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Association between food consumption and quality of life in university students: A multicenter study in Brazil

Associação entre consumo alimentar e qualidade de vida em universitários: um estudo multicêntrico no Brasil

Asociación entre el consumo de alimentos y la calidad de vida en estudiantes universitarios: un estudio multicéntrico en Brasil

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ABSTRACT

Objective: To evaluate the association between food consumption, according to the extent and purpose of food processing, and the quality of life of university students from different fields of knowledge.

Method: Multicenter cross-sectional study with students from eight Brazilian universities. Data were collected between October 2021 and February 2022 through a self-administered online questionnaire. Quality of life was assessed using the WHOQOL-BREF and categorized as high (> 25th percentile) and low (≤ 25th percentile) for each of the four domains. Food consumption assessed by questionnaire with categorical variables of food frequency, according to the Nova classification, whose scores ranged from 0 (best) to 48 (worst diet quality), divided into distribution quartiles. Univariate and multivariate logistic regression was performed.

Results: Of the 8,650 university students evaluated, the majority were female, aged between 18 and 20. Using multivariate logistic regression, students with poorer diet quality (students in the highest quartile of ultra-processed food consumption) were more likely to have poorer quality of life in all domains, especially in the Physical (OR=2.49; 95%CI=2.16-2.88) and Psychological (OR=2.40; 95%CI=2.08-2.76) domains compared to students with better diet quality.

Conclusion: University students with poor diet quality were more likely to have a lower quality of life in all four domains.

Descriptors: Quality of life; Ultra-processed foods; University students; Multicenter study; Eating.

RESUMO

Objetivo: Avaliar a associação entre consumo alimentar, segundo a extensão e finalidade do processamento de alimentos, e a qualidade de vida de estudantes universitários de diferentes áreas do conhecimento.

Métodos: Estudo transversal multicêntrico com estudantes de oito universidades brasileiras. Os dados foram coletados entre outubro de 2021 e fevereiro de 2022 por meio de questionário online autoaplicável. Qualidade de vida foi avaliada pelo *WHOQOL-bref* e categorizada em alta (> 25°percentil) e baixa (≤ 25°percential) para cada um dos quatro domínios. Consumo alimentar avaliado pelo questionário com variáveis categóricas de frequência alimentar, segundo a classificação Nova, cujos escores variaram de 0 (melhor) a 48 (pior qualidade da dieta), divididos em quartis de distribuição. Realizou-se regressão logística univariada e multivariada.

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Resultados: Dos 8.650 universitários avaliados, a maioria era do sexo feminino, com idade entre 18 e 20 anos. Na regressão logística multivariada os estudantes com pior qualidade da dieta tiveram maior chance a pior qualidade de vida em todos os domínios, principalmente nos domínios físico (OR=2,49; IC95%=2,16-2,88) e psicológico (OR=2,40; IC95%=2,08-2,76) em comparação com estudantes com melhor qualidade da dieta.
Conclusão: Os estudantes universitários com pior qualidade da dieta tiveram maior chance de apresentar baixa qualidade de vida nos quatro domínios.
Palavras-Chave: Qualidade de vida; Alimentos ultraprocessados; Estudantes universitários; Estudo multicêntrico; Comportamento Alimentar.

RESUMEN

Objetivo: Evaluar la relación entre el consumo alimentario, según el grado y la finalidad del procesamiento de los alimentos, y la calidad de vida de los estudiantes universitarios de diferentes áreas del conocimiento.
Método: Estudio transversal multicéntricocon estudiantes de ocho universidades brasileñas. Los datos se recopilaron entre octubre de 2021 y febrero de 2022 mediante uncuestionarioen línea autoaplicable. La calidad de vida se evaluó mediante el WHOQOL-BREF y se clasificóen alta (> 25° percentil) y baja (≤ 25° percentil) para cada uno de los cuatro dominios. Consumo alimentario evaluado mediante un cuestionario con variables categóricas de frecuencia alimentaria, según la clasificación Nova, cuyas puntuaciones variaban de 0 (mejor) a 48 (peor calidad de la dieta), divididas en cuartiles de distribución. Se realizó una regresión logística univariante y multivariante.
Resultados: De los 8.650 universitarios evaluados, la mayoría eran mujeres, con edades comprendidas entre los 18 y los 20 años. En la regresión logística multivariante, los estudiantes con peor calidad de dieta tuvieron más probabilidades de tener una peor calidad de vida en todos los ámbitos, especialmente en el físico (OR = 2,49; IC del 95 % = 2,16-2,88) y el psicológico (OR = 2,40; IC del 95 % = 2,08-2,76), en comparación con los estudiantes con mejor calidad de dieta.
Conclusión: Los estudiantes universitarios con peor calidad de dieta tenían más probabilidades de presentar una baja calidad de vida en los cuatro ámbitos.
Descriptores: Calidad de vida; Alimentos ultraprocessados; Estudiantes universitários; Estudio multicêntrico; Consumo Alimentario.

