Original article

Vegetarianism among first-year students at a public university in Southern Brazil, 2018*

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Abstract

Objective: To identify vegetarianism prevalence and associated factors among students at a public university in Southern Brazil. **Methods:** This was a cross-sectional study carried out in 2017-2018 with first-year university students. A questionnaire was administered to assess diet type (omnivorous or vegetarian). Logistic regression was used to estimate odds ratios (OR) and 95% confidence intervals (95%CI). **Results:** Of 2,706 eligible individuals, 1,841 formed part of the sample. The predominant type of diet was omnivorous (93.6%), followed by lacto-ovo vegetarian (5.4%), strict vegetarian (0.7%), ovo vegetarian (0.2%) and lacto vegetarian (0.1%). Females (OR=0.58 – 95%CI 0.38;0.89), students reporting harmful use of alcohol (OR=2.02 – 95%CI 1.34;3.04) and students enrolled in Linguistics, Modern Languages and Arts courses – compared to those enrolled in Applied Social Sciences and Humanities courses (OR=2.59 – 95%CI 1.42;4.71) – were more likely to be vegetarians. **Conclusion:** Vegetarian diet was associated with the female sex, alcohol use, and taking linguistics, modern language and arts courses.

Keywords: Feeding Behavior; Diet, Vegetarian; Vegetarians; Students; Universities; Cross-Sectional Studies.

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Introduction

At the start of university life, changes in routine and important discoveries can be seen, such as reduction in parental supervision, greater personal independence, new friendship ties. These events tend to lead to consolidation of personal principles, values and personal choices, including behaviors related to physical and mental health.[1-3] These behaviors include diet. Strengthening or changes in ethical, environmental, esthetic and psychological concerns[1,2] may be reflected in the adoption of dietary patterns, with inclusion or otherwise of certain food groups, such as omnivorous e vegetarian patterns, whereby the latter are increasingly present in choice of diet.

> *An omnivorous diet is more common, adherence to vegetarian diets, characterized by restriction or total exclusion of food of animal origin, is a relatively new and increasingly common practice in these countries.*

An omnivorous diet, characterized by consumption of food of animal and vegetable origin, is the predominant pattern in the majority of Western countries.[4] Even though an omnivorous diet is more common, adherence to vegetarian diets, characterized by restriction or total exclusion of food of animal origin, is a relatively new and increasingly common practice in these countries.[5,6] Vegetarian diet has a variety of subclassifications, the more well-known of which include the lacto-ovo vegetarian diet, which only restricts meat consumption, and the strict vegetarian diet, which restricts consumption of any animal product.[7]

According to the literature, in high-income Western countries, prevalence of vegetarians varied between 0.79% in Italy,[8] in 2005, and 45.9% in Belgium,[9] in 2012. In the Latin American and Caribbean region, 6% vegetarian prevalence was found in 2017; however, the study that provided this finding only assessed an adolescent population.[10] Data collected by the Brazilian Institute of Public Opinion and Statistics (IBOPE)[11] in 2018, in relation to individuals aged 16 or over, demonstrated 9% vegetarian prevalence among males and 7% among females; in Southern Brazil, as well as in middle-sized municipalities with populations between 50,000 and 500,000 inhabitants, vegetarian prevalence was 6%.[11]

Despite studies showing that vegetarians tend to have a healthier lifestyle, with predominance of fruit, greens and vegetables and reduced consumption of ultra-processed food, practicing physical activities and not consuming alcohol and tobacco,[12,13] many of them were conducted in countries with different dietary cultures and a higher socioeconomic level, when compared to Brazil. As such, it is not possible to go hand in hand with the conclusions of those studies without measuring the adequacy of different dietary patterns in relation to healthy diet markers typical of the Brazilian population's diet.[14,15] Unhealthy eating is one of the main risk factors for chronic non-communicable diseases (NCDs) among university students, and may directly influence cardiovascular problems and high blood glucose levels, when consumption of fat, salt and sugar is excessive, in addition to reduced academic performance and indisposition to carry out activities when micronutrient consumption is deficient.[16,17]

The objective of this study was to analyze vegetarianism prevalence and associated factors among students at a public university in Southern Brazil.

