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Use and knowledge of ultra-processed food labeling among university students

Uso e conhecimento sobre rotulagem de alimentos ultraprocessados entre estudantes universitários

Patrícia Fernandes da Silva Gomes

Raquel de Almeida Alvarenga

Daniela Silva Canella*

Instituto de Nutrição, Universidade do Estado do Rio de Janeiro (UERJ), Rio de Janeiro, RJ, Brasil

* **E-mail:** daniela.canella@uerj.br

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ABSTRACT

Introduction: Ultra-processed foods are industrial formulations that present several food additives in their composition. Food labeling is an important tool for making decisions about these foods. Objective: To analyze usage and knowledge of ultra-processed food labeling by university students. Method: Cross-sectional study using a self-administered electronic questionnaire. The sample consisted of 129 students from a public university in Rio de Janeiro of undergraduate courses in health and other areas. The studied variables related to the usage of ultra-processed food labeling and the knowledge of 12 types of food additives and/or ingredients were described for the population as a whole and stratified by area of undergraduate course. Results: More than half of the individuals reported reading labels. The most read items were: number of calories (40.3%), all information (22.4%) and list of ingredients (17.8%). The main difference between students refers to the knowledge of ingredients and/or additives, being better known by those from the health area. The most well-known additives and/or ingredients were the same: fructose and glucose – health area students: 84.5% (72.5; 91.8) and other areas: 50.7% (39.0; 62.2) – and aspartame – health area students: 65.5% (52.2; 76.7) and other areas: 40.8% (29.9; 52.7). The frequency of health area students that would stop buying food in the presence of some of the additives and/or ingredients studied was higher. Conclusions: We verified a high frequency of students that read labels and, despite knowing a few additives and/or ingredients, their presence influences the students purchase decision. Thus, food labeling is important for food choices.

KEYWORDS: Ultra-processed Foods; Nutritional Label; Food Additives; Health; Students

RESUMO

Introdução: Alimentos ultraprocessados são formulações industriais que apresentam em sua composição uma série de aditivos alimentares. A rotulagem de alimentos é uma ferramenta para a tomada de decisão dos consumidores. Objetivo: Analisar o uso e conhecimento sobre rotulagem de alimentos ultraprocessados por estudantes universitários. Método: Estudo transversal utilizando questionário eletrônico autoaplicável. A amostra foi composta por 129 estudantes de universidade pública do Rio de Janeiro de cursos de graduação da área da saúde e de outras áreas. As variáveis estudadas relacionadas ao uso de rotulagem de alimentos ultraprocessados e ao conhecimento sobre 12 tipos de aditivos alimentares e/ou ingredientes foram descritas para o conjunto da população e estratificadas por área de curso. Resultados: Mais da metade dos indivíduos referiu ler rótulos. Os itens mais lidos foram: número de calorias (40,3%), todas as informações (22,4%) e lista de ingredientes (17,8%). A principal diferença entre os estudantes se refere ao conhecimento de ingredientes e/ou aditivos, sendo mais conhecidos pelos da área da saúde. Os ingredientes e/ou aditivos mais conhecidos foram os mesmos: frutose e glucose – saúde: 84,5% (72,5; 91,8) e outras áreas: 50,7% (39,0; 62,2) – e aspartame – saúde: 65,5% (52,2; 76,7) e outras áreas: 40,8% (29,9; 52,7). Estudantes da área da saúde deixariam de comprar alimentos na presença de algum dos aditivos e/ou ingredientes estudados com maior frequência. Conclusões: Verificou-se alta frequência de estudantes que leem o rótulo de alimentos e, apesar de conhecerem poucos ingredientes e/ou aditivos, a presença destes influencia sua decisão de compra. Assim, a rotulagem nutricional é importante para as escolhas alimentares.

PALAVRAS-CHAVE: Alimentos Ultraprocessados; Rotulagem Nutricional; Aditivos Alimentares; Saúde; Estudantes

INTRODUCTION

Dietary patterns are changing fast in economically emerging countries like Brazil[1,2]. In Brazilian metropolitan areas there has been a steady and significant increase in the caloric contribution of ultra-processed foods in just over 20 years (1987 to 2009), from 18.7% to 29.6%[3].

