

Dietary practices of university students according to the Dietary Guidelines for the Brazilian Population: PADu study

Práticas alimentares de ingressantes na universidade segundo o Guia Alimentar para a População Brasileira: estudo PADu

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ABSTRACT

Objective

To evaluate factors associated with dietary practices in students of a institution of higher education, included in the PADu study: "Anxiety and depression symptoms among university students in Minas Gerais: a longitudinal study".

Methods

Cross-sectional study of PADu project baseline with undergraduate first period students, who responded in person to a printed and self-administered questionnaire. Dietary practices were evaluated through a 24 items scale based on recommendations of Dietary Guidelines for the Brazilian Population. Answer choices are four-point Likert scale: "strongly agree", "agree", "disagree" and "strongly disagree". The sum of the items corresponded a score ranging (0-72 points), a high score indicating greater adequacy. The explanatory variables were: sociodemographics (gender, age, knowledge area, skin color, marital status, monthly household income), behaviors (excess alcohol consumption, physical

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exercise, screen exposure, internet use), health conditions (self-rated health, nutritional status, symptoms of depression, anxiety, stress). Adjusted multiple linear regression model was used to estimate the coefficients and their 95% CI.

Results

356 students participated in the study. The average of dietary practices was 34.9 ± 9.3 (0-63) points. Physical exercise practice (β : 3.75; CI: 1.83; 5.67) was associated with higher scores in the eating students score. We observed factors associated with the lowest score greater exposure to screens (β : -0.44; CI: -0.67; -0.13), excessive internet use (β : -3.05; CI: -5.22; -0.88), poor health self-assessment (β : -3.63; CI: -4.97; -1.21), excessive alcohol consumption (β : -2.09; CI: -3.92; -0.26) and stress symptoms (β : -2.81; CI: -4.72; -0.77).

Conclusion

Most students have inadequate dietary practices associated with internet use, alcohol consumption and stress.

Keywords: Food guide. Diet, healthy. Feeding behavior. Nutritional surveys.

RESUMO

Objetivo

Avaliar os fatores associados às práticas alimentares em estudantes de uma instituição de Ensino Superior incluídos no estudo PADu: "Sintomas de ansiedade e depressão em universitários de Minas Gerais: um estudo longitudinal".

Métodos

Estudo transversal da linha de base do projeto PADu com alunos do primeiro período da graduação, que responderam pessoalmente a um questionário impresso e autoaplicável. As práticas alimentares desses estudantes foram avaliadas por meio de uma escala de 24 itens baseada nas recomendações do Guia Alimentar para a População Brasileira. As opções de resposta foram coletadas em escala Likert de quatro pontos: "concordo totalmente", "concordo", "discordo" e "discordo totalmente". A soma dos itens correspondeu a uma pontuação (0-72 pontos), onde uma pontuação alta indicava maior adequação. As variáveis explicativas foram: características sociodemográficas (sexo, idade, área do conhecimento, cor da pele, estado civil, renda familiar total mensal), comportamentos (consumo excessivo de álcool, exercícios físicos, exposição a telas e uso de internet) e condições de saúde (autoavaliação saúde, estado nutricional, sintomas de depressão, ansiedade e stress). O modelo de regressão linear múltipla ajustado foi usado para estimar os coeficientes e seus IC 95%.

Resultados

356 alunos participaram do estudo. A média das práticas alimentares foi de $34,9 \pm 9,3$ (0-63) pontos. A prática de exercícios físicos (β : 3,75; IC: 1,83; 5,67) esteve associada a maiores escores no escore de hábitos alimentares dos escolares. Foram observados fatores associados ao menor escore maior exposição a telas (β : -0,44; IC: -0,67; -0,13), uso excessivo de internet (β : -3,05; IC: -5,22; -0,88), ruim autoavaliação de saúde (β : -3,63; IC: -4,97; -1,21), consumo excessivo de álcool (β : -2,09; IC: -3,92; -0,26) e sintomas de estresse (β : -2,81; IC: -4,72; -0,77).

Conclusão

A maioria dos estudantes apresenta práticas alimentares inadequadas associadas ao uso da internet, consumo de álcool e estresse.

Palavras-chave: Guias alimentares. Dieta saudável. Comportamento alimentar. Inquéritos nutricionais.

