murillo, Jacqueline Araneda-Flores, Valeria Carpio, Brian Cavagnari, Israel Rios-Castillo, Edna Nava-González, Jhon Bejarano-Roncancio, Beatriz Núñez-Martínez, Karla Cordón-Arrivillaga, Eliana Meza-Miranda, Saby Mauricio-Alza **and Georgina Gómez:** Generation, collection, assembly. **Solange Parra-Soto, Gabriela Murillo and Jacqueline Araneda-Flores:** Analysis and interpretation of data. **Gabriela Murillo, Jacqueline Araneda-Flores, Leslie Landaeta-Díaz, Samuel Durán-Agüero, Gabriela Murillo, Jacqueline Araneda-Flores, Valeria Carpio, Brian Cavagnari, Israel Rios-Castillo, Edna Nava-González, Jhon Bejarano-Roncancio, Beatriz Núñez-Martínez, Karla Cordón-Arrivillaga, Eliana Meza-Miranda, Saby Mauricio-Alza and Georgina Gómez:** Drafting or revision of the manuscript. All authors approved the final version of the manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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