

# Correspondence between anthropometric state, sociodemographic and lifestyle variables among university students

## Correspondência entre estado antropométrico, variáveis sociodemográficas e de estilo de vida em universitários

Jéssica Santos Santana<sup>1</sup>

Orcid: <https://orcid.org/0000-0002-9073-4096>

Sulamita Oliveira Gonzaga<sup>2</sup>

Orcid: <https://orcid.org/0000-9991-6833-4734>

Manuela Santos Farias<sup>3</sup>

Orcid: <https://orcid.org/0000-0002-9923-950X>

Maria da Conceição Pereira da Fonseca<sup>4</sup>

Orcid: <https://orcid.org/0000-0003-0325-7162>

Carlos Rodrigo Nascimento de Lira<sup>5</sup>

Orcid: <https://orcid.org/0000-0001-7266-1367>

### Resumo

**Introduction:** Alterations on lifestyle happen among young people after entering higher education institutions for many reasons. Thus, university students manifest several risk factors to gain weight, such as physical inactivity, sleep disorders, changes on eating habits, beginning of experimentation with psychoactive substances such as alcohol, tobacco and illicit drugs, that is, practices that contribute to weight gain. **Objective:** Evaluating the correspondence between the anthropometric state, sociodemographic and lifestyle variables among college students. **Methods:** This is a transversal study on which participated 155 college students, over 18 years old, by questionnaire application to obtain sociodemographic and lifestyle information. The anthropometric evaluation consisted of measuring weight, height, skinfolds, waist and hip circumference. Analysis consisted of simple and absolute frequency, and also on Multiple Correspondence Analysis (MCA). **Results:** There was an association between excessive weight on male individuals, without other occupations, of low economic income, who did not engage on domestic activities and belong to interdisciplinary bachelor and post-graduation studies. **Conclusion:** Through the observed correspondence between the interest variables, we suggest the adoption of practices to promote adequate dietary habits among college students, especially through Food and Nutrition Education actions..

**Palavras-chave:** overweight; anthropometry; food services.)

### Abstract

**Introdução:** Alterações no estilo de vida ocorrem entre jovens após ingressarem no ensino superior por diversos motivos. Assim, os universitários manifestam fatores de risco para ganho de peso, tais como inatividade física, alterações do sono, alterações dos hábitos alimentares, início para experimentação de substâncias psicoativas como álcool, tabaco e drogas ilícitas, ou seja, práticas que contribuem para o excesso de peso. **Objetivo:** Avaliar a correspondência entre estado antropométrico, variáveis sociodemográficas e de estilo de vida em universitários. **Métodos:** Trata-se de um estudo transversal realizado com 155 universitários, maiores de 18 anos, com aplicação de questionário para obtenção de informações sociodemográficas e de estilo de vida. A avaliação antropométrica consistiu da aferição do peso, estatura, dobras cutâneas, circunferência da cintura e do quadril. As análises consistiram em frequência simples e absoluta, além da Análise de Correspondência Múltipla. **Resultados:** Houve associação entre excesso de peso com indivíduos de idade 26 a 34 anos, sexo masculino, sem outras ocupações, classe econômica baixa, que não desenvolviam atividade doméstica e serem dos cursos bacharelado interdisciplinar e de pós-graduação. **Conclusão:** Por meio da correspondência observada entre as variáveis de interesse, sugerimos adoção de práticas para promoção de adequados hábitos alimentares entre os universitários, principalmente a partir de ações de Educação Alimentar e Nutricional.

**Keywords:** sobrepeso; antropometria; serviços de alimentação.

<sup>1</sup> Universidade Federal da Bahia. E-mail: [jeusanta@gmail.com](mailto:jeusanta@gmail.com)

<sup>2</sup> Universidade Federal da Bahia. E-mail: [sulamitagonzaga@gmail.com](mailto:sulamitagonzaga@gmail.com)

<sup>3</sup> Universidade Federal da Bahia. E-mail: [mannufarias0712@gmail.com](mailto:mannufarias0712@gmail.com)

<sup>4</sup> Universidade Federal da Bahia. E-mail: [mcfonseca@gmail.com](mailto:mcfonseca@gmail.com)

<sup>5</sup> Universidade Federal da Bahia E-mail: [carlos.rodrigo.n@hotmail.com](mailto:carlos.rodrigo.n@hotmail.com)