INTRODUCTION

The concept of quality of life (QoL) is defined by the World Health Organization (WHO) as *"an individual's perception of their position in life, in the context of the culture and value system in which they live and in relation to their goals, expectations, standards and concern"*[1].

Research has shown that university students tend to have lower Quality of Life (QoL) levels than the general population[2]. Factors such as the transition to higher education, family estrangement, competitiveness, changes in social life (e.g., circle of friends), sleeping and eating routines, contact with illness and death, relationships with professors, frustrations with the curriculum, contact with hostile social realities, insecurity about the professional future and the length of the course contribute to reduced levels of QoL in this population[3].

This topic has been widely investigated around the world, especially among university students in health programs (nursing, medicine, pharmacy, and dentistry). In addition to the factors mentioned above, health risk behaviors such as poor diet, increased consumption of alcohol and other substances, unsafe sexual practices, a sedentary lifestyle, and poor sleep quality can have a detrimental effect on students' QoL[4].

Social circles, new exposure, limited culinary skills, product characteristics, meals during classes, and tight schedules can make choosing ultra-processed foods (soft drinks, frozen foods, sweets, etc.) a more practical and accessible option[5,6]. In this regard, recent evidence has indicated a relationship between the consumption of ultra-processed foods (UPF) and decreased QoL, sleep, and other mental disorders such as depression and anxiety[7], weight gain[8], type 2 diabetes[9], cardiometabolic diseases[8], premature deaths[10], and deaths from all causes[8]. These risk factors are interconnected, impacting QoL and encompassing dimensions at the physical, economic, social, and mental levels that, in the long term, can impact health systems, loss of productivity, and disabilities[11].

Regarding the mechanisms linking UPF consumption to QoL, indirect pathways can be attributed to lifestyle, such as the association between high UPF consumption and excess weight [12], heart disease and cerebrovascular disease[13]. However, most of this research has been conducted with the general population.

Studies that associate food consumption - according to the extent and purpose of processing, as defined by the NOVA classification[14] (grouping foods into four categories according to the level of industrial processing to which they were subjected) - with QoL in university students from all areas of knowledge are still incipient and little explored.

Although there is robust literature linking inadequate nutrition and poorer QoL in health students[2,4,15,16] and

the general population[17], few studies encompass students from all fields of knowledge in a representative sample. Furthermore, studies using the NOVA classification to assess dietary quality in this group remain scarce. The hypothesis of this study is that inadequate dietary intake compromises the QoL of university students.

Based on the assumption that the assessment of QoL is an essential parameter for a broader understanding of an individual's health, as well as the incipience of studies involving the study of QoL in different areas of knowledge, the present study aimed to evaluate the association between food consumption, according to the extent and purpose of food processing, and the quality of life of university students from different areas of knowledge.

METHOD

This cross-sectional study used data from the multicenter study *"Symptoms of anxiety disorder and depression in university students in Minas Gerais: prevalence and associated factors,"* also known as the Anxiety and Depression in University Students Project (PADu-multicenter study). The eligible population for the PADu-multicenter study consisted of 118,828 students regularly enrolled in undergraduate programs offered by the eight participating universities during any academic term. Of these, 7.3% responded to the questionnaire, a response rate consistent with those reported in the literature for similar studies. The final sample of the PADu-multicenter study comprised 8,650 students.

The technique used was non-probability convenience sampling, and the sample size was not previously calculated. Sample power was calculated using the OpenEpi® tool (https://www.openepi.com/Menu/OE_Menu.htm), and the result proved adequate to identify significant differences and associations in the present study, ensuring the robustness and reliability of our findings (power above 90%).

The inclusion criteria were students aged 18 years or older, of both sexes, regularly enrolled in in-person and distance learning undergraduate courses, in the second semester of 2021, at the eight Federal Higher Education Institutions (IFES) in Minas Gerais, Brazil: Universidade Federal de Ouro Preto (UFOP), Universidade Federal de Minas Gerais (UFMG), Universidade Federal de Uberlândia (UFU), Universidade Federal de Juiz de Fora (UFJF), Universidade Federal de São João del-Rei (UFSJ), Universidade Federal de Lavras (UFLA), Universidade Federal dos Vales do Jequitinhonha e Mucuri (UFVJM) and Universidade Federal de Alfenas (UNIFAL-MG).

These eight educational institutions were chosen due to existing partnerships. Students with incomplete questionnaires, those away from academic activities, or on exchange programs during data collection[18] were excluded.

Data was collected from October 2021 to February 2022, lasting three months at each participating IFES. The research, along with the developed visual identity, was extensively publicized on the IFES and project websites and social media channels (@padufederais), as well as in mentoring programs, laboratories, research groups, centers, and academic directories.