Ultra-processed foods are industrial formulations whose manufacturing involves several processing steps and techniques and the use of various ingredients, of which many are for industrial use only, like food additives. Some examples of these foods are: soda, sandwich cookies, packaged snacks, instant noodles, ice cream, candies and treats in general, breakfast cereal, nutrition bars, sweetened and flavored yogurt, reconstituted meat products[2]. Consumption of these foods is associated with obesity, metabolic syndrome, dyslipidemia and other health outcomes[4,5,6].

According to the Pan American Health Organization, from 2000 to 2013, the *per capita* sales of ultra-processed foods have increased significantly in Latin America, and this is strongly related to the increase in the average body mass index of the population[1]. In response to this context, the Dietary Guidelines for the Brazilian Population recommends avoiding the consumption of ultra-processed foods[2]. To increase individuals' autonomy in their food choices, access to reliable and consistent information, while respecting the identity and dietary culture of the population, is fundamental, because, despite the amount of food information available, little comes from reliable sources[2,7]. In this sense, food labeling can be an important tool for decision making and food choices.

Nutrition labeling is intended to inform consumers about the nutritional properties of food. RDC resolution n. 360 of December 23, 2003 makes it mandatory in Brazil[8]. The Brazilian Health Regulatory Agency (Anvisa) is the agency responsible for regulating food labeling and determining the information that a label should bear, with a view to ensuring product quality and consumer health[9]. Mandatory labeling components include: product name; origin identification; net content; preparation instructions whenever necessary; expiration date; batch; and list of ingredients, including the food additives that were used[10].

Widely used in ultra-processed foods, food additives are, according to Anvisa, any ingredients intentionally added to food without a nutritional purpose but with the purpose of modifying its physical, chemical, biological or sensory characteristics, during manufacture, processing, preparation, treatment, packaging, wrapping, storage, transport or handling[11]. The effects of additives on the human body are still being researched, but there is evidence of their relationship with cases of allergies, cancer, disorders of the digestive system, skin rash, angioedema, bronchospasm, among other diseases[12,13,14, 15,16,17,18,19], as shown in the Chart.

The Strategic Action Plan to Tackle Noncommunicable Chronic Diseases (NCDs) in Brazil from 2011 to 2022[20] included the review and improvement of packaged food labeling to meet the criteria of readability and visibility, and thus enable better consumer understanding. Some studies have shown that the population is interested in label information, but this information is unclear[21].

In this context, this study aimed to analyze the use and knowledge about labeling of ultra-processed foods by university students. Additionally, we verified differences in these results between students from health-related courses and students from other areas.

METHOD

This is a cross-sectional study conducted online with students from a public university in the state of Rio de Janeiro, Brazil, from May to June 2017.

The population chosen for the research was selected by convenience, comprising students from undergraduate courses in health and other areas. The students considered "from health areas" belonged to the following courses: nutrition, medicine, nursing, physical education and dentistry. Students from the other courses of the State University of Rio de Janeiro (UERJ) were considered "from other areas". This included students of: administration, archeology, visual arts, actuarial sciences, biology, accounting, communication, law, economics, engineering, physics, geography, history, language & literature, mathematics, oceanography, education, psychology and international studies. To calculate the sample size to be used in the study, we considered as parameters that 50% of individuals usually read the food label[21], a

Chart. Food additives and/or ingredients and their association with health outcomes.

Health outcomes	Additives and/or related ingredients
Cancer	Caramel IV, tartrazine, nitrite and nitrate, sunset yellow
Cardiovascular diseases	Monosodium glutamate
Allergies	Sunset yellow, sodium benzoate, potassium sorbate
Alzheimer's	Aspartame, monosodium glutamate
Obesity	Maltodextrin, fructose, glucose and inverted sugar
Diabetes	Maltodextrin, fructose, glucose and inverted sugar

Source: Cruz et al., 2015[13]; CSPI, 2012[14]; Polônio and Peres, 2009[15]; Scheibler JR et al., 2013[16]; Ferreira, 2015[17]; Ministry of Health, 2016[18]; Jovanovski et al., 2015[19].

95% confidence interval and a 90% statistical power, which resulted in a minimum sample of 96 individuals. The final study sample consisted of 129 students.