## Introduction

Excessive weight is defined as the excessive accumulation of body fat<sup>1</sup>. In 2014, over 1.9 billion adults were considered to have excessive weight in the world, of which 600 million presented obesity levels. In 2019, 55.4% Brazilians presented overweight and 20.3%, obesity. In Salvador-Bahia, 51.8% of the adult population presented overweight and 18.1%, obesity<sup>2</sup>. In order to develop excessive weight multiple factors are involved, among which genetic, endocrinological, lifestyle and emotional related factors stand out. Concerning lifestyle, these changes are expressed on the alteration of eating patterns, physical activity reduction, smoking and excessive alcohol consumption, among others<sup>3,4</sup>.

Changes on lifestyle occur among young people after they begin higher education courses given, for example, high performance and dedication demands, managing their finances and time, etc. This way, college students manifest several risk factors to weight gain, such as physical inactivity and sedentary lifestyle, sleep disorders, anxiety, stress and especially eating habit alterations<sup>5-7</sup>. Studies also point out to other changes in lifestyle that occur on this population, such as going to parties and the beginning of experimentation of psychoactive drugs as alcohol, tobacco and illicit drugs, that is, practices that also contribute to excessive weight<sup>8-10</sup>.

The consequences of excessive weight are numerous, whether for the individual, the community or economy. On a review conducted by Chu et al.<sup>11</sup>, it was pointed out that obesity and related disorders undertake great pressure on the economy, aside from triggering lethal health issues. In Iran<sup>12</sup>, teenagers with excessive weight featured the self-stigma related to weight mediating the effects of body mass index on psychological suffering (CI95%=0.08-0.45), psycho-

social life quality (CI95%=-1.10,-0.32) and physical life quality (CI95%=-2.43,-0.26). On a cohort study in Brazil, Padilha et al.<sup>13</sup> concluded parental obesity has a transgenerational effect on weight, bringing on overweight on the offspring from childhood to adult life, obesity on parents was also a risk factor for the occurrence of asthma on adult offspring. Correa et al.<sup>14</sup>, by estimating governmental cost of all types of cancer resulting of excessive weight on adults, considering medical expenses on the Brazilian Unified Public Health System (Sistema Único de Saúde, or SUS) discovered the federal cost in 2018 for all types of cancer combined was US\$ 1.73 billion, of which US\$710 million were spent on the treatment of cancer related to excessive body weight and US\$ 30 million attributable to excessive weight, therefore an elevated economic load for the country.

The high prevalence of excessive weight among college students<sup>15-17</sup> highlights the need to deepen the gaze and knowledge concerning this condition on this group, as to signal and steer, when necessary, inappropriate eating habits, aiming along the years, an improvement on the health and life quality of these individuals. However, studying the body composition of this population, sociodemographic and lifestyle conditions are of extreme importance, because certain habits can perpetuate once they become graduates.

Given the transition of the nutritional profile observed on the population, the expansion of higher education in Brazil and the absence of specific public policies directed towards college students considering their particularities, this study presents relevance on such approach<sup>18</sup>. Taking that into account, this paper's objective was to assess the correspondence between an anthropometric state, sociodemographic and lifestyle variables among college students, in a way to assess if these

parameters present an association with excessive weight.

## Materials e Métodos

### Materials and Methods

#### Sample and Study Type

Transversal study, on a quantitative approach, developed by students who attended the University Restaurant (Restaurante Universitário, or RU) of a University in Northeast Brazil. For the sample calculation, the body mass index (BMI) mean of the participants was considered, given a confidence interval of 95% ( $\alpha=0.05$ ) and admitting a sampling error of 5% ( $d=0.05$ ), given an  $n$  of 136 students. The study was publicized at the RU through posters, social media and email with the assistance of the Dean's Office of Affirmative Actions and Student Assistance (Pró-Reitoria de Ações Afirmativas e Assistência Estudantil) at the University. On the process of publicization, a period for data collection was established, so, who attended until the pre-determined date was selected, on a total sample of 155 students. Students from Higher Education Institutions on the Brazilian federal network who feed on the RU are considered beneficiary of the National Program of Student Assistance (Programa Nacional de Assistência Estudantil), even though they pay an undermost value per meal or, in some cases, pay nothing at all<sup>19</sup>. The attendance of these diners at RU is different between scholarship holders and paying diners, hence, we decided to evaluate in a separate way the anthropometric parameters of the two groups.