INTRODUCTION

A decline in the acquisition of fresh or minimally processed foods has been recorded in the last two decades, followed by an increase in the availability of processed and ultra-processed foods and inadequate dietary practices among university students [1]. Low consumption of vegetables and fruits and a high intake of ultra-processed foods stand out among these practices [2-4].

The university population stands out for its vulnerability to health risk practices, such as sedentary behavior and tobacco and alcohol consumption [5,6]. In addition, these conducts may be related to changes

inherent to the entry into academic life and are represented by psychosocial instability [7], impairing nutritional status and health [3-8].

Most students have a low intake of vegetables and high consumption of high-calorie foods, replacement of complete meals with snacks, and frequent skipping breakfast [3,8]. However, none of these studies evaluated eating habits according to the 2nd edition of the Food Guide for the Brazilian Population recommendations and its association with health behaviors among university students [9].

Understanding the dietary practices of university students according to the new guide recommendations is imperative for the establishment of more assertive public policies and guidelines. Therefore, the objective of this study was to evaluate the factors associated with the dietary practices of university students based on the recommendations of the guidelines.

METHODS

This was a cross-sectional study derived from the PADu Project: "Anxiety and depression symptoms among university students in Minas Gerais: a longitudinal study" approved by the Research Ethics Committee of the Federal University of Ouro Preto, under protocol nº 85839418.8.1001.5150. The longitudinal PADu seeks to assess students from 14 courses at the Federal University of Ouro Preto over the four to five years they have been at the university. It was conducted in three stages: the first in the year of admission (T0 or baseline), the second after two years (T1), and the third in the last year of the course (T2).

Our study used only baseline data from the longitudinal PADu project. All university students aged 18 and older who were regularly enrolled in the first semester of 2019 in one of the 14 selected courses were invited to participate. The courses were as follows: Life Sciences (Physical Education, Pharmacy, Medicine, and Nutrition), Exact Sciences (Architecture, Mathematics, Civil Engineering, Geological Engineering, and Production Engineering), and Human and Social and Applied Sciences (Performing Arts, Law, History, Journalism, and Pedagogy). Courses with the highest number of students enrolled and the lowest dropout rate were chosen in anticipation of the possible expected losses in a longitudinal study.

Data were collected between April and September 2019, using a printed and self-administered questionnaire composed of blocks covering sociodemographic issues, lifestyle habits, and health conditions. The application of the questionnaires took place in the classroom environment after the responsible teacher had been asked to leave. In addition, the study researcher was present to clarify possible doubts.

"Dietary practices" were assessed using the scale developed and validated by Gabe and Jaime (2019) for adult individuals [10]. It consisted of 24 items based on the recommendations in the Guide, grouped into four areas: food choices, ways of eating (positive), household organization, and food planning (negative) [9]. The answer choices followed a four-point Likert scale – "strongly agree", "agree", "disagree", and "strongly disagree". Item scores on the positive dimensions ranged from zero for "strongly disagree" to 3 for "strongly agree". The inverse of the score applied to the negative dimensions. The sum of the points attributed to the answers for each alternative resulted in a score (0-72 points), with higher values indicating greater adequacy of dietary practices.

Variables were presented in three blocks: 1) Sociodemographic: sex, age, the field of knowledge, skin color, marital status, having children (no/yes), work, total monthly family income, university financial support, type of housing, and religious belief [11, 12]; 2) Behaviors: exposure to screens (television, computer, tablet, cell phone) (number of hours of exposure in free time), Internet use, physical exercise, alcohol consumption (no/yes), excessive consumption of alcoholic beverages (when above five doses for men and four for women

on a single occasion), and tobacco consumption (no/yes) [11,12-14]. Internet use was assessed using the Internet Addiction Test Scale, with individuals classified by the sum of points as normal use, mild, moderate, and severe dependence [14]. The present study categorized the variables into medium use (normal use and light dependence) and severe/extreme use. Physical exercise was assessed using the question adopted in the National Health Survey [12] and VIGITEL [15] (“In the last three months, have you practiced any type of physical exercise or sport?”); and 3) Health conditions: health self-assessment (very good/good or fair/poor/very poor), body mass index (BMI), symptoms of anxiety disorder, depression and stress, and use of anxiolytic and/or antidepressant medications [12,16-18]. As it was a self-administered questionnaire, there were non-responses in some explanatory variables. However, an analysis was performed comparing the profiles of participants with missing data with those with complete data, and no significant differences were found.