The survey was posted on social media widely accessed by students from this university. Data were collected using the Google Apps Form tool. The students accessed the form and on the cover page there was a Free and Informed Consent Form saying that the information provided would be used for research purposes and that their anonymity would be guaranteed. Those who accepted these terms and clicked on "I agree to participate in the evaluation" answered the questionnaire.

To develop the data collection instrument, we adopted two strategies: 1) to explore the use of labeling, we started from a previous study conducted by the Brazilian Institute of Defense of the Consumer (IDEC)[21] and consulted a specialist in the topic for instrument review; 2) regarding knowledge about food additives and ingredients, field research was done in a large supermarket, where we identified the most common types found in ultra-processed foods. The data collection instrument consisted of 13 closed-ended questions and three open-ended questions that addressed: 1) population characterization; 2) reasons for choosing food; 3) use of ultra-processed food labeling (understood here as the habit of reading labels and the reasons for that); 4) knowledge – whether they recognize the ingredients on the labels (which of these ingredients have you seen before on any food labels?) and whether they know or have some information (which of these ingredients are you familiar with?) - about 12 types of food additives and ingredients. Additionally, through an open-ended question, students were asked about the reason for not buying ultra-processed foods.

The database for the analysis was generated by the Google Apps tool. Variables were described by frequency and their respective confidence intervals (95% CI) for the entire population studied and stratified for courses in the health area and in other areas. Significant differences between health students and others were identified based on the comparison of the 95% CI. Stata 14.2 software was used for the analyses. The answers to the open-ended question were described in the text.

The study began after approval by the Research Ethics Committee of the Pedro Ernesto University Hospital of UERJ (CAAE: 64143616.0.0000.5259) and acceptance of the free and informed consent form by the students.

RESULTS

The study sample consisted of 129 students (45.0% from the health area), with a mean age of 23.1 years and the majority composed of non-quota students (64.3%) and female students (57.4%). Of these, 10.1% reported having some disease that interferes with their health. Regarding gender, there was a significant difference between students from health and other areas: in health, the majority (88.0%) were female. No other significant differences were found (Table 1).

Regarding the reading of the labels and the reasons for choosing food, there was no significant difference between the two groups of students, as shown in Table 2.

The items that were more frequently mentioned as reasons for the choice of food by health students were: health (34.4%), pleasure (25.8%) and price (22.4%), whereas students from other areas said: pleasure (35.2%), price (26.7%), convenience (18.3%) and health (18.3%). As for the main reason for reading the labels, the majority in both groups (40.3% in total) said it was to learn the number of calories (Table 2).

Although there was no significant difference in the habit of reading labels among students of different courses (Table 2), it can be observed that those in the health area said they recognize the ingredients or additives more frequently than students from other areas. The most recognized ingredients or additives (read) on food labels by health students were: monosodium glutamate (75.9%), fructose and glucose (72.4%) and maltodextrin (70.7%). As for their familiarity with (having information about) ingredients or additives, the most frequent were: fructose and glucose (84.5%), aspartame (65.5%) and maltodextrin (58.6%). For students in other areas, the most frequently recognized items were: fructose and glucose (66.2%), aspartame (53.5%) and modified starch (40.8%); while the best known are: fructose and glucose (50.7%), aspartame (40.8%), maltodextrin (23.9%) and caramel IV (23.9%). The ingredients recognized on the labels were not always also known to the students (Table 3).

When asked whether they would stop buying some ultra-processed food due to the presence of the mentioned ingredients

Table 1. Characterization of the studied population, according to study area. Rio de Janeiro, 2017.

Variables	Students from the health area (n = 58)		Students from other areas (n = 71)		Total (n = 129)	
	%	CI 95%	%	CI 95%	%	CI 95%
Gender (%)						
Female	87.9	76.5; 94.2	32.4	22.4; 44.3	57.4	48.6; 65.7
Male	12.1	5.8; 23.5	67.6	55.7; 77.6	42.6	34.3; 51.4
Quota students (%)	34.5	23.3; 47.7	36.6	26.1; 48.5	35.6	27.8; 44.4
Mean age (years)	23.3	22.3; 24.3	22.8	22.2; 23.5	23.1	22.5; 23.6
Students with eating disorders (%)	8.6	3.6; 19.3	11.3	5.7; 21.1	10.1	5.9; 16.7

Table 2. Distribution of students, according to area of study, in relation to the reasons for choosing food and reading labels. Rio de Janeiro, 2017.