Eligible students received an invitation text via institutional email (sent in two attempts, with duplicate responses excluded from the study) and a link to access the confidential self-completion form through the Google Forms® platform. Participation in the study began with accessing the questionnaire link and accepting the online verification of the Free and Informed Consent Form (FICF), submitted electronically and available for download.

All questionnaire items were detailed to address important points that could be misunderstood[18]. The structured, self-administered questionnaire was divided into thematic modules: sociodemographic and academic characteristics, lifestyle habits, and health conditions, including the QoL scale.

The dependent variable was QOL measured by the World Health Organization Quality of Life (WHOQOL-bref), which assessed participants' self-perception in the physical, psychological, environmental and social relationships domains involving QOL in the last two weeks (15 days). This instrument was validated for the Brazilian population with good psychometric indicators[19].

The WHOQOL-BREF scale consists of 26 questions, two of which address self-assessment of global quality of life and general health perception. The other 24 are divided into four domains: physical, psychological, environment, and social relationships. The physical domain consists of seven facets: 1) pain and discomfort, 2) energy and fatigue, 3) sleep and rest, 4) mobility, 5) activities of daily living, 6) dependence on medication

or treatments, and 7) work capacity. The psychological domain consists of six facets: 8) assessment of positive feelings; 9) thinking, learning, memory, and concentration; 10) self-esteem; 11) body image and appearance; 12) negative feelings; and 13) spirituality/religion/personal beliefs. The social relationships domain consists of three facets: 14) personal relationships; 15) social support; and 16) sexual activity. And the environment domain consists of 8 facets: 17) physical safety and protection 18) home environment, 19) financial resources, 20) health and social care: availability and quality, 21) opportunities to acquire new information and skills, 22) participation and opportunities for recreation/leisure, 23) physical environment (pollution/noise/traffic/climate) and 24) transportation[1]. The response options are: I) not at all, II) very little, III) medium, IV) very much and V) completely, with scores ranging from 1 to 5 points for each option[1].

It is worth noting that this study assessed participants' satisfaction in each domain, as well as their overall quality of life. The first two questions addressed perceptions of overall QoL and satisfaction with health, expressed on a 1-5 scale and interpreted based on the content of the responses. The sum of the items in each domain was converted to a scale of 0 to 100 points, according to the methodology proposed by the WHO Quality of Life Group, in which scores closer to 100 indicated a better perception of QoL in that domain.

It should also be noted that, in this study, the 25th percentile (p25) was used as the cut-off point. Scores less than or equal to p25 were considered low (low QoL), and scores greater than p25 were considered high (high QoL) for each domain, similar to previous studies[4,20].

Food consumption was measured as an independent variable according to the extent and purpose of processing, NOVA classification. For this purpose, a food frequency questionnaire (FFQ) based on the National Telephone Survey on Risk and Protective Factors for Chronic Diseases (VIGITEL) was used, consisting of 16 food items consumed in the last 30 days. VIGITEL is part of the Ministry of Health's Surveillance System for Risk Factors for Chronic Noncommunicable Diseases (NCDs) and describes the annual evolution of these indicators in Brazil[21] The frequency of food consumption was based on five response options: i) never or almost never, ii) 1-2 days a week, iii) 3-4 days a week, iv) 5-6 days a week, and v) every day, including Saturdays and Sundays.

For food consumption, according to the extent and purpose of processing, the score used by Menezes-Júnior et al.[22] was used. From the foods listed in the FFQ, two categories were created: i) natural/minimally processed foods and ii) ultra-processed foods, classified according to the Food Guide for the Brazilian Population[23] and the NOVA classification[14].

The natural/minimally processed foods group included the following: beans, nuts, legumes, vegetables, red meat, chicken, and fruits. The UPF group included ultra-processed beverages (soft drinks or artificial juice, chocolate milk, or flavored yogurt), cookies/snacks (processed cookies and packaged snacks), instant noodles or soups, frozen/processed products (frozen products and processed meats), processed breads, and sweets.

To assess the co-occurrence of consumption of the two food groups, a score ranging from zero to four points was calculated based on the type of food consumed and the weekly frequency of consumption. The minimum score (zero) was assigned to participants who consumed natural/minimally processed foods daily and who rarely or never consumed UPF. The maximum score (four points) was assigned to participants who rarely or never consumed natural or minimally processed foods and consumed UPF daily. The total score was calculated by adding the food items, ranging from 0 (best diet quality) to 48 points (worst diet quality).

To analyze associations with the variables, distribution quartiles were classified. The first quartile contained the lowest values, characterized by high consumption of natural /minimally processed foods and low consumption of UPF (better diet quality). The fourth quartile contained the highest values, characterized by high UPF consumption and low consumption of natural/minimally processed foods.