The database was constructed using Microsoft Office Excel 2013 program by double typing. All analyses were performed using Stata 13.0, and statistical significance was set at 5%. The normality of continuous variables was assessed using the Shapiro-Wilk test. Simple linear regression was applied to the bivariate analysis.

Multiple linear regression analysis was performed to assess the factors associated with dietary practices. The explanatory variables were included in the bivariate analysis if the p-value of the analysis was ≤ 0.20 . The backward method was used, in which the variables were removed one by one from the model, from the lowest to the highest level of significance, until all variables present in the model were statistically significant ($p \leq 0.05$), respecting plausibility theory. The model was adjusted for income, gender, and age. Residuals were evaluated according to normality, homoscedasticity, linearity, and independence assumptions.

RESULTS

A total of 546 university students were recruited for this study. Of them, 356 participated in the study, representing a response rate of 65.2%. The reason for non-participation was the absence from the classroom on the day the questionnaire was administered.

When evaluating dietary practices, it was found that the minimum score achieved in the sample was 0, and the maximum was 63, with a mean of 34.9 ± 9.3 and a median of 35.

Most university students were female (57.6%), with a mean age of 20.6 ± 3.65 , and were predominantly from life sciences courses (41.6%). A total of 62.9% of the students declared that they practiced physical exercise and had an average exposure to screens of $7.7 \text{h} \pm 3.42/\text{day}$. Among the participants, 59.0% rated their health as good, 43.0% had anxiety symptoms, 33.3% had depression, and 36.1% had stress. BMI averaged $22.7 \pm 3.5 \text{ kg/m}^2$ (Table 1).

Table 1 – Sociodemographic characteristics, behaviors, and health conditions of university students (N=356). *Ouro Preto*, Brazil, 2019.

Variables	n	Values
Sociodemographic characteristics		
Sex (%)		
Female	205	57.6
Male	151	42.4
Age (mean and standard deviation)	353	20.6 ± 3.6

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Table 1 – Sociodemographic characteristics, behaviors, and health conditions of university students (N=356). *Ouro Preto*, Brazil, 2019.

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Variables	n	Values
Area of knowledge (%)		
Life sciences	148	41.6
Exact Sciences	86	24.1
Applied human and social sciences	122	34.3
Skin color (%)		
White	181	50.8
Others (yellow, brown, mulatto, or black)	175	49.2
Marital status (%)		
Single	339	95.2
Others (married, stable, widowed, divorced)	17	4.8
Children (%)		
No	345	96.9
Yes	11	3.1
Total family income* (mean and standard deviation)	356	3.7±1.3
Financial assistance (%)		
No	319	89.6
Yes	37	10.4
Type of housing (%)		
Relatives	119	33.4
Alone	35	9.8
Fraternity or friends	202	56.8
Religious belief (%)		
None	121	34.0
Believe	235	66.0
Work (%)		
No	316	88.8
Yes	40	11.2
Behaviors		
Internet use (n=351) (%)		
Average	267	76.1
Sharp/Extreme	84	23.9
Physical exercise (%)		
No	132	37.1
Yes	224	62.9
Alcohol consumption (%)		
No	93	26.1
Yes	263	73.9
Excessive alcohol consumption** (n=354) (%)		
No	198	55.9
Yes	156	44.1
Tobacco consumption (%)		
No	294	82.6
Yes	62	17.4
Hours of screen exposure (average and standard deviation)	356	7.72±3.4
Health conditions		
Health self-assessment (%)		
Good (very good/good)	210	59.0
Poor (fair/poor/very poor)	146	41.0
BMI (mean and standard deviation)	355	22.74±3.5
Anxiety symptoms (%)		
No	202	57.0
Yes	152	43.0

Table 1 – Sociodemographic characteristics, behaviors, and health conditions of university students (N=356). *Ouro Preto*, Brazil, 2019.