Methods

This was a university-based cross-sectional study conducted with a population of students starting degree courses at the Federal University of Pelotas (UFPel), in the form of a census. UFPel is located in the south of Rio Grande do Sul state and was created in 1969. It has 96 on-campus degree courses and some 3,000 new students start there every semester. In 2018, the university had 16,461 undergraduate students (http://portal.ufpel.edu.br/historico/).

This study is part of a larger study called SEU-UFPel (University Student Health – UFPel), conducted by the UFPel Epidemiology Postgraduate Program. Carried out in the form of a "research consortium", the study enables all Master's Degree students to take part and obtain data for their respective dissertations.[18]

Free OpenEpi software (available at www.openepi.com) was used to calculate the sample size, i.e. to determine the number of students needed to identify diet type prevalence, as well as statistical power needed to study possible associations between the independent variables and the outcomes. Based on a Brazilian Vegetarian Society publication, vegetarian prevalence was estimated as being 10%,[2] with a one point margin

of error and a 95% confidence interval. A further 10% was added to compensate for any losses and refusals. The necessary sample size was calculated to be 1,598 students. In the analyses of association, the power of some variables was less than 80%, such as age, sex, alcoholic beverage consumption and markers of unhealthy food consumption.

Eligible students were considered to be those starting on-campus courses at UFPel in the first semester of 2017, aged 18 years old or over. The exclusion criteria were visual or hearing impairment or other disability preventing individuals from answering the questionnaire without help.

A self-administered digital questionnaire was built using the REDCap system (Research Electronic Data Capture), which enables data to be captured electronically and then a database to be built.[19] Data collection took place between November 2017 and July 2018, when the students were in the second or third semesters, using tablets in classrooms as and when teachers allowed.

In order to collect data related to the study outcome, questions were formulated based on the questionnaire used in the study entitled European Prospective Investigation into Cancer and Nutrition (EPIC) – Oxford,[20] conducted between 1992 and 2000 in 17 European countries. In this way, respondents were characterized according to their type of diet, by asking three questions:

1) *Do you eat any kind of meat or fish (including bacon, chicken, quail, sausages)?*
2) *Do you consume any kind of milk product (including cow's milk, lactose-free milk of animal origin, cheese, butter, yoghurt, cream cheese)?*
3) *Do you eat eggs in any way (including eggs in cakes and other cooked food)?*

Participants were considered to be omnivorous if they answered 'Yes' to the first or all the questions; lacto-ovo vegetarians, if they answered 'No' to question 1 and 'Yes' to questions 2 and 3; lacto vegetarians if they answered 'No' to questions 1 and 3 and 'Yes' to question 2; ovo vegetarians, if they answered 'No' to questions 1 and 2 and 'Yes' to question 3; and strict vegetarians, if they answered 'No' to all 3 questions. For the purpose of analysis, the respondents were divided into two groups: (i) omnivorous; and (ii) vegetarians/strict vegetarians, whereby all vegetarian subclassifications were included in the latter group.

The independent variables were:

a) sex (male; female);
b) age (in years: 18 and 19; 20-22; 23 or over);
c) race/skin color (white; black/brown/other);
d) socioeconomic level (classification used by the Brazilian Association of Survey Companies [ABEP]: A, B, C, D and E, which in this study were grouped into three categories, A/B, C and D/E);[21]
e) lives with whom (father, mother, siblings, partner, alone; with friends);
f) course area of knowledge (Exact and Earth/Agrarian Sciences and Engineering; Health and Biological Sciences; Applied Social Sciences and Humanities; Linguistics, Modern Languages and Art);
g) alcoholic beverage consumption, measured using the Alcohol Use Disorders Identification Test (AUDIT), where prejudicial alcohol use was considered to be $\geq$8 points;[22]
h) tobacco smoking (smoker/former smoker; non-smoker);
i) physical activity during leisure, measured using the International Physical Activity Questionnaire (IPAQ), where being active was considered to be $\geq$150min of physical activity a week, and not being active was $<$150min/week;[23] and
j) body mass index (BMI), calculated by taking weight (self-reported in kilograms [kg]) divided by height (self-reported in meters, expressed in square meters [m^2]), categorized into underweight (below 18.5kg/m^2), normal weight (between 18.5 and 24.9kg/m^2), overweight (between 25.0 and 29.9kg/m^2) and obese (equal to or greater than 30kg/m^2).[24]

In order to assess indicators of diet quality, we used the healthy and unhealthy food consumption markers recommended by the Food and Nutrition Surveillance System (SISVAN).[15] Respondents were asked about consumption, on the day before the questionnaire was administered, of food items considered to be healthy diet markers (beans; fresh fruit; greens and/or vegetables) and food items considered to be unhealthy markers (hamburgers and/or charcuterie; sweetened drinks; instant noodles; filled sweet biscuits, candies or desserts).