The covariates assessed included sociodemographic variables such as sex (male and female), age (18-20, 21-22, 23-25, or ≥26 years), housing (alone, with a family, or in a shared apartment), skin color (white and Asian, indigenous, black, mixed race, or other), marital status (single and married/stable relationship/widowed/divorced), and family income (up to 3 minimum wages, 4 to 5 minimum wages, or >5 minimum wages). The value applied in this study was the minimum wage

in effect in 2021 (R$1.045.00). Regarding academic variables, undergraduate courses were categorized as life sciences, exact sciences, and social, human, and applied sciences. The anthropometric profile used the body mass index (BMI), calculated from self-reported weight and height, and categorized based on the values recommended by the WHO for adults as underweight, eutrophic and overweight[24].

Statistical analyses were performed using Stata® software, version 15.1, with a significance level of 5%. Categorical variables were presented with relative frequencies and 95% confidence intervals (95% CI), and continuous variables were presented with mean and standard deviation (SD) to describe the sample. Pearson's chi-square test was used for comparative analyses.

A theoretical causality model based on a Directed Acyclic Graph (DAG) was created with the explanatory variable (food consumption), the outcome (QoL) and the confounding variables, using the online software Dagity®, version 3.2[25] (Figure 1).

Analyses were performed in Stata® 15.1. Univariate and multivariate binary logistic regression were used, adjusted for sex, age, skin color, residence, marital status and family income, as defined by the DAG.

The research was approved by the Research Ethics Committee (CEP) of Universidade Federal de Ouro Preto (CAAE: 43027421.3.1001.5150) and by all participating CEPs (UFMG: 43027421.3.2004.5149; UFU: 43027421.3.2001.5152; UFJF: 43027421.3.2003.5147; UFSJ: 43027421.3.2002.5545; UFLA: 43027421.3.2006.5148; UFVJM: 43027421.3.2009.5108; and UNIFAL-MG: 43027421.3.2008.5142).

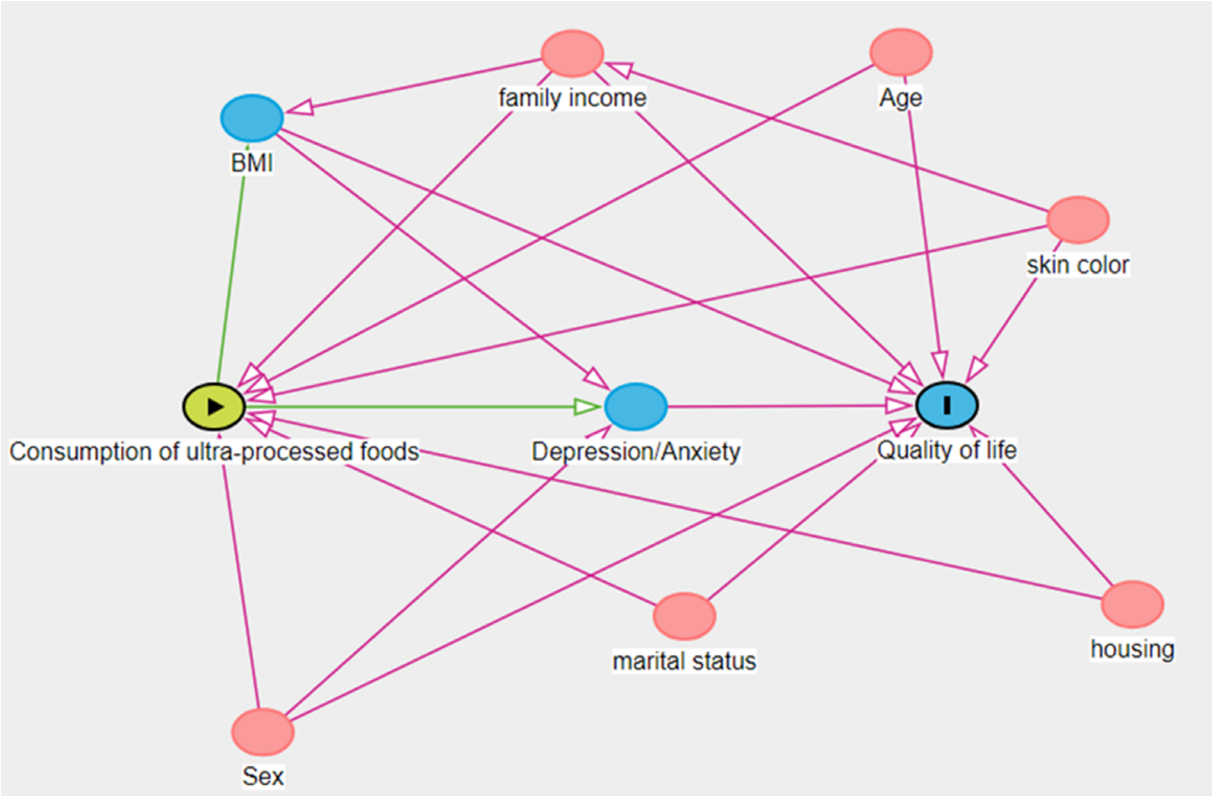

Figure 1 – Directed Acyclic Graph (DAG) on the food consumption score according to the level of food processing and quality of life in university students at Federal Higher Education Institutions, Minas Gerais, MG, 2022.