Variables	Frequency of students					
	From the health area (n = 58)		From other areas (n = 71)		Total (n = 129)	
	%	CI 95%	%	CI 95%	%	CI 95%
Reasons for choosing food						
Convenience	12.0	5.7; 23.4	18.3	10.8; 29.2	15.5	10.1; 22.9
Price	22.4	13.3; 35.1	26.7	17.6; 38.4	24.8	18.0; 33.0
Pleasure	25.8	16.0; 38.8	35.2	24.8; 47.1	31.0	23.5; 39.6
Health	34.4	23.2; 47.7	18.3	10.8; 29.2	25.5	18.7; 33.9
Others	5.1	1.6; 15.1	1.4	0.1; 9.6	3.1	1.1; 8.0
Habit of reading labels	68.9	55.7; 79.6	52.1	40.3; 63.5	59.6	50.9; 67.8
Main reason for reading						
Learning the number of calories	31.0	20.3; 44.2	47.8	36.4; 59.6	40.3	32.1; 49.0
Nutrition facts	6.8	2.5; 17.2	5.6	2.0; 14.2	6.2	3.1; 12.0
Learning the ingredients	17.2	9.4; 29.4	18.3	10.8; 29.2	17.8	12.0; 25.5
All information	27.5	17.4; 40.6	18.3	10.8; 29.2	22.4	16.0; 30.5
See expiration date	15.5	8.1; 27.4	9.8	0.4; 19.4	12.4	7.6; 19.4
Others	0.1	0.2; 11.6	-	-	0.7	0.1; 5.4

and/or additives, we observed that 69.8% of the total answered that they would not, without significant difference between the areas. Among health students, the ingredients and additives most frequently mentioned as reasons for not buying some food were: monosodium glutamate (27.6%) and nitrite and nitrate (24.1%). The most mentioned by the other students were: caramel IV (12.7%) and aspartame (9.9%) (Table 4).

Potential health risks were informed as the justification for not buying ultra-processed foods with these ingredients. Some mentioned that the consumption of those ingredients and additives would be associated with the risk of cancer and that these ingredients and additives could have negative impacts on their body, regardless of caloric value.

DISCUSSION

The results found in the present study have shown that more than half of the students who participated in the study reported having the habit of reading labels, with little difference in the use of ultra-processed food labels among students from health areas and other courses. The main difference between students is found in their knowledge about ingredients and/or additives, with students in the health area having greater familiarity with them. Despite the difference in frequency, the ingredients and/or additives that were best known to students in all areas were the same: fructose and glucose and aspartame. Students from health-related areas would fail to buy food that had any

Table 3. Distribution of students according to field of study in relation to label recognition and knowledge of food ingredients and additives. Rio de Janeiro, 2017.