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Variables	n	Values
Depression symptoms (n=354) (%)		
No	236	66.7
Yes	118	33.3
Stress symptoms (n=355) (%)		
No	227	63.9
Yes	128	36.1
Use of anxiolytic and/or antidepressant medications (n=337) (%)		
No	295	87.5
Yes	42	12.5

Note: *Salary in 2019: BRL 998.00. **Excessive alcohol consumption considered for the minimum intake was five doses for men and four for women on a single occasion. BMI: Body Mass Index.

In the bivariate analysis, the following variables were related to dietary practices: having children, institutional financial support, work, exposure to screens, Internet use, physical exercise, alcohol consumption, alcohol consumption in excess, tobacco consumption, self-rated health, symptoms of anxiety disorder, depression, stress, and use of anxiolytic and/or antidepressant medication (Table 2).

Table 2 – Bivariate analysis of sociodemographic characteristics, behaviors, and health conditions related to university students' dietary practices (N=356). *Ouro Preto*, Brazil, 2019.

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Variables	Dietary practices	
	β (CI)	p-value
Sociodemographic characteristics		
Sex		
Female	ref	
Male	-0.25 (-2.20; 1.70)	0.800
Age	0.16 (-0.10; 0.43)	0.230
Area of knowledge		
Life sciences	ref	
Exact Sciences	-1.19 (-3.66; 1.27)	0.340
Applied human and social sciences	-0.69 (-2.92; 1.53)	0.540
Skin color		
White	ref	
Others (yellow, brown, mulatto or black)	-0.73 (-2.66; 1.19)	0.450
Marital status		
Single	ref	
Others (married, stable, widowed, divorced)	1.50 (-3.03; 6.03)	0.510
Children		
No	ref	
Yes	6.23 (0.68; 11.78)	0.020
Total family income	0.22 (-0.50; 0.94)	0.540
Financial assistance		
No	ref	
Yes	-3.92 (-7.06; -0.77)	0.010
Type of housing		
Relatives	ref	
Alone	-0.51 (-4.02; 3.00)	0.770
Republic or friends	-0.45 (-2.15; 2.06)	0.960

Table 2 – Bivariate analysis of sociodemographic characteristics, behaviors, and health conditions related to university students’ dietary practices (N=356). *Ouro Preto*, Brazil, 2019.

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Variables	Dietary practices	
	β (CI)	p-value
Religious belief		
None	ref	
Believe	0.23 (-1.80; 2.27)	0.820
Work		
No	ref	
Yes	-2.35 (-5.40; 0.69)	0.130
Behaviors		
Hours of screen exposure	-0,54 (-0.81; -0.26)	<0.001
Internet use		
Average	ref	
Sharp/Extreme	-4.56 (-6.79; -2.33)	<0.001
Physical exercise		
No	ref	
Yes	4.11 (2.15; 6.06)	<0.001
Alcohol consumption		
No	ref	
Yes	-1.89 (-4.09; 0.29)	0.090
Excessive alcohol consumption** (n=354)		
No	ref	
Yes	-2.48 (-4.42; -0.54)	0.010
Tobacco consumption		
No	ref	
Yes	-2.92 (-5.45; -0.39)	0.020
Health conditions		
Health self-assessment		
Good (very good/good)	ref	
Poor (fair/poor/very poor)	-4.62 (-6.53; -2.71)	<0.001
BMI	0,10 (-0,37; 0,17)	0.462
Anxiety symptoms		
No	ref	
Yes	-2.42 (-4.36; -0.48)	0.010
Depression symptoms (n=354)		
No	ref	
Yes	-4.05 (-6.07; -2.04)	0.001
Stress symptoms (n=355)		
No	ref	
Yes	-4.15 (-6.13; -2.18)	0.001
Use of anxiolytic and/or antidepressant medications (n=337)		
No	ref	
Yes	-2.60 (-5.58; 0.37)	0.08

Note: Bivariate analysis by simple linear regression. **Excessive alcohol consumption considered for the minimum intake was five doses for men and four for women on a single occasion. β : Beta Coefficient; BMI: Body Mass Index; CI: 95% Confidence Interval.