This study is part of a larger project, approved on the Ethics and Research Committee of the Nutrition School at Bahia Federal University (assessment nº228.318/2012). Participants were informed of the study's objectives, and those who agreed to participate read and signed the consent form.

#### Inclusion and Exclusion Criteria

The inclusion criteria were: dining at least three meals a week at the RU; being 18 years old or more; not to be on their first semester of attendance at the RU; being Brazilian; if the participant is a foreigner, he needs to have been living in Brazil for at least a year at the time of the research. Non included: pregnant women, for possessing specific nutritional needs; foreign students in the country for less than a year; physically compromised student in a way that precluded the anthropometric exam; to have began attending the RU at the semester of the data collection.

#### Proceedings

In order to obtain the data, we have used a questionnaire elaborated by the researchers and tested on a pilot study, where the participants themselves filled them in. Sociodemographic variables were: link with RU; sex; age range divided from the median; skin color; place of birth; course; other occupation; economic class. For the assessment of economic class, we have used the Brazilian Association of Research Companies (Associação Brasileira de Empresas de Pesquisa) methodology<sup>20</sup>. Lifestyle related variables were: elitism; smoking; if the participant is or was ever on a diet; reasons to be on a diet. Information about activities developed during the day: performing leisure activities; performing domestic activities; hours of leisure activity; intensity of leisure activity (sedentary, light, moderate and heavy)<sup>21</sup>; hours of sleep.

In order to evaluate the anthropometric state, we measured: height and weight and, for the calculation of the BMI, the recommendations of the World Health Organization (WHO) were followed<sup>22</sup>. Measuring the weight, we have used a digital scale (Plenna brand, model MEA 07400) with a capacity of 150kg. The height was measured with a stadiometer (SECA brand, model E0123) distant 2.2 vertical meters from the floor,

on a wall without baseboard. We have measured waist circumference (WC) with an inelastic tape-measure (Grafcó brand, model #17-1340-2, 1.5m) following WHO recommendations<sup>22</sup> and we have interpreted reference values to metabolic complications associated to obesity according to WHO recommendations<sup>22</sup>, on which men with WC  $\geq 94$  cm were considered elevated risk and  $\geq 102$  cm, very elevated and women  $\geq 80$  cm, as elevated and  $\geq 88$  cm as very elevated.

We have assessed hip circumference (HC) with an inelastic tape-measure (Grafcó brand, model #17-1340-2, 1.5m) following WHO recommendations<sup>22</sup> and, this way, calculated Waist-to-Hip Ratio (WHR) using the WC and hip values and, for this classification, we have used WHO's cutpoints<sup>22</sup>: 0.90 to men and 0.85 to women. A ratio of 1.0 or plus, to any sex, is considered "at risk". Body fat distribution standards were classified according to Matsuzawa<sup>23</sup> as android and gynoid given WHR values.

For body fat, we did the sum of four skinfolds (tricipital, bicipital, subscapular and supraillia skinfold) obtained according to Lohman et al<sup>24</sup> and we have determined the percentage of body fat (%BF) from different ages and sexes, as presented on Durnin and Wolmersley's<sup>25</sup> table. For gauging the skinfolds, we have used a clinical skinfold caliper from Cescorf with 1mm sensitivity and a 63mm reading range.

All measures were taken twice by the same examiner, considering arithmetic average in the end. On cases the difference exceeded 100g of weight, 0.2 cm of height, 0.2mm WC and HC to skinfolds, the measures were taken again.

For the data analysis, we have done a descriptive analysis (simple and absolute frequency) for the sample's characterization, and the analysis of joint relations between sociodemographic and lifestyle variables with the anthropometric ones, we have assessed through Multiple Correspondence Analysis (MCA). MCA

refers to a multivariate analysis for categoric data exploration, used mainly to verify, in a graphic way, relations between the variables' categories. On this methodology, the studied variables' categories were visually represented on a perceptual map, and its correspondence was evaluated according to the proximity of these categories (the closer, the higher the probability of association). All analysis were performed on IBM Statistical Package for Sciences version 21.0<sup>®</sup>.