The statistical analyses were performed using Stata 12.1® (StataCorp., College Station, Texas, USA). The descriptive analysis included calculations of absolute and relative frequencies of the exposure variables and outcome. Logistic regression analysis was used to estimate crude and adjusted odds rates (OR), and their respective 95% confidence intervals (95%CI). The adjusted analysis was performed according to hierarchical

levels: the demographic and socioeconomic (sex; age; race/skin color; economic class) variables were included on level 1; while level 2 included behavioral variables and variables related to the students' courses (lives with whom; course area of knowledge; prejudicial alcohol use; current tobacco smoking; physical activity during leisure; BMI). The variables were adjusted between each other on each level and on the next level up. Variables having $p \leq 0.20$ were kept in the model, to control for confounding factors, and variables having $p < 0.05$ were considered to be associated with the outcome. Two statistical tests were used, namely Pearson's chi-square test and the Wald test. Crude analyses were performed using the chi-square test when the objective was to check for association between diet types and each healthy and unhealthy food marker. A 5% significance level was used. Akaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC) were calculated as measures to assess final model goodness-of-fit. The variance inflation factor (VIF) was estimated to assess collinearity.

The study project was approved by the Federal University of Pelotas Faculty of Medicine Research Ethics Committee (CEP/FAMED/UFPel): Protocol No. 79250317.0.0000.5317, dated October 23rd 2017. All participants were informed beforehand about the study and only answered the questionnaire after signing a Free and Informed Consent form. Confidentiality of participant information was guaranteed.

Results

In all, 2,706 university students were considered to be eligible and were invited to take part in the study. After successive attempts to make contact were made, 792 losses and 49 refusals were identified, accounting for 31.1% of the study's target population. The proportion of losses and refusals was high, and greater among students taking Exact and Earth/Agrarian Sciences and Engineering courses (38.3%), male students (52.8%) and those whose age was equal to or greater than 23 years (46.7%). As such, the sample size was defined as being 1,865 students. However, 24 of them did not provide complete information for the study variables and were excluded from the analyses, resulting in a final sample of 1,841 university students.

Table 1 shows the overall description of the sample. The greater part of the participants were female (54,8%), self-reported being of white race/skin color (71.9%), belonged to economic classes A or B (61.0%), reported living with family members (61.5%) and were between 18 and 19 years old (41.2%). A total of 34.4% were enrolled in Applied Social Sciences and Humanities courses. With regard to the variables concerning health-related behavior, the majority of participants did not report prejudicial alcohol use (66.8%), reported not smoking or being a former smoker (89.0%), were physically active (55.2%) and had normal weight (63.5%). The omnivorous diet type was predominant (93.6%), followed by lacto-ovo vegetarian diet (5.4%), strict vegetarian diet (0.7%), ovo vegetarian diet (0.2%) and lacto vegetarian diet (0.1%), accounting for 6.4% of what the study considered to be a 'vegetarian diet', i.e. the sum of the last four subclassifications mentioned.

In Table 2, according to the adjusted logistic regression analysis, it can be seen that males had 42.0% less odds of being vegetarians (OR=0.58 – 95%CI 0.38;0.89; p=0.013), compared to females. Students taking Linguistics, Modern Languages and Art courses had 2.59 (95%CI 1.42;4.71) more odds of being vegetarian, compared to those taking Applied Social Sciences and Humanities courses (p=0.011). It is noteworthy that university students who reported prejudicial alcohol use were almost twice as likely (OR=2.02 – 95%CI 1.34;3.04) to adopt a vegetarian diet, compared to those who did not report prejudicial alcohol use (p=0.001).

