Nutritional Profile and the use "Whole Grains" Claims in Packaged Food in Brazil

Giovanna Andrade (✉ gi.calixto.andrade@gmail.com )
FMUSP: Universidade de Sao Paulo Faculdade de Medicina  https://orcid.org/0000-0002-1901-3093

Laís Amaral Mais
Brazilian Institute for Consumers Defense

Camila Ricardo
University of Chile: Universidad de Chile

Ana Clara Duran
State University of Campinas: Universidade Estadual de Campinas

Ana Paula Martins
Brazilian Institute for consumers defense

Research article

Keywords: Whole grains, claims, food packing, food labeling, list of ingredients, nutritional quality.

DOI: https://doi.org/10.21203/rs.3.rs-200460/v1

License: ☑️ This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License
Abstract

Background: Although the nutrition claim “whole grains” can be found in packaged foods marketed in Brazil, the current legislation does not establish composition or labelling criteria to its use, which may confuse and misinform consumers and lead to inadequate food choices. Thus, the present study aims to assess the use of “whole grains” claims in food products marketed in Brazil, and to assess the nutritional profile of these products.

Methods: We used data from 775 grain-based packaged foods collected in Brazil from April to July 2017. Using the INFORMAS’s protocol for food labelling, we estimated the prevalence of packaged foods with “whole grains” claims. The amount of whole grains was evaluated using the ingredients list. We compared the nutritional profile of the products with and without “whole grains” claims using the Pan American Health Organization (PAHO) nutrient profile criteria.

Results: Results show that about 19% of the assessed products had "whole grains" claims; of these, 35% did not have any whole grain among the top three ingredients. These products also had a high proportion of refined ingredients (e.g. refined flour and sugar) and were high in critical nutrients according to PAHO’s criteria.

Conclusion: Our results showed the need to improve Brazilian food labeling regulation in order to determine thresholds for wholemeal flour content to allow foods to receive “whole grains” claim.

Background

Whole grain is defined as the product from the cereal processing which maintains in its composition fractions that characterize the whole grain such as the endosperm, germ, and bran. The consumption of whole grains has been associated with a higher consumption of nutrients (such as dietary fiber, complex B vitamins, vitamin E, selenium, zinc, copper, and magnesium), and better diet quality (1). Additionally, studies indicate a positive association between the consumption of whole grains and a reduced risk of type 2 diabetes, obesity, coronary heart disease, cardiovascular disease, total cancer, and mortality from all causes (2–4).

Despite the benefits of whole grains, in Brazil, a national study conducted with a representative sample of the population in 2008/2009 showed that the consumption of whole grains was much lower than the consumption of refined grain products. The mean daily consumption of refined rice, for example, was 160.3 g/day while brown rice mean daily consumption was 8.1 g/day. The consumption of whole grain bread was on average 0.9 g/day, almost six times lower than the mean consumption of refined bread (53.0 g/day) (5).

Considering its beneficial effect on health, the World Health Organization (WHO) recommends that countries develop and implement strategies to promote the consumption of whole grains in food and
nutrition public policies (6). However, the current Brazilian legislation does not mandate that clear information on whole grains is made available for consumers.

Up to 2005, whole grains products were characterized in the Resolution of the National Commission of Food Standards (Comissão Nacional de Normas e Padrões para Alimentos – CNNPA) n° 12, of 1978 (7). However, at that point, this Resolution was revoked by the Resolution of the Collegiate Board (Resolução da Diretoria Colegiada – RDC) n° 263, which did not include a definition of whole grains products (8). In addition, there is no regulation about the minimum amount of wholemeal flour necessary for the use of the “whole grains” claim in food products, and the current legislation does not require any mandatory declaration of the percentage of wholemeal used in the composition of the product on food labels.

Gaps in the legislation concerning the use of “whole grains” claims are in foods sold in Brazil may deceive consumers at the point of purchase. Food labels are the consumer’s first contact with the package foods which should be able to clearly convey information on their nutrition content. The presence of health-related claims on food packaging may influence the consumer decision-making process, and lead to erroneous conclusions regarding the healthfulness of certain foods (9).

Considering the health benefits associated with the consumption of whole grains and the potential negative influence of the use of “whole grains” claims may have on consumer decision-making, the present study aimed to assess the prevalence of packaged foods sold in Brazil with claims for “whole grains” claims and their nutritional profile.

**Methods**

This is a cross-sectional study that used information collected on labels of packaged foods and beverages sold in the five food retail chains with the largest market share in Brazil, between April and July of 2017, in São Paulo and Salvador, which are located in the Southeast and Northeast regions of the country, respectively (10).