Ingredients and additives	Frequency of students who reported recognizing label items						Frequency of students who reported being familiar with the items					
	From the health area (n = 58)		From other areas (n = 71)		Total (n = 129)		From the health area (n = 58)		From other areas (n = 71)		Total (n = 129)	
	%	CI 95%	%	CI 95%	%	CI 95%	%	CI 95%	%	CI 95%	%	CI 95%
Inverted sugar	48.3	35.5; 61.1	32.4	22.4; 44.2	39.5	31.3; 48.3	56.9	43.7; 69.1	18.3	10.8; 29.2	35.6	27.7; 44.3
Sunset yellow	29.3	18.9; 42.4	12.7	6.6; 22.8	20.1	14.0; 28.0	25.9	16.0; 38.8	5.6	2.0; 14.2	14.7	9.5; 22.0
Modified starch	53.4	40.4; 66.0	40.8	29.9; 52.7	46.5	37.9; 55.2	37.9	26.2; 51.1	19.7	11.9; 30.7	27.9	20.7; 36.3
Aspartame	67.2	54.0; 78.2	53.5	41.7; 64.9	59.7	50.9; 67.8	65.5	52.2; 76.7	40.8	29.9; 52.7	51.9	43.2; 60.5
Sodium benzoate	37.9	26.2; 51.1	33.8	23.6; 45.7	35.7	27.7; 44.3	18.9	10.7; 31.3	14.1	7.6; 24.4	16.3	10.7; 23.7
Caramel IV	39.6	27.7; 52.8	39.4	28.6; 51.3	39.5	31.3; 48.3	32.7	21.7; 45.9	23.9	15.3; 35.3	27.9	20.7; 36.3
Fructose and glucose	72.4	59.3; 82.5	66.2	54.2; 76.3	68.9	60.3; 76.4	84.5	72.5; 91.8	50.7	39.0; 62.2	65.9	57.1; 73.6
Monosodium glutamate	75.9	63.0; 85.2	38.0	27.3; 49.9	55.0	46.2; 63.5	51.7	38.8; 64.4	14.1	7.6; 24.4	31.0	23.5; 39.6
Maltodextrin	70.7	57.5; 81.0	30.9	21.2; 42.8	48.8	40.2; 57.5	58.6	45.4; 70.6	23.9	15.3; 35.3	39.5	31.3; 48.3
Nitrite and nitrate	41.4	29.3; 54.5	16.9	9.7; 27.6	27.9	20.7; 36.3	51.7	38.8; 64.4	22.5	14.1; 33.8	35.6	27.7; 44.3
Potassium sorbate	29.3	18.9; 42.4	11.3	5.6; 21.1	19.4	13.3; 27.2	8.6	3.5; 19.3	2.8	0.6; 10.7	5.4	2.5; 11.0
Tartrazine	36.2	24.7; 49.4	15.5	8.7; 26.0	24.8	18.0; 33.0	27.6	17.4; 40.6	5.6	2.0; 14.27	15.5	10.1; 22.9

Table 4. Student distribution, by area of study, in relation to the negative influence of the presence of ingredients and food additives on the purchase of ultra-processed foods. Rio de Janeiro, 2017.

Ingredients and additives	Frequency of students negatively influenced by the presence of food ingredients and additives when buying food					
	From the health area (n = 58)		From other areas (n = 71)		Total (n = 129)	
	%	CI 95%	%	CI 95%	%	CI 95%
Inverted sugar	13.8	6.9; 25.4	5.6	2.0; 14.2	9.3	5.3; 15.7
Sunset yellow	10.3	4.6; 21.4	7.0	2.9; 16.0	8.5	4.7; 14.8
Modified starch	10.3	4.6; 21.4	4.2	1.3; 12.5	6.9	3.6; 12.9
Aspartame	12.1	5.7; 23.4	9.8	4.7; 19.4	10.8	6.4; 17.6
Sodium benzoate	12.1	5.7; 23.4	7.0	2.9; 16.0	9.3	5.3; 15.7
Caramel IV	17.2	9.4; 29.4	12.7	6.6; 22.8	14.7	9.5; 22.0
Fructose and glucose	8.6	3.5; 19.3	1.4	0.1; 9.6	4.6	2.0; 10.0
Monosodium glutamate	27.6	17.4; 40.6	2.8	0.6; 10.7	13.9	8.9; 21.1
Maltodextrin	13.8	6.9; 25.4	0.0	-	6.2	3.1; 12.0
Nitrite and nitrate	24.1	14.7; 36.9	7.0	2.9; 16.0	14.7	9.5; 22.0
Potassium sorbate	5.2	1.6; 15.1	7.0	2.9; 16.0	6.2	3.1; 12.0
Tartrazine	12.1	5.78; 23.4	5.6	2.0; 14.2	8.5	4.7; 14.8

of the most frequently mentioned additives and/or ingredients, despite the low overall percentage.

The frequency of university students who reported having the habit of reading labels (59.6%) is higher than that found in the study with women aged 20 to 65 years, from four Brazilian state capitals, in which almost half (46%) of the interviewed women claimed to read the nutritional labeling of ultra-processed foods only sometimes. Regarding the main concerns in the choice of food, the results were also similar to those of this study, in which health, price and pleasure stood out in the decision making process[21]. Since in the health area group there was prevalence of women and in other areas there were more men, this may, to some extent, suggest that men have less interest in reading labels, confirming the findings of a systematic review on the use of nutrition labeling[22].