## Resultados

### Results

On the present study, there were 56.1% of paying diners and 43.9% scholarship holders from students' assistance program. There was a predominance of the female sex on both groups (55.2% of paying diners vs. 57.4% of scholarship holders). About the age group, students were between 18 and 25 years old on both groups (82.8% vs. 61.8%) and the average age was 25.1 (DP = 5.2) years old for scholarship holders and 22.3 (DP = 4.4) years old for paying diners. About the referred skin color, there was a predominance of parça color (44.8% vs. 44.1%). Mostly, students' place of birth is Bahia (88.51% vs. 86.76%). On both groups, university students had other occupations beyond their dedication to the academic course (66.7% vs. 57.4%). The middle economic class prevailed among paying diners (56.3%) and scholarship holders (70.6%). And 32.2% of paying diners and 32.4% of scholarship holders attended courses on the Humanities area.

As to the anthropometric state, having BMI as a parameter, there was a predominance of individuals on eutrophy (66.7% vs. 60.3%). As to WC (81.6% vs. 72.1%) and also on the case of WHR (86.2% vs. 83.8%), evaluated participants did not present risks to metabolic complications associated to obesity. However, about the percentage of body fat, we have found that 21.8% of the paying

diners and 39.7% of scholarship holders risked illnesses associated to obesity. We have also verified that most of the students

did not report any chronic diseases, on percentages over 80% on both groups (Table 1).

**Table 1:** Anthropometric characteristics of university students and their parents (n = 155). Salvador, Bahia, Brazil, 2019.

Variables	Options	Pay (n=87)		Scholarship Holder (n=68)	
		n	%	n	%
Body Mass Index	Thinness	8	9,2	5	7,4
	Eutrophy	58	66,7	41	60,3
	Overweight	15	17,2	16	23,5
	Obesity	6	6,8	6	8,9
Waist Circumference	Increased	10	11,5	10	14,7
	Risk of metabolic complications	6	6,9	9	13,2
	Without risk	71	81,6	49	72,1
Body Fat Distribution	Ginoide	81	93,1	65	95,6
	Android	6	6,9	3	4,4
Waist-To-Hip Ratio	At risk	12	13,8	11	16,2
	Without risk	75	86,2	57	83,8
Body Fat Percentage	Below average	15	17,2	11	16,2
	Above average	44	50,6	28	41,2
	Average	9	10,3	2	2,9
	Risk	19	21,8	27	39,7
Disease	Diabetes Mellitus	1	1,1	1	1,5
	High cholesterol / Hypertension	2	2,3	1	1,5
	No disease	78	89,7	57	83,8
	Others	6	6,9	9	13,2

Regarding lifestyle, an elevated percentage of alcohol consumption was registered (63.2% vs. 64.7%). As to tobacco use, most of the students declared themselves non-smokers (92% vs. 88.2%). On both groups, there was a predominant performance of domestic activities (92% vs. 88,2%) varying between one to four daily hours (85% vs. 77.9%) and leisure activities (75.9% vs. 73.5%), among paying diners five hours a day were spent (42.5%) and among scholarship holders, one to four hours (39.6%). However, a high percentage of light intensity leisure activities was reported (36.8% vs. 44.1%). About sleeping hours, paying students (7 to 8 hours – 49.3%) reported sleeping more hours than scholarship holders (4 to 6 hours – 49.9%). Most students declared not to be on a diet (56.3% vs. 61.8%) and among the ones who already done it

before, the motivation was weight loss (13.8% vs. 16.2%).

From the MCA, two dimensions were retained on the model, which presented eigenvalues of 2.1 and 1.8, explaining 16.16% variance on the first dimension and 14.52% on the second. For the construction of the MCA model, measures for the variables' discrimination were used (Table 2). Hence, only variables close or superior to inertia dimension values were considered. These regard the variance explained by the dimension, obtaining 0.162 of inertia on the first and 0.145 of inertia on the second.

**Table 2:** Measures of discrimination and coordinates of centroides, in dimensions (1 and 2). Salvador, Bahia, Brazil, 2019.