Source: Adapted by the authors of the online software Dagity

Legend: The exposure variable is the green one with the ">" symbol in the circle; the blue one with the letter "I" inside the circle is the outcome variable; the red ones are antecedents of the exposure and outcome variables; the blue ones are antecedents of the outcome variable. Green arrows are causal paths between the explanatory variables and outcome or antecedent variables; red arrows are biased paths.

RESULTS

Of the 8,650 students evaluated, most were women (65.7%), aged 18- 22 years (54.2%), had a family income of up to three minimum wages (49.8%), and were studying exact sciences (39.5%). Regarding health conditions, 55.15% of the participants were classified as having normal weight, 9.18% as underweight, and 35.66% as overweight. Self-reported medical diagnoses of anxiety and depression were mentioned by 56.72% and 31.11% of the participants, respectively. Regarding the academic variable, 39.49% were enrolled in undergraduate courses in exact sciences (Table 1).

The average food consumption score was 19.88 (SD=5.54), with a minimum value of 0 and a maximum of 48. The domains of the WHOQOL-bref scale with the worst scores were the psychological (49.64±19.84) and the physical (57.95±18.12) domains. (Table 2).

Table 3 presents the prevalence of low QoL in the domains of the WHOQOL-bref scale, according to the quartiles of the distribution of food consumption scores. Students in the fourth quartile (Q4) had high consumption of UPF and low consumption of natural/minimally processed foods (worse diet quality), with a higher prevalence of low QoL in all domains. Students in the first quartile (Q1) had the lowest frequency of UPF consumption and the highest consumption of natural/minimally processed foods (better diet quality).

Figure 2 shows the association between the domains of the QoL scale and diet quality according to food consumption scores. In the adjusted multivariate analysis, university students in Q4 were 149% more likely to have low QoL in the physical domain (OR=2.49; 95% CI=2.16-2.88), 140% more likely to have low QoL in the psychological domain (OR=2.40; 95% CI=2.08-2.76), 59% more likely to have low QoL in the social relationships domain (OR=1.59; 95% CI=1.34-1.89) and 95% more likely to have low QoL in the environment domain (OR=1.95; 95% CI=1.66-2.30).

DISCUSSION

This study revealed that university students with poorer dietary quality were more likely to have a low quality of life across all domains of the WHOQOL-bref scale. These findings reinforce the hypothesis that the consumption of ultra-processed foods compromises students' overall well-being. According to database searches, this study is the first to assess the association between food consumption, considering the extent and purpose of processing, and QoL in university students at federal higher education institutions across all fields.

The main results showed that higher frequency of UPF consumption and lower consumption of natural/minimally processed foods were associated with lower QoL across all domains. Overall, 24.32% (95% CI=22.51-26.22) of university students had poorer diet quality. Sex, age, marital status, residence, race, and family income were factors associated with a higher prevalence of low QoL across all domains.

Previous research with similar populations has also indicated a negative impact of inadequate dietary intake on QoL[4,15]. However, many studies focused exclusively on health sciences students and did not consider students from different fields of knowledge[2,16]. Assessing the QoL of university students allows for a better understanding of their overall health status and can therefore guide university administrators with specific, context-sensitive, and appropriate interventions to promote QoL.

The university students' responses regarding their overall perception of quality of life and general health had mean values of 3.66 ± 0.9 and 3.16 ± 1.3, respectively (minimum 1 and maximum 5). These findings are similar to those reported in the study with university students in Spain[15]. This study revealed that the psychological health domain obtained the lowest mean score[15], while the environment domain was the best rated.

Although the number of published studies on college students' quality of life does not clearly indicate which domain scores are higher, a consistent pattern is observed: the psychological domain tends to receive lower scores[15,16]. This result contrasts with other studies, in which the physical health domain often achieved the highest scores[14–16]. In some studies, higher scores in the environmental domain were directly related to academic satisfaction and better diet quality.

It is possible that the divergences presented in the literature regarding the quality of life domain are related to contextual, cultural, and socioeconomic differences between various countries, communities, and cultures. In particular, we must recognize that there are significant differences in the expectations

Table 1 – Analysis of sociodemographic , academic and health condition variables with quality of life among students at Federal Higher Education Institutions in Minas Gerais, Minas Gerais, 2022 (n=8650).