With regard to intake of food types considered to be healthy diet markers on the day before the interview, shown in Table 3, difference was found between diet types, regarding consumption of beans (p=0.012), fresh fruit (p=0.016) and greens and/or vegetables (p<0.001). Consumption prevalence of these food items was found to be greater among vegetarians, namely 68.4%, 66.7% and 82.1% for consumption of beans, fresh fruit and greens and/or vegetables, respectively, compared to the corresponding 56.2%, 44.9% and 66.8% prevalence rates among omnivorous respondents. With regard to food items considered to be unhealthy diet markers, there were differences in relation to consumption of hamburgers and/or charcuterie (p<0.001) and sweetened drinks (p<0.001), whereby consumption was higher among those who had a omnivorous diet, for whom frequency was 37.3% and 64.5%, respectively, compared to those who had a vegetarian diet, for whom frequency was 5.9% and 47.9%, respectively.

Table 1 – Description of the sample of new university students (n=1,841) according to demographic, socioeconomic, course area, lifestyle and health habit variables, Pelotas, Rio Grande do Sul, 2018

Variable	n (%)
Age (complete years)	
18-19	754 (41.2)
20-22	599 (32.8)
≥23	475 (26.0)
Sex	
Female	1,009 (54.8)
Male	832 (45.2)
Race/skin color	
White	1,324 (71.9)
Black/brown/other	517 (28.1)
Economic class (ABEP)[a]	
A/B	1,124 (61.0)
C	640 (34.8)
D/E	77 (4.2)
Lives with whom	
With family members (father, mother, siblings, partner)	1,113 (61.5)
Alone	232 (12.6)
With friends	476 (25.9)
Course area of knowledge	
Exact and Earth/Agrarian Sciences and Engineering	536 (29.1)
Health and Biological Sciences	328 (17.8)
Applied Social Sciences and Humanities	633 (34.4)
Linguistics, Modern Languages and Art	344 (18.7)
Prejudicial alcohol use[b] (AUDIT≥8)[c]	
No	1,128 (66.8)
Yes	561 (33.2)
Current tobacco smoking	
Non-smoker/former smoker	1,639 (89.0)
Smoker	202 (11.0)
Physical activity during leisure – IPAQ[d]	
Active	1,016 (55.2)
Not active	824 (44.8)
Body mass index (BMI)[e]	
Underweight	93 (5.1)
Normal weight	1,160 (63.5)
Overweight	396 (21.7)
Obese	178 (9.7)
Diet patterns	
Omnivorous	1,723 (93.6)
Strict vegetarian	14 (0.7)
Lacto-ovo vegetarian	99 (5.4)
Lacto vegetarian	2 (0.1)
Ovo vegetarian	3 (0.2)

a) ABEP: Brazilian Association of Survey Companies.

b) Variable with the largest number of missing data: prejudicial alcohol use (n=133).

c) AUDIT: Alcohol Use Disorders Identification Test.

d) IPAQ: International Physical Activity Questionnaire.

e) Body mass index (BMI): kg/m^2.

Table 2 – Crude and adjusted analysis of omnivorous and vegetarian university students (n=1,841) according to demographic, socioeconomic, course area, lifestyle and health habit variables, Pelotas, Rio Grande do Sul, 2018

L[a]	Variable	OR[b] (crude)	95%CI[c]	p-value[d]	OR[b] (adjusted)	95%CI[c]	p-value[e]
	Age (complete years)			0.127			0.099
1	18-19	1.00			1.00		
	20-22	1.55	1.01;2.04		1.67	1.05;2.68	
	≥23	1.16	0.71;1.90		1.30	0.75;2.25	
	Sex			0.005			0.013
1	Female	1.00			1.00		
	Male	0.58	0.39;0.86		0.58	0.38;0.89	
	Race/skin color			0.548			0.559
1	White	1.00			1.00		
	Black/brown/other	1.13	0.75;1.70		1.13	0.75;1.70	
	Economic class (ABEP)[f]			0.809			0.619
1	A/B	1.00			1.00		
	C	0.91	0.61;1.35		0.84	0.56;1.27	
	D/E	0.77	0.27;2.15		0.70	0.25;2.00	
	Lives with whom			0.001			0.052
2	With family members (father, mother, siblings, partner)	1.00			1.00		
	Alone	0.70	0.34;1.42		0.82	0.40;1.70	
	With friends	1.89	1.27;2.81		1.68	1.09;2.59	
	Course area of knowledge			0.001			0.011
	Applied Social Sciences and Humanities	1.00			1.00		
2	Exact and Earth/Agrarian Sciences and Engineering	0.66	0.38;1.14		1.85	0.97;3.51	
	Health and Biological Sciences	1.21	0.71;2.08		1.39	0.77;2.50	
	Linguistics, Modern Languages and Art	1.94	1.21;3.12		2.59	1.42;4.71	
	Prejudicial alcohol use (AUDIT≥8)[g]			0.001			0.001
2	No	1.00			1.00		
	Yes	1.92	1.30;2.84		2.02	1.34;3.04	
	Current tobacco smoking			0.081			0.402
2	Non-smoker/former smoker	1.00			1.00		
	Smoker	1.61	0.96;2.70		1.27	0.72;2.24	
	Physical activity during leisure – IPAQ[h]			0.724			0.318
2	Active	1.00			1.00		
	Not active	0.93	0.64;1.36		0.81	0.54;1.22	
	Body mass index – IMC[i]			0.160			0.188
	Normal weight	1.00			1.00		
2	Underweight	2.09	1.06;4.10		0.46	0.22;0.94	
	Overweight	0.91	0.56;1.50		0.47	0.21;1.06	
	Obese	1.12	0.60;2.12		0.57	0.23;1.42	