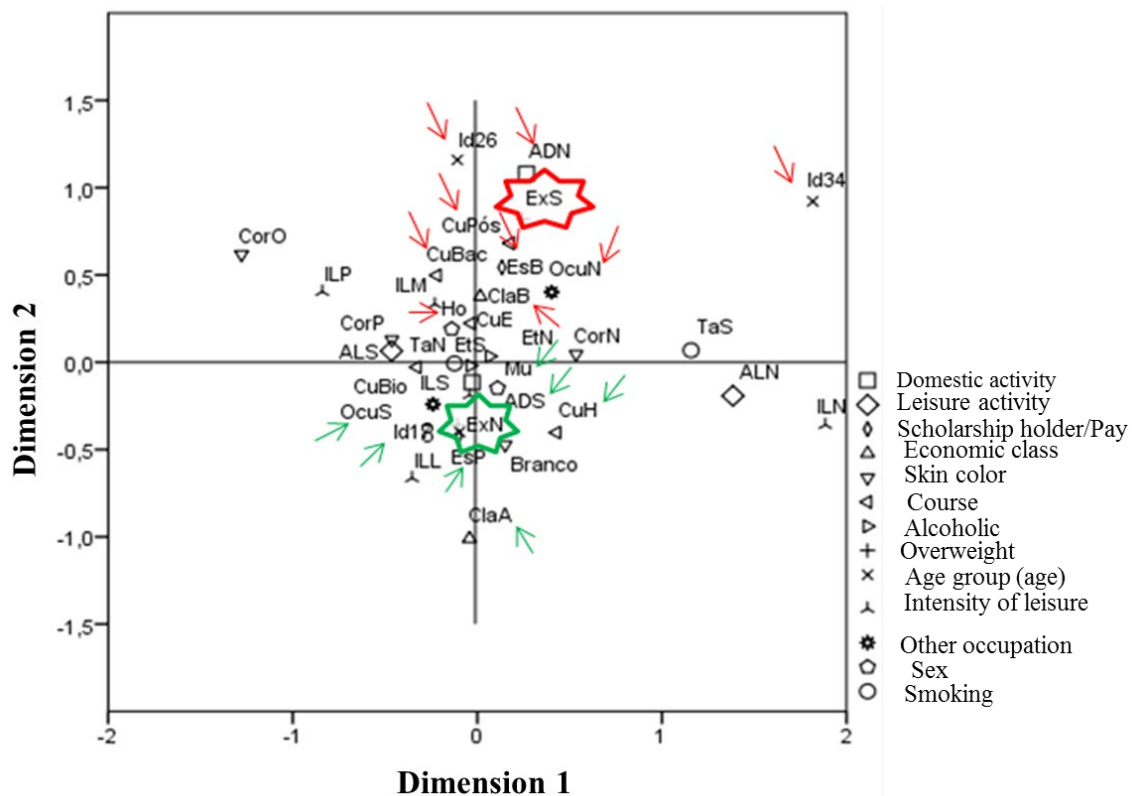
Variables	Discrimination measures		Coordinates of centroides	
	Dimensions			
	1	2	1	2
<b>Economic class</b>	0,001	<b>0,380</b>	-	-
High class	-	-	-0,043	-1,011
Low class	-	-	0,016	0,376
<b>Age</b>	0,180	<b>0,448</b>	-	-
18 to 25 years	-	-	-0,096	-0,400
26 to 34 years	-	-	-0,109	1,159
> 34 years	-	-	1,817	0,922
<b>Overweight</b>	0,026	<b>0,294</b>	-	-
Yea	-	-	0,243	0,822
No	-	-	-0,106	-0,358
<b>Domestic activity</b>	0,008	<b>0,125</b>	-	-
Yea	-	-	-0,029	-0,116
No	-	-	0,267	1,080
<b>Leisure Activity</b>	<b>0,644</b>	0,012	-	-
No	-	-	1,384	-0,192
Yea	-	-	-0,465	0,065
<b>Intensity of leisure activity</b>	<b>0,645</b>	0,109	-	-
Sedentary	-	-	-0,043	-0,188
Light	-	-	-0,354	-0,664
Moderate	-	-	-0,230	0,332
Heavy	-	-	-0,840	0,404
None	-	-	1,885	-0,360
<b>Smoker</b>	<b>0,144</b>	0,001	-	-
Yea	-	-	1,157	0,068
No	-	-	-0,124	-0,007
<b>Alcoholic</b>	0,003	0,001	-	-
Yea	-	-	-0,038	-0,020
No	-	-	0,067	0,035
<b>Other occupation</b>	0,097	0,096	-	-
Yea	-	-	-0,240	-0,240
No	-	-	0,402	0,401
<b>Course</b>	0,101	<b>0,112</b>	-	-
Biological	-	-	-0,327	-0,028
Exact Sciences	-	-	-0,033	0,223
Human	-	-	0,429	-0,403
Interdisciplinary Bachelor	-	-	-0,219	0,498
Postgraduate studies	-	-	0,178	0,682
<b>Skin color</b>	<b>0,226</b>	0,052	-	-
White	-	-	0,150	-0,472
Black	-	-	0,535	0,046
Brown	-	-	-0,463	0,129
Others	-	-	-1,277	0,617
<b>Scholarship holder/Pay</b>	0,014	<b>0,231</b>	-	-
Scholarship holder	-	-	0,133	0,544
Pay	-	-	-0,104	-0,425
<b>Sex</b>	0,015	<b>0,028</b>	-	-
Men	-	-	-0,139	0,190
Women	-	-	0,109	-0,148