	Total N (%)	Physical N (%)	p-value[b]	Psychological N (%)	p-value [b]	Social relations N (%)	Value -p [b]	Environment N (%)	p-value [b]
Sociodemographic Characteristics									
Age			**<0.001**		0.191		**<0.001**	423(20.96)	**<0.001**
18-20 years old	2570 (29.5)	628 (24.30)		771(28.40)		394(27.21)		465(23.04)	
21-22 years old	2136 (24.68)	643 (24.88)		662(24.38)		317(21.89)		476(23.59)	
23 to 25 years old	2006 (23.12)	654 (25.31)		621(22.87)		329(22.72)		654(32.41)	
>= 26 years old	1964 (22.60)	659 (25.50)				408(28.18)			
Housing			**0.009**		0.739		**0.016**		0.127
Alone or in a guesthouse, inn, hotel and others	715 (8.24)	238 (9.21)		229(8.43)		144(9.94)		174(8.62)	
Family	6626 (76.37)	1919(74.26)		2079(76.57)		1101(76.06)		1508(74.73)	
Accommodation or apartment/in a house with other people	1335 (15.39)	427 (16.52)		407(14.99)		203(14.02)		336(16.65)	
Skin Color			**0.027**		**0.023**		**0.001**		**<0.001**
White	4717 (55.46)	1349(53.62)		1423(53.64)		729(51.59)		834(42.34)	
Yellow, indigenous, black, brown or other	3786 (44.54)	1167(46.38)		1230(46.36)		684(48.41)		1136(57.66)	

Table 1 – Cont.

	Total N (%)	Physical N (%)	p-value[b]	Psychological N (%)	p-value [b]	Social relations N (%)	Value -p [b]	Environment N (%)	p-value [b]
Sex			**<0.001**		**<0.001**		**0.001**		**0.044**
Female	5678 (65.71)	1849(72.09)		1879(69.67)		888(61.88)		1353(67.58)	
Male	2963 (34.29)	716 (27.91)		818(30.33)		547(38.12)		649(32.42)	
Marital status			0.145		**0.023**		0.147		**0.011**
Single	7801 (90.63)	2302(89.92)		2500(92.90)		1316(91.64)		1777(89.16)	
Married/Stable Union, Widowed, Divorced (others)	807 (9.38)	258 (10.08)		191(7.10)		120(8.36)		216(10.84)	
Family Income			**<0.001**		**<0.001**		**<0.001**		0.127
up to 3 minimum wages	4044 (49.83)	1403(58.19)		1444(56.99)		772(56.81)		1462(76.30)	
04 to 05 minimum wages	1881 (23.18)	521 (21.61)		557(21.98)		288(21.19)		302(15.76)	
>5 minimum wages	2190 (26.99)	487 (20.20)		533(21.03)		299(22.00)		152(7.93)	
Academic Characteristics									
Course according to the area of knowledge			**<0.001**		**<0.001**		**<0.001**		**<0.001**
Exact Sciences	3427 (39.50)	957 (37.04)		1055(38.86)		585(40.40)		785(38.90)	
Life Sciences	2734 (31.51)	735 (28.44)		758 (28.44)		396(27.35)		523(25.92)	

Table 1 – Cont.

	Total N (%)	Physical N (%)	p-value[b]	Psychological N (%)	p-value [b]	Social relations N (%)	Value -p [b]	Environment N (%)	p-value [b]
Human, Social and Applied Sciences	2515 (28.99)	892 (34.52)		902 (33.22)		467(32.25)		710(35.18)	
Health Conditions									
Body Mass Index-BMI			**<0.001**		**<0.001**		**<0.001**		**<0.001**
Low weight	789 (9.19)	241(9.44)		248 (9.25)		129(9.01)		174(8.72)	
Eutrophic	4734 (55.15)	1231(48.20)		1271 (47.43)		711(49.69)		958(48.02)	
Overweight	3061 (35.66)	1082(42.36)		1161 (43.32)		591(41.30)		863(4326)	

Source: Survey data, 2022.
[b]Chi-Square Test
[a]Quality of life domains categorized as low quality of life (<=25th percentile)
N (%): absolute number (percentage)
1 minimum wage for the year 2021 in Brazil is equivalent to R$1,045.00

Table 2 – Score of university students from Federal Higher Education Institutions on the WHOQOL-bref scale and the frequency distribution of food consumption scores, Minas Gerais, 2022 (n=8650).

	mean ± SD	High QoL[d]	Low QoL[d]
		% (95% CI)	% (95% CI)
FFQ			
Food consumption[a] (fresh foods and UPF)	19.88±5.54		
Quality of Life[b]			
Self-perception of quality of life	3.66±0.9		
Health self-assessment	3.16±1.03		
Quality of Life Domainsc			
Physical	57.95±18.12	70.23 (69.05-71.37)	29.77 (28.02-31.59)
Psychological	49.64±19.84	68.72 (67.52-69.90)	31.28 (29.52-33.05)
Social Relations	53.02±23.39	83.32 (82.27-84.01)	16.68 (14.81-1.72)
Environment	58.97±18.79	76.75 (75.71-77.75)	23.25 (21.44-25.18)

Source: Research Data, 2022.
[a]score: 0-48; [b]score: 1-5; [c] score ranges from 0 to 100 points; [d]classified according to the 25th percentile: <= Low QoL and > High QoL; UPF: ultra-processed foods; SD: standard deviation; FFQ: Food Frequency Questionnaire; % (95% CI): percentage (95% Confidence Interval).