a) L: level.

b) OR: odds ratio.

c) 95%CI: 95% confidence interval.

d) Crude analysis – Wald test.

e) Adjusted analysis – Wald test.

f) ABEP: Brazilian Association of Survey Companies.

g) AUDIT: Alcohol Use Disorders Identification Test.

h) IPAQ: International Physical Activity Questionnaire.

i) BMI: body mass index (kg/m²).

Notes:

Level 1 – adjustment for age and sex.

Level 2 – previous adjustment + lives with whom, course area of knowledge, prejudicial alcohol use and BMI.

Final model goodness-of-fit measure: pseudo R^2: 6.19.

Akaike's Information Criterion (AIC): 771.40.

Bayesian Information Criterion (BIC): 841.84.

Variance Inflation Factor (VIF): 1.05.

Table 3 – Intake on the day before the interview of healthy and unhealthy food consumption markers among omnivorous and vegetarian university students, Pelotas, Rio Grande do Sul, 2018

Food	n (%)	Omnivorous % (95%CI[a])	Vegetarian % (95%CI[a])	p-value[b]
Healthy diet markers				
Beans (n=1,837)	1,046 (56.9)	56.2 (53.8;58.5)	68.4 (59.9;76.8)	0.012
Fresh fruit (n=1,833)	1,023 (55.8)	44.9 (42.6;47.3)	66.7 (58.1;75.2)	0.016
Greens and/or vegetables (n=1,830)	1,240 (66.8)	66.8 (64.5;69.0)	82.1 (75.1;89.0)	<0.001
Unhealthy diet markers				
Hamburger and/or charcuterie (n=1,833)	646 (35.2)	37.3 (35.0;39.5)	5.9 (1.6;10.2)	<0.001
Sweetened drinks (n=1,832)	1,162 (63.4)	64.5 (62.2;66.7)	47.9 (38.8;56.9)	<0.001
Instant noodles (n=1,823)	493 (27.0)	27.5 (25.4;29.6)	20.5 (13.2;27.9)	0.107
Filled sweet biscuits, candies or desserts (n=1,826)	956 (52.3)	52.3 (49.9;54.7)	53.0 (43.9;62.1)	0.924

a) 95%CI: 95% confidence interval.

b) Pearson's chi-square test.

Discussion

This study described prevalence of omnivorous and vegetarian dietary patterns among students starting at a public university in Southern Brazil, as well as the relationship of these patterns with demographic, socioeconomic, nutritional, health-related behavior characteristics, and with consumption of food items considered to be healthy and unhealthy diet markers.

Overall prevalence found for vegetarian diet was similar to the 6.0% found by the 2018 IBOPE survey with a sample of 2,002 individuals aged 16 years or over in 142 Brazilian municipalities.[11] When compared only with people with complete high school education in the IBOPE survey, prevalence was slightly higher in our study, i.e. 6.4% in our study versus 4.0% in the IBOPE survey.[11]

Males were 42% less likely to be vegetarians than females in our study, whereas in the IBOPE survey,[11] males were more likely to have a vegetarian diet. However, according to the literature, women are more adept at vegetarianism than males.[7,8,25]