We used information from the Euromonitor International’s annual sales to select the supermarket chains where data collection was held (10). The addresses of the selected supermarket chain stores were geocoded and classified according to neighborhood income tertiles. To estimate the neighborhood income level of each supermarket, we measured a buffer of 1 km around each store and then used information on mean income of main house breadwinners available in the Brazilian Demographic Census 2010 (11). Two stores of each food retail chains were selected (one of the first tertile and one of the last tertile), prioritizing those with greater physical area. All the supermarket chains included in this study provided formal permission for data collection.

Previously trained fieldworkers photographed all package sides of all foods and beverages marketed in each food store according to the methods proposed by Kanter et al. (12). Subsequently, trained typists entered mandatory information from package foods, such as brand, origin, list of ingredients and information from the nutrition facts panel, in the online platform RedCap, using a form developed by the
University of North Carolina at Chapel Hill (UNC) from the United States (US) and by the Instituto de Nutrición y Tecnología de los Alimentos (INTA) from Chile, and adapted to be used in Brazil. Duplicated items, products without nutrition information, products available in more than one package size, and products with multiple items were excluded. In total, information from 11,434 products was collected.

Among these products, a sample with 30% of the items, totaling 3,491 products, was randomly selected and, in the present study, only grain-based products were included, totaling 775 products. We classified the selected food items according to the resemblance into six groups: bakery products; breakfast cereals and granola bars; cereals and flours; cookies; pasta; and savory snacks.

The prevalence of products with “whole grains” claims was estimated using the International Network for Food and Obesity/Non-Communicable Diseases (NCDs) Research, Monitoring and Action Support (INFORMAS) protocol for food labeling, which classifies health and nutrition claims according to format, type, class and content. The INFORMAS protocol stands out for being an internationally standardized methodology, allowing the comparison of studies that evaluate the marketing of packaged foods and beverages over time and across countries (13).

Among the products with “whole grains” claims, we estimated the number of times that the claim appeared all over the package, its format (verbal, numerical or symbolic), and the prevalence of products that declared the percentage of whole grains in the list of ingredients. Intra and interrater reliability analyses were performed (14).

To estimate the amount of whole grains in the food products, we used the list of ingredients. This information is mandatory by a Brazilian norm, and the ingredients are listed by quantity, with the ingredients used in the greatest amount first, followed in descending order by those in smaller amounts (15). We therefore chose to evaluate the first three ingredients in the list. First, we estimated the prevalence of products with “whole grains” claims that had whole grains among the top three ingredients on the list. Subsequently, the most frequent ingredients occupying the first three positions in the list of ingredients were computed. As our objective was to evaluate the degree of refinement, not the type of cereal, we chose to combine different cereals (such as corn, rice, oats, etc.) according to the industrial processing level in “whole grain” or “refined grain”.

Finally, to compare the nutritional quality of products in the same food group with and without a “whole grains” claim, we estimated the prevalence of grain-based food products with high content of critical nutrients (total fat, saturated fat, trans fat, free sugar, and sodium) and/or with any amount of non-caloric sweeteners according to the Pan American Health Organization (PAHO) nutrient profile model. The criteria to defining PAHO’s critical nutrient profile was based on WHO recommendations focusing on the prevention of obesity and NCDs. PAHO’s criteria also considers the purpose and extent of industrial processing to which the food was submitted, excluding unprocessed and minimally processed foods from the classification since recommendations define these food group as the basis for healthy eating (16). The nutrient content of food products was accessed using the nutrition facts panel, which is a mandatory information on the label of packaged foods marketed in Brazil (17).
(95%) were used to compare the prevalence of products with a high content of critical nutrients between foods with and without a “whole grains” claim.

Results

We evaluated 775 packages of grain-based food products, of which 147 (19.0%) contained at least one claim for “whole grains”. This claim was more frequent in cereals and flours (31.3%), followed by bakery products (22.3%), breakfast cereals and granola bars (21.0%), cookies (19.6%), pasta (13.2%) and savory snacks (3.7%) (Table 1).

Table 1
Prevalence of “whole grains” claims on the package of grain-based food products marketed in Brazilian supermarkets, 2017 (n = 775).

| Food products                  | n   | Products with “whole grains” claim % (CI 95%) |
|--------------------------------|-----|---------------------------------------------|
| Bakery products                | 175 | 22.3 (16.7;29.1)                            |
| Breakfast cereals and granola bars | 95  | 21.0 (14.0;30.5)                            |
| Cereals and flours             | 96  | 31.3 (22.7;41.2)                            |
| Cookies                        | 225 | 19.6 (14.9;25.3)                            |
| Pasta                          | 76  | 13.2 (7.1;22.8)                             |
| Savory snacks                  | 108 | 3.7 (1.4;2.5)                               |
| **Total**                      | **775** | **19.0 (16.3;21.9)**                      |

CI: confidence interval.

In many of the assessed products, the use of a “whole grains” claim appeared repeatedly throughout the package. In savory snacks and breakfast cereals and granola bars, a “whole grains” claim was found in the package up to three times. In bakery products, cookies and pasta packages it appeared up to eight times, and up to fifteen times in cereals and flours (data not shown). In all food subgroups, the most common claim format was verbal (90.5%), followed by numerical (21.8%) and symbolic (2.0%) (Table 2). “Whole grain” and “made with wholemeal”, “100% whole grain” and “5 whole grains” were the most frequently found expressions for the verbal and numerical claim format, respectively, while the main image used for the symbolic claim format was a wheat bough. Only 15.0% of breakfast cereals and granola bars, 9.1% of cookies, 5.0% of pasta, 3.3% of the cereals and flours, and 2.6% of bakery products packages reported voluntarily the percentage of whole grains in the list of ingredients. No savory snack did so (data not shown).
Table 2
Format of “whole grains” claims found in food packages. Grain-based food products with “whole grains” claim marketed in Brazil, 2017 (n = 147).

| Food products                        | n   | Products with “whole grains” claim |
|--------------------------------------|-----|------------------------------------|
|                                      |     | Numerical format | Verbal format | Symbolic format |
| Bakery products                      | 39  | 25.6%               | 94.9%        | 2.6%            |
| Breakfast cereals and granola bars   | 20  | 30.0%               | 90.0%        | 5.0%            |
| Cereals and flours                   | 30  | 23.3%               | 86.7%        | 3.3%            |
| Cookies                              | 44  | 20.4%               | 86.4%        | 0.0%            |
| Pasta                                | 10  | 0.0%                | 100.0%       | 0.0%            |
| Savory snacks                        | 4   | 0.0%                | 100.0%       | 0.0%            |
| **Total**                            | **147** | **21.8%**     | **90.5%**    | **2.0%**       |

Table 3 describes the most frequent ingredients in the composition of grain-based food products. Only 30% of breakfast cereals and granola bars, and pasta presented whole grains among the first three components of the list of ingredients. Refined grains were more frequently found in the list of ingredients of breakfast cereals and granola bars, bakery products, cookies and pasta compared to whole grains. In addition, sugar was found to be the main ingredient in the formulation of breakfast cereals and granola bars, bakery products and cookies. Vegetable fat was the second ingredient most frequently in savory snacks.
Table 3
Percentage of products with whole grains among the top three components in the list of ingredients and the main ingredients of grain-based food products presenting "whole grains" claim on the label, 2017 (n = 147).

| Food products                  | Products with whole grains among the top three ingredients | Most prevalent ingredients of products presenting "whole grains" claims |
|--------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------------|
|                                |                                                           | 1st                     | 2nd                     | 3rd                     |
| Bakery products                | 87.2%                                                     | Refined grain            | Whole grain             | Sugar                   |
| Breakfast cereals and granola bars | 30.0%                                                   | Refined grain            | Sugar                   | Whole grain             |
| Cereals and flours             | 76.7%                                                     | Whole grain              | Refined grain           | *                       |
| Cookies                        | 61.4%                                                     | Refined grain            | Whole grain             | Sugar                   |
| Pasta                          | 30.0%                                                     | Refined grain            | Eggs                    | Whole grain             |
| Savory snacks                  | 75.0%                                                     | Whole grain              | Vegetable fat           | Refined grain           |
| **Total**                      | **65.3%**                                                 |                         |                         |                         |

*Most of the products in the ‘cereals and flours’ group contained only one or two ingredients in the list of ingredients. Among the products that had three or more ingredients, there was a great variety of *in natura* and minimally processed food items, making it impossible to identify a more frequent ingredient.

Approximately 90% of the breakfast cereals and granola bars, bakery products, savory snacks, and cookies presented high amounts of at least one critical nutrient according to the PAHO’s criteria. This prevalence was lower in pasta and cereals and flours. No difference was found in the prevalence of products with high amounts of critical nutrients, according to the presence of "whole grains" claims in the package (Table 4).
Table 4
Prevalence of grain-based food products with high amounts of at least one critical nutrient according to the PAHO criteria, 2017 (n = 775).

| Food products                  | Without “whole grain” claim (n = 628) | % (CI 95%) | With “whole grain” claim (n = 147) | % (CI 95%) |
|-------------------------------|---------------------------------------|------------|------------------------------------|------------|
| Bakery products               |                                       | 91.2 (85.0;95.0) |                                     | 89.7 (74.8;96.3) |
| Breakfast cereals and granola bars |                                       | 62.7 (51.0;73.0) |                                     | 70.0 (45.0;86.9) |
| Cereals and flours            |                                       | 1.5 (0;10.5)    |                                     | 0.0        |
| Cookies                       |                                       | 93.9 (89.3;96.6) |                                     | 93.2 (80.1;97.9) |
| Pasta                         |                                       | 30.3 (20.2;42.7) |                                     | 30.0 (7.6;69.0) |
| Savory snacks                 |                                       | 93.3 (86.4;97.0) |                                     | 100.0      |
| Total                         |                                       | 73.1 (69.5;76.4) |                                     | 66.0 (57.9;73.3) |

CI: confidence interval.

Discussion

The use of “whole grains” claims is common in grain-based food products marketed in Brazil. Although many products use the “whole grains” claim in their package, only a few present the percentage of whole grains and not all contain whole grains among the ingredients in higher amounts in the products. Additionally, the presence of “whole grains” claims was found in products with high content of critical nutrients, such as total fat, saturated fat, trans fat, free sugar, and sodium, as well as the presence of non-caloric sweeteners (18).

This study found that only a third of the products with a “whole grains” claim had whole grains among the first three components of the list of ingredients, which can mislead consumers when attempting to purchase foods with this characteristic and looking for the health benefits related with it. In addition, these products presented high proportions of refined flour, sugar, saturated and trans fat, which are associated with increased risk of NCDs (16, 18–21).

When comparing the nutrition profile of similar foods with and without “whole grains” claim, we did not find any differences in the prevalence of products with high amounts of critical nutrients according to the PAHO criteria. Bakery products, savory snacks and cookies had the highest prevalence of excess critical nutrients. Cereals and flours and pasta, on the other hand, had the lowest prevalence of excess critical nutrients as these groups are basically composed of in natura or minimally processed foods – which have better nutrition profile comparing with ultra-processed food products and are excluded of the PAHO nutrient profile criteria (16, 22).
Similar studies have been conducted in other countries. In Canada, a study evaluating breads with "whole grains" claims showed that only 54% of the products presented a whole grain cereal as the first component of the list of ingredients. Also, products with "whole grains" claim were significantly higher in energy, total fat and sugars comparing to products without claims (23). In the US, study evaluating breakfast cereals marketed to children with a “whole grains” claim presented higher fat content, but also lower sugar content comparing to products without “whole grains” claim (24).

These findings are of concern as claims referring to specific product characteristics, such as nutrition content and presence of ingredients, can influence dietary choices as consumers tend to perceive the products with claims healthier (9).

In Brazil, complementary nutrition information and reporting of health properties on food labels are regulated by the RDC n° 54 and RDC n° 18, respectively, but, neither of them includes standards or criteria for the use of "whole grains" claims (25, 26). The only mandatory information that currently allows the identification of whole grains content in food labels is the list of ingredients. However, previous knowledge of the different terms for ‘whole grains’ is necessary for the available information to be correctly understood by the consumers. Also, information on the amount (in grams or percentage) of whole grains is not mandatory in the food label (23).

Regulations about the definition of whole grain, whole grain flour and the use of the “whole grains” claims vary from country to country, with some of them establishing minimum amounts of whole grain that a product must contain to be declared as a whole product. However, in general, all countries have gaps in the legislation. In the US, for example, for breads and pasta to be declared as a whole grain product must be made entirely of whole grain flour, and cannot contain refined flour in its composition. The use of whole grain claims, however, does not require minimum amounts of whole grain flour in the product (27). In the United Kingdom (UK), on the other hand, it is established that breads declared as whole grain or that contain a “whole grains” claim should be composed only by whole grain flour, but there is no definition for that ingredient (28).

In Brazil, considering the absence of definition, composition criteria and labeling standards of whole grain-based food products, the National Health Surveillance Agency (Agência Nacional de Vigilância Sanitária - Anvisa) is reviewing the regulation of these products. The agency recognized that the absence of a whole grain definition, the high proportions of refined ingredients in the formulation of whole grain-based foods and the lack of surveillance on the use of "whole grains" claims in package foods are the main causes of the information asymmetry, which can lead to consequences such as inadequate food choices by the consumers (29).

As a solution, Anvisa proposed that grain-based food products with "whole grains" claim should have at least 30% of whole grains. Additionally, the amount of whole grains should be greater than the refined grains (otherwise the claim must be accompanied by the percentage of whole grains in the composition
of the product, as well as in the list of ingredients) (29). The regulatory process is still ongoing in the country and the publication of the whole grain regulation is expected to happen by September 2020.

In addition to improvements on the information related to the content of whole grains in food labels, banning claims on the package of foods with high amounts of critical nutrients should be considered by Health Authorities. This would prohibit products with poor nutrition profile from being marketed with "whole grains" claim, preventing consumers from misinterpreting the quality of the product. Changes in the legislation of food labels in Brazil, however, are still being discussed.

This is the first study that evaluated the use of “whole grains” claims and the nutrition profile of packaged grain-based food products marketed in Brazil. Also, this study stands out because of its sample size and for using the PAHO nutrient profile model, which was developed based on scientific evidence by an Expert Consultation Group specifically for Latin America.

Nonetheless, no laboratory analysis was performed to verify the amount of whole grains in the composition of the products or to check their nutrition content, so the information used is based exclusively on what the companies declare on the food labels. However, the nutrition information from the labels of food products marketed in Brazil has been used without any indication that the percentage of erroneous information is relevant (30–32).

**Conclusion**

A significant proportion of products with a "whole grains" claim do not present considerable amounts of the wholemeal grains and, in general, are high in critical nutrients related to increase NCDs risks. Therefore, these claims lead to misleading interpretations of the consumers about the healthiness of the package foods available in Brazilian supermarkets. These results reinforce the need to improve Brazilian food labeling regulation in order to determine thresholds for wholemeal flour content to allow foods to receive “whole grains” claim, as well prohibit the use of such claims in products high in critical nutrients.

**Abbreviations**

World Health Organization (WHO)

Resolution of the National Commission of Food Standards (*Comissão Nacional de Normas e Padrões para Alimentos* – CNNPA)

Resolution of the Collegiate Board (*Resolução da Diretoria Colegiada* – RDC)

International Network for Food and Obesity/Non-Communicable Diseases (NCDs) Research, Monitoring and Action Support (INFORMAS)

Non-Communicable Diseases (NCDs)
Pan American Health Organization (PAHO)
National Health Surveillance Agency (Agência Nacional de Vigilância Sanitária - Anvisa)

Declarations

Ethical Standards Disclosure
The manuscript did not use data from humans or animals, and therefore there is no need for approval by the ethics committee.

All information contained in the file is original and, if necessary, the original database can be sent.

Consent for publication
Not applicable.

Availability of data and materials
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests
The authors declare no conflict of interest.

Funding
International Development Research Centre (IDRC) (project number 108166-001) and Bloomberg Philanthropies (project number 5104695).

Authors’ contributions
Giovanna C. Andrade, the first and corresponding author, participated in the design and planning of the study, analysis and interpretation of data and in the manuscript writing. The other authors, Laís Amaral Mais, Camila Zancheta Ricardo, Ana Clara Duran and Ana Paula Bortoletto Martins participated in the planning of the study, interpretation of data, critical review of the content and approval of the final version of the manuscript. All authors have reviewed and approved the final version of the manuscript.

Acknowledgments
We thank the International Development Research Centre (IDRC) and Bloomberg Philanthropies for financial support.
References

1. Slavin JL, Jacobs D, Marquart L, Wiemer K. The role of whole grains in disease prevention. J Am Diet Assoc. 2001;101(7):780-5.

2. Aune D, Norat T, Romundstad P, Vatten LJ. Whole grain and refined grain consumption and the risk of type 2 diabetes: a systematic review and dose-response meta-analysis of cohort studies. Eur J Epidemiol. 2013;28(11):845-58.

3. Aune D, Keum N, Giovannucci E, Fadnes LT, Boffetta P, Greenwood DC, et al. Whole grain consumption and risk of cardiovascular disease, cancer, and all cause and cause specific mortality: systematic review and dose-response meta-analysis of prospective studies. BMJ. 2016;353:i2716.

4. Ye EQ, Chacko SA, Chou EL, Kugizaki M, Liu S. Greater whole-grain intake is associated with lower risk of type 2 diabetes, cardiovascular disease, and weight gain. J Nutr. 2012;142(7):1304-13.

5. IBGE. Pesquisa de orçamentos familiares 2008-2009: análise do consumo alimentar pessoal no Brasil. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística; 2011.

6. WHO. Global Strategy on Diet, Physical Activity and Health. Geneva: World Health Organization; 2004.

7. Brasil. Resolução - CNNPA nº