Table 3 – Domains of the Quality of Life scale according to food consumption in quartiles among students at Federal Higher Education Institutions, Minas Gerais, 2022 (n=8650).

Variables	Quality of Life Domains[a b]								
	Total	Physical		Psychological		Social Relations		Environment	
	N (%)	N (%)	p-value	N(%)	p-value	N(%)	p-value	N(%)	p-value
Food Consumption (fresh + UPF)			**<0.001**		**<0.001**		**<0.001**		**<0.001**
Quartile 1 (0-16)	2295(26.46)	467(18.10)		509(18.77)		317(21.90)		374(18.60)	
Quartile 2 (17-20)	2478(28.57)	641(24.74)		698(25.72)		393(27.10)		538(26.60)	
Quartile 3 (21-23)	1794(20.65)	593(22.95)		600(22.06)		313(21.55)		469(23.22)	
Quartile 4 (24-48)	2109(24.32)	883(34.21)		908(33.44)		425(29.45)		637(31.58)	

Source: Research Data, 2022.
[a]Pearson's Chi-Square Test; [b]Quality of life domains categorized as low QoL (<=25th percentile); UPF: ultra-processed foods.

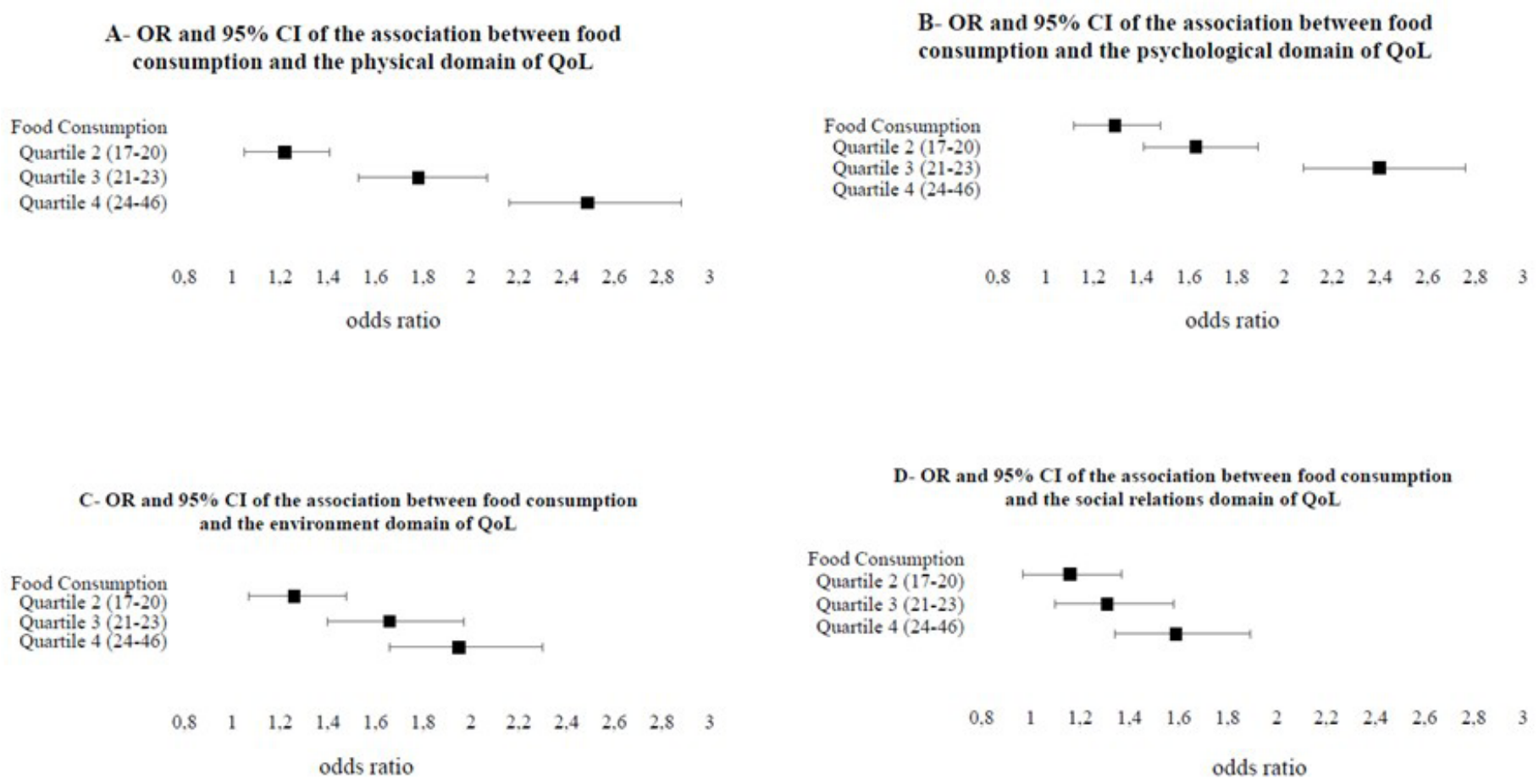

Figure 2 – Odds ratio (OR) and 95% Confidence Interval (95%CI) for the association between food consumption according to the NOVA classification and the Low Quality of Life Domains of the WHOQOL-bref scale among students at Federal Higher Education Institutions, Minas Gerais, 2022 (n=8650).

Source: Survey Data, 2022

OR: odds ratio; 95%CI: 95% confidence interval; QoL quality of life

and customs of university students from one context to another, and that these differences undoubtedly influence quality of life[15].

When comparing our overall averages in the four domains with those of other countries, we found that they are lower than those of Spain [15] (23.84%), Greece (20.76%) and the United States[16] (22.43%). They are also lower (17.09%) compared to a study carried out with Brazilian medical students[3].

Among Spanish university students, only 17.7% were considered to have a healthy diet, and 76.6% had a diet that needed to be modified[15]. Students at a public university in Ceará obtained a daily calorie intake of 27.2% of UPF[16], and in another study carried out in seven higher education institutions in Fortaleza (Ceará), with nutrition students, UPF represented 16.7% (SD: 10.4%) of the calorie intake[26].

The results of an Italian, Spanish and Greek study revealed that QoL worsens in physically inactive people and in those with multiple chronic non-communicable diseases[27]. The relationship between high UPF consumption and obesity/chronic non-communicable diseases is well described in the scientific literature[17,27].

A review article summarizing recent research on the implications of UPF consumption for metabolic health, classified according to the NOVA system, highlighted that associations between genetic and environmental factors influence food consumption and physical activity-related behaviors. Furthermore, the causal and likely mechanisms underlying UPF consumption and metabolic health have not yet been elucidated. However, studies have demonstrated a positive propensity for adult BMI (indicators of abdominal adiposity and obesity), hypertension, type 2 diabetes, cardiovascular disease, and chronic systemic inflammation[28].