The final multiple linear regression model adjusted for sex, age, and income identified that physical exercise (β : 3.75; CI: 1.83; 5.67) was associated with higher scores in the dietary practices score of college students and that greater exposure to screens (β : -0.44; CI: -0.67; -0.13), excessive Internet use (β : -3.05; CI: -5.22; -0.88), poor health self-assessment (β : -3.63; CI: -4.97; -1.21), excessive alcohol consumption (β : - 2.09; CI: - 3.92; -0.26), and the presence of stress symptoms (β : -2.81; CI: -4.72; -0.77) were factors associated with lower scores in the dietary practice score (Table 3).

Table 3 – Final multiple linear regression model of variables associated with dietary practices in university students (N=345). *Ouro Preto*, Brazil, 2019.

Variables	Dietary practices	
	β (CI)	p-value
Hours of screen exposure	-0.40 (-0.67; -0.13)	<0.01
Internet use		
Average	ref	
Sharp/Extreme	-3.05 (-5.22; -0.88)	<0.01
Physical exercise		
No	ref	
Yes	3.75 (1.83; 5.67)	<0.001
Excessive alcohol consumption		
No	ref	
Yes	-2.09 (-3.92; -0.26)	0.025
Health self-assessment		
Good (very good/good)	ref	
Poor (fair/poor/very poor)	-3.09 (-4.97; -1.21)	<0.01
Stress symptoms		
No	1	
Yes	-2.74 (-4.72; -0.77)	<0.01

Note: Adjusted for income, gender, and age. β : Beta Coefficient. CI: 95% Confidence Interval. R2: 0.194. Adjusted R2: 0.173. Backward Method. Test F: $p < 0.0001$.

DISCUSSION

This study is the first to assess the dietary practices of university students according to the recommendations of the second edition of the Guide. The average score achieved was 34.9 ± 9.3 points, similar to the study conducted by Gabe and Jaime (2020) with the Brazilian adult population [19]. The average score of university students was not low to characterize their dietary practices as bad, but it also did not reach values close to the maximum score limit. Surprisingly, when using the same scale as an assessment tool, Quaresma and collaborators observed that in their sample during the Covid-19 pandemic in São Paulo, Brazil, almost 50% of the people assessed had dietary practices above 41 points [20].

Other studies on university students showed inadequate food choices, although they did not use the same parameters to assess dietary practices. Yun, Ahmad, and Quee (2018) study carried out with students from the Universiti Brunei Darussalam observed a high consumption of fried foods at least three to five times a week and low regular consumption of vegetables and fruits [21]. Similar results were observed in a study of medical students in India. Only 10% of the participants reported daily fruit consumption, falling short of what is recommended by the World Health Organization [22]. Other studies also showed inadequate food choices in the university environment. Bernardo *et al.* (2017) [3] observed low consumption of fruits and vegetables among the university population, and the studies by Kabir *et al.* [23] and Musaiger *et al.* [24] identified that more than half of the evaluated students skip the first meal of the day (breakfast).

These findings show food choices far removed from those deemed appropriate by the Guide, possibly reflecting habits such as skipping meals or substituting for quick snacks, lack of time planning, stress, and not living with parents [3,25].

The Guide deals with healthy eating through a holistic approach, considering nutritional characteristics, with recommendations for the assertive choice of foods, clarifying the differentiation between fresh, minimally processed, processed, and ultra-processed foods. It discusses respect for social, cultural, and

environmental aspects innovatively. It provides guidance on food combinations (culture and regional foods), the act of eating and commensality (environment, time, and company), and possible obstacles to adhering to the recommendations [9].

According to the World Health Organization, most university students do not consume enough vegetables. Similar to our study, this review points to stress and alcohol use as variables that negatively influence dietary practices. On the other hand, both in our results and in the literature, physical exercise can positively influence dietary practices [18].

Our results have shown a negative association between dietary practices and time of exposure to screens, including cell phone use. A study carried out in Shanghai reinforces our data regarding the use of screens and their relationship with dietary practices, demonstrating that medical students considered dependent on cell phone use had a higher consumption of sugary drinks than those who were not cell phone-dependent [19]. In addition, eating meals while watching television can influence the body's satiety responses, reducing the perception of volume, frequency, and composition, and altering internal signs of food fullness [26,27].

The accentuated or extreme use of the Internet was also associated with poor dietary practices. College students who use the Internet are less likely to engage in behaviors that favor healthy eating [28].