Bigger composition and influence were reported on the first dimension referring to leisure activity, intensity of leisure activity, smoking and skin color. On the second dimension, an influence of economic class, age, excessive weight, domestic activity, course, being a paying diner or a scholarship holder and sex were verified (Table 2).

The number of variables on the dimensions of the perceptual map resulted from the processing of values found on the

centroid coordinates (Table 2), which allow the construction of point through which the parameters are inserted, symbolized and classified by positive and negative signs referring to centroid coordinates on each category. Correlations between categories of variables and conglomerate formation may be evaluated analyzing proximity between the points (Figure 1), as well as relation standards between these characteristics.

**Figure 1:** Visualization of the sociodemographic and lifestyle characteristics of university students, based on the graph of category points between dimensions 1 and 2. Salvador, Bahia, Brazil, 2019.



Subtitle			
Initials	Variable category	Initials	Variable category
<b>Age group (age)</b>		<b>Overweight</b>	
Id 18	18 to 25 years	ExS	Yea
Id 26	26 to 34 years	ExN	No
Id 34	> 34 years	<b>Economic class</b>	
<b>Sex</b>		ClaA	High class
Ho	Men	ClaB	Low class
Mu	Women	<b>Alcoholic</b>	
<b>Skin color</b>		EtS	Yea

CoB	White	No	Não
CoN	Black	<b>Smoking</b>	
CoP	Brown	TaS	Yea
CoO	Others	TaN	No
<b>Course</b>		<b>Intensity of leisure</b>	
CuBio	Biological course	ILS	Sedentary
CuE	Exact course	ILL	Light
CuH	Human course	ILM	moderate
CuBac	Bachelor's degree	ILP	Heavy
CuPos	Postgraduate course	ILN	None
<b>Other occupation</b>		<b>Domestic activity</b>	
OcuS	Yea	ADS	Yea
OcuN	No	ADN	No
<b>Scholarship holder/Pay</b>		<b>Leisure activity</b>	
EsB	Scholarship holder	ALS	Yea
EsP	Pay	ALN	No

The excess weight is located on the upper right quadrant, on both groups, which influences on the inferior left quadrant, for paying diners, and the superior right quadrant for scholarship holders. Based on the graphic, in association with excessive weight there were being a scholarship holder, being between 26 and 34 years old, being male, not participating on domestic activities, not having other occupations, being part of the multidisciplinary bachelor course or the post-graduation and belonging to a low economic class. On the other hand, the variables being a paying diner, being female, being 18 to 25 years old, doing a Humanities major, being from a high economic class and having other occupation were related to non-excessive weight (Figure 1).

## Discussão

Given the proposed analysis method, the results from this investigation indicated the variables distinct among themselves that were related or not to the anthropometric state between the studied groups. Here, we understand the anthropometric outcome (by BMI, WC and/or %BF) as excessive weight.

Determinant factors to the development of excessive weight constitute a complex set of genetic, behavioral, metabolic, social and psychological factors<sup>4</sup>. This way, among the variables related to such outcome, we

have observed that being a scholarship holder<sup>26</sup>, not having another occupation and belonging to a low economic class have revealed to be concerning aspects, since they demonstrate social vulnerability as an important factor with direct impact over health outcomes. Authors like Pisbarro et al.<sup>27</sup> and Pires and Mussi<sup>18</sup>, on their argument about socioeconomic level, believe it influences directly on the prevalence of excessive weight, which prevails on the lower and middle extracts, given the socioeconomic level may interfere on the access to food, goods and services and also to health, resulting therefore on a lesser frequent adoption of healthy habits.