A study of Chilean university students with better results in terms of healthy habits (daily breakfast, lunch, and dinner and home-cooked meals at least three times a week) revealed a lower risk of low QoL in all domains. On the other hand, the consumption of fried foods and fast food were risk factors for low QoL in the physical health domains, and snacks and sweets were risk factors for the physical health and environmental domains[2]. However, at the time of data collection, the Chilean Dietary Guidelines were not categorized according to the NOVA classification or the extent and purpose of processing.

These findings highlight the urgent need for institutional policies that promote healthy food environments at universities, including cafeteria subsidies, educational campaigns, and mental and nutritional health promotion initiatives. The shift in food consumption, with accelerated consumption of UPF, is linked to unhealthy nutritional profiles and diet-related NCDs[29], and is a leading cause of premature death in Brazil[10]. The positive association between UPF consumption and poor QoL may increase understanding of adverse health effects.

This study has some limitations, such as its cross-sectional design, which prevented the establishment of a temporal relationship between food consumption and QoL. The use of a self-administered questionnaire depended on the dedication and authenticity of the respondents. Another limitation is the non-probabilistic sample, in which all students were invited to participate, thus highlighting the possibility of response bias. The stratification of the classifications adopted in this study may differ from those adopted by other authors in national and international studies.

Furthermore, it is important to consider that different measurement tools and cutoff points were used to assess QoL and food consumption. Although not a limitation of the study, the scarcity of studies related to QoL and food consumption, according to the extent and purpose of processing and the NOVA classification, made it difficult to discuss this study. Despite the aforementioned limitations, the study has strengths, as it was conducted with a large sample of university students from eight public higher education institutions.

The strengths of the study include the use of validated instruments, the multicenter sample and the use of the NOVA classification, supporting the validity of the results.

CONCLUSION

It is concluded that university students with poorer diet quality (high consumption of ultra-processed foods, concomitantly with lower consumption of natural/minimally processed foods) had greater chances of poor quality of life in all four domains.

These findings may contribute to further research assessing the causality between food consumption—depending on the degree of processing—and QoL. University policies that ensure a healthy environment, with actions that value the development of physical and psychological capacities and social environments, and the overall QoL of the academic community as a whole are needed. Since such circumstances can result in reduced academic performance and social interactions, as well as a significant worsening of mental health and an increased risk of suicide, the present study aims to contribute to the field of educational administration by developing strategies for effective monitoring and improving students' quality of life, especially in health courses, which are widely recognized in the literature for their low QoL levels.

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