An assessment of label reading among supermarket chain consumers found that most consumers read labels at all times (48%) or sometimes (24%). Women stood out (76% versus 59% among men), but it was pointed out that the label is not always well understood by the consumers. This also highlights the importance of labeling to guide consumers about the constituents of food, promoting more sensible and healthier food choices[23].

A study with US adolescents has shown that the use of the label is related to healthier eating habits, such as smaller consumption of sugary drinks and higher consumption of fruit and vegetables. Considering this result, the authors pointed out that intervention strategies should include efforts to teach people about the use of labels to make healthy food choices[24]. Another Brazilian study found that individuals with chronic diseases had greater health concerns in their food choices[21]. It is assumed that individuals with chronic diseases receive some type of dietary orientation from healthcare professionals[11]. In this sense, they are similar to the health students evaluated in the present study, who are more concerned with this aspect (health) than those from other areas.

These findings are in agreement with a Brazilian study in which participants had a positive change of attitude toward the use of nutritional information on food labels and a greater understanding of that information when exposed to dietary orientation[25].

Only 21% of Brazilian women report fully understanding the content of label information. Aspects such as fine print and nutritional claims can contribute to the difficulty understanding this information[21]. A systematic review also points to the difficulty understanding labels. This suggests that even though people often say they do read the labels, more objective measurement reveals that their understanding of these labels can be quite low. Evidence suggests that consumers who check the labels may understand some of the terms used, make simple calculations and comparisons, but are confused about other pieces of information. The authors then suggest that improvements in nutrition labeling could make a small and important contribution to making the shopping environment more conducive to healthy choices[22].

Within the scope of actions that make up the regulatory agenda that aims to contribute to the promotion of healthy eating habits, the question of labeling, especially with models of front label with a warning, has gained strength[26]. In this regard, countries like Chile and Uruguay have developed front labeling models to make critical nutrient-related information clearer[27,28]. In Brazil, the nutrition labeling model is under discussion in Anvisa[29].

The results of the present study have shown that the number of students who would stop buying food with the surveyed additives and/or ingredients is low, even among students who claimed to be familiar with them. These data are worrying because of the possible health effects of these ingredients and additives[12,13,14,15,16,17,18,19]. Nevertheless, despite the low overall percentage of students who would not stop buying food with the aforementioned ingredients, when we compare the two groups, we can see that health students would stop buying them more

than students from other areas. Therefore, we can infer that knowledge about nutrition labeling makes a difference at the time of purchase. This also shows that more studies are necessary to investigate this topic and support the development of educational activities in spaces such as basic health units, schools and college cafeterias, for example. With that, this topic can be addressed in the context of high consumption of ultra-processed foods associated with the increase in noncommunicable chronic diseases[30]. Since 2008, there has been a consumer guidance manual on mandatory nutrition labeling prepared by Anvisa, which is poorly disseminated and used by healthcare professionals and the population. This can be a useful tool to encourage and facilitate people's understanding of labels[9].

This study has some limitations. The instrument used was not submitted to validity and reliability assessment. However, a labeling expert was consulted to discuss the relevance and content of the questions. As for the sample used, it was restricted to young adults, students from a single university. Nevertheless, it is noteworthy that the study has a heterogeneous sample, with representation of men and women from different courses and students of different income levels (quota and non-quota students), which reinforces its relevance. The final size of the sample was also higher than the number of students predicted in the sample calculation. Its importance is also highlighted by the fact that no study evaluating knowledge about additives and/or ingredients has been found and the importance of exploring this in a context of increased consumption of ultra-processed foods and the problems arising from their consumption.

CONCLUSIONS

The present study found a high frequency of university students who read food labels. Although they are familiar with only a few ingredients and/or additives, the presence of these ingredients and/or additives seems to influence the purchase decisions of the studied population. This indicates that nutritional labeling is important for their choices of food. These findings, especially about the students' level of knowledge, reinforce the importance of simpler labeling models and the fact that this subject should be addressed in different contexts to enable individuals to use labels as a tool to make decisions about their food purchases.

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Conflict of Interest

Authors have no potential conflict of interest to declare, related to this study's political or financial peers and institutions.