This study was developed with beneficiaries of the Student Assistance Nacional Program<sup>19</sup> who also frequently used the RU for their meals. The RU has the function of providing a nutritionally balanced meal on adequate sanitary condition. These RU, on the other hand, may minimize the impact leaving the family home can cause, helping them not to choose unhealthy nutrition and contributing to maintain the health of college students. When the students feed inside the university, however, it must be highlighted the ponderal gain is to be evaluated throughout the day<sup>28</sup>.

Other factors such as age between 26 and 24 years old, being male, not developing domestic activities and attending interdisciplinary bachelor



courses or post-graduation were also related to excessive weight. The age group and identified sex on this study corroborate national reseraches<sup>2</sup> by presenting the percentage of Brazilian adults (18-34 years old) who have shown excessive weight corresponding to 55.4% of the population, 57.1% of men and 53.9% of women. Silva et al.<sup>29</sup> and Santos et al.<sup>30</sup> have also verified that male students of age equal or superior to 20 years old have presented higher chances of developing excessive weight. The association between the male sex and excessive weight can also happen through inadequate health behavior more frequently associated to men, such as smoking and alcoholism, while women present more control over their eating habits, for example<sup>30,31</sup>.

About the formation area, other studies have also found the association between excessive weight and the chosen major, as in the investigation of Lira Neto et al.<sup>32</sup> where 42.3% of the Administration bachelor students presented excessive weight, as well as on the study of Mori et al.<sup>33</sup>, which finds that college students on Human Resources (60%), Law (49.1%) and Engineering (53.6%) have presented higher excessive weight compared to other areas. On this study, we have found that 35.2% scholarship holders and 35.67% of paying diners from the interdisciplinary bachelor courses and from post-graduation courses have presented excessive weight (data not presented graphically on this paper). The non-development of domestic activities was also related to excessive weight. Performing domestic activities takes physical effort, consequently generating an energetic expenditure, even if it is a small one, which suggests a contribution to the non-accumulation of calories<sup>34</sup>, this way confirming the results of Lins et al.<sup>35</sup>, by suggesting that leisure and domestic physical activity seem to have a protective effect for excessive weight (PR: 0.38 – CI 95%: 0.17 - 0.83).

Contrary to variables related to excessive weight, we have identified that

developing domestic activities, belonging to a high economic class and having another occupation were some of the variables related to non-excessive weight, findings corroborated by other investigations, such as Lira Neto et al.<sup>32</sup> e Mori et al.<sup>33</sup>.

Referring to anthropometric variables in isolation, although most college students did not present risks to metabolic diseases related to obesity, a considerable proportion has presented excessive weight (40.7% overweight and 15.7% obesity); risk of metabolic complications by WC (20.1%), by %BF (61.5%) and WHR (30%); and a distribution of body fat of the android kind (11.3%). These results have presented a concerning scenario which must be monitored constantly, because studies have shown that excessive weight and excessive body fat are high risk factors for the appearance of chronic noncontagious diseases, even among young adults<sup>36-38</sup>.

We reinforce, therefore, the importance of this study, because it presents information that contributes to the proposition of short, medium and long-term interventions. On short-term, we highlight educational and corrective measures on the elaboration and/or preparation of menus, this way offering a smaller caloric density. On the medium term, the study can help elaborate the contract between the University and the companies, among those that work with outsourcing, acquisition of food supplies and the offered menus. And on the long term, along with other studies, it can sensibilize superior stances so that dietary changes and directives are elaborated for this population and consequently reducing the possibility of development of chronic diseases, and also, reducing expenses on public health.

## **Conclusão**

### **Conclusion**

This article's objective was achieved by the identification of which

sociodemographic and lifestyle variables were related to excessive weight or not among university students. This way, we highlight the importance of university restaurants, as they are spaces directed towards the supply of nutritionally balanced and easy access meals, because of

their location inside University campuses. Therefore, it is important to verify the quality of the food provided on these establishments and to adopt methods to promote proper eating habits, through actions and strategies of Nutritional Surveillance and Education.

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