Students taking Linguistics, Modern Languages and Art courses at UFPel were 2.59 times more likely to be in the vegetarian group when compared to those taking Applied Social Sciences and Humanities courses. In the study conducted by Hackbarth et al.,[26] which assessed a non-representative sample of students at the Federal University of Paraná between 2014 and 2015, the majority of vegetarians were concentrated in Social Sciences and Humanities courses. As they were new students, they probably had not had sufficient time adapting to university for this to influence changes in eating habits.[27]

Vegetarians were found to be around twice as likely to have prejudicial alcohol use. This finding is different to that found in the literature for people who follow this kind of diet.[7,25,26,28,29] Some suppositions could be made such as, for instance, the self-administered format of the questionnaire, which could enable the university students to give more accurate information about their alcohol use, or, in the case of this study and this finding, the dietary preferences of this populations were not tied to a healthier lifestyle. Furthermore, the results of the Avon Longitudinal Study of Parents and Children (ALSPAC) involving young people identified that vegetarians were more at risk of presenting depressive symptoms and using harmful substances, such as alcohol.[30]

Although some studies show that vegetarians practice more physical activities[27-29] and have a lower BMI than people with an omnivorous diet,[28,29] these differences were not identified in our study. However, the studies cited assessed populations who were older than the population covered by our study,[28,29] which may justify the difference found.

Food items taken to be healthy diet markers according to SISVAN are considered to be good sources of dietary fiber and micronutrients.[20] When analyzing intake of these food groups for each of the dietary patterns, greater consumption of healthy food items on the day before the interview was found among the vegetarians. Other international studies have reported similar results.[7,25,26]

Omnivorous individuals consumed more hamburgers and/or charcuterie on the day before the interview, compared to those who had a vegetarian diet. It should be noted that the question did not specify the type of hamburger and whether it was of animal or vegetable origin, and this may have been the reason why the

majority of vegetarians gave a negative answer to this question. Even so, around 4 in 10 omnivorous respondents reported consuming some of these food types the day before, which is of concern considering that their consumption should be discouraged.[15]

Intake of sweetened drinks was greater among omnivorous participants when compared to vegetarian participants. This result was similar to that of a Brazilian study that concluded that people with an omnivorous diet consume more soda than vegetarians.[28] No difference was found between diet types and consumption of instant noodles, or consumption of filled sweet biscuits, candies or desserts. A study conducted in France in 2009 with the general adult population, reported higher sweet food consumption among omnivorous participants.[6] It is noteworthy that almost half the students taking part in our study as a general rule reported consuming filled sweet biscuits, candies or desserts on the day before, while consumption of these types of food rich in free sugar and fats should also not be encouraged.[15]

A limitation of this study was lack of statistical power to detect certain associations. The high proportion of losses and refusals contributed to this. It would also be important for future studies to consider data dependency on students by class, principally because it is believed that behaviors tend to be similar. Moreover, information bias may have occurred owing to the questionnaire being self-administered. Despite confidentiality being guaranteed, the students may have reported a healthier diet than they actually have. Another disadvantage of the study was it not being possible to fully assess the students' diets; for this to be done instruments with a large number of questions would need to be used, which would be infeasible for the characteristics of this study. Hence the option to assess food consumption markers. Even though the answers may not reflect eating habits, it was possible to identify some indicators of the quality of the diet of UFPel students. Due to the absence of a validated questionnaire to analyze omnivorous and vegetarian practices of the Brazilian population, and absence of a questionnaire with an adequate number of questions for this study, we opted to use an instrument from a study recognized and widely conducted in diverse European countries.

We conclude that this study conducted with students starting university identified vegetarianism associated with the female sex, university course area of knowledge and prejudicial alcohol use. Vegetarian students also presented (i) greater consumption of beans, fresh fruit and greens and/or vegetables and (ii) lower consumption of sweetened drinks, when compared to omnivorous students. Notwithstanding their consumption of sweetened drinks being lower than that of omnivorous students, almost half the vegetarian students consumed sweetened drinks, as well as filled sweet biscuits, candies or desserts. Finally, the need exists to implement actions aimed at promoting health and healthy habits among the university community.

Authors' contributions

Barros KS, Bierhals IO and Assunção MCF contributed to the concept and design of the article. Barros KS contributed to data analysis and interpretation. All three authors drafted and critically reviewed the manuscript, approved its final version and are responsible for all aspects thereof, including the guarantee of its accuracy and integrity.

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