Excessive alcohol consumption was inversely associated with adherence to dietary practices, as recommended by the Guide. Corroborating our evidence, a study conducted with first-year students at a university in the United States demonstrated that alcohol consumption influences their eating habits. This effect is enhanced in situations of excessive consumption of alcoholic beverages, leading to the consumption of food in greater quantities, rich in calories, and of low nutritional quality [29].

In contrast, physical exercise is associated with healthy dietary practices. This relationship can be justified by the motivation inherent in physical exercise practitioners for a healthy lifestyle, interfering with their food choices in searching for a more balanced diet [30]. Unfortunately, few studies in the literature in university students evaluated the association of dietary practices with the practice of physical exercise. There was a positive association between physical exercise and vegetable and water intake in other population groups and an improvement in the fractionation of meals in women [30,31].

University students who showed symptoms of stress had inadequate dietary practices. Penaforte *et al.* (2016) identified a higher frequency of snacks and fast food consumption in Brazilian students with higher levels of stress [32]. In conditions of social distancing during the Covid-19 pandemic, emotional eating and binge eating, being male, and not exercising at home were negative predictors of dietary practices [20]. Thus, the role of stress in worsening dietary practices has become increasingly evident in the literature. "Fast foods," classified by the Guide [9] as ultra-processed, are highly palatable that may justify their preference in an attempt to face the negative feelings inherent to stress, providing a reward system mediated by cortisol [33]. In a state of stress, dietary practices can be guided by biological aspects, such as palatability and/or hedonic and emotional motivations, resulting in inappropriate eating practices [33]. Among the participants in this study, evaluating health as poor was associated with poor dietary practices. Similar results were found by Zarini *et al.* (2014), showing a high prevalence of inappropriate eating practices in Americans who self-rated their health as poor [34].

In the university context, the academic routine is endowed with several situations that can trigger stress, such as extensive demands that the disciplines impose, responsibility for planning food, and household activities because most leave their familiar environment [35].

In addition, university admission is a moment of transition, a particularly stressful experience of adapting to the study environment, adopting a more exhaustive routine, and unfamiliar social interactions

that may interfere with food choices [35]. Finally, it contributes to the establishment of new eating habits. However, the students observed may not have changed their dietary practices because of their recent inclusion in academic life.

It is worth noting that studies evaluating dietary practices based on the new Guide are scarce [19,20], especially among university students, making it difficult to compare our findings with the literature. The present study had some limitations. First, its cross-sectional design did not allow the causality of the observed associations to be assessed. However, studies of this nature allow us to establish hypotheses that can be proven through longitudinal studies. Furthermore, it is important to consider that the practice of physical exercise was not assessed for the frequency and type of physical activity performed. Still, the question used to assess the practice of physical exercise was adopted by national surveys such as the VIGITEL and the National Survey of Health.

A strong point of the study is the use of the Gabe and Jaime dietary practices scale that has validity (content validity, apparent validity, and construct validity) and reliability in terms of internal consistency and reproducibility [11,19]. In addition, the participants were highly educated and likely to provide high-quality self-reported data.

CONCLUSION

It was observed that university students adopted regular dietary practices since their score based on the Guide's recommendations was not of a low average. The students' dietary practices were not bad, but neither did their score values reach close to the maximum score limit. In addition, those with lower scores also reported less physical exercise, greater exposure to screens, increased Internet use, excessive alcohol consumption, poor health self-assessment, and the presence of stress symptoms. Therefore, university students seem to adopt several behaviors negatively impacting health; Brazilian universities can target institutional policies and actions to address this.

CONTRIBUTORS

PS CÉSAR participated in data collection, consistency, and statistical analysis. She was responsible for writing the manuscript. W PAULA helped to prepare the original project, conducted data collection, and critically reviewed the manuscript. RD MENDONÇA assisted in the statistical analysis, interpretation of results, and critical review of the manuscript. AL MEIRELES prepared and coordinated the project, participated in the study design throughout the field process, followed the statistical analysis, interpretation of results, and the critical review of the manuscript. JF AMARAL monitored the statistical analysis, interpretation of the results, and critical review of the manuscript. All the authors approved the final version and were responsible for all aspects of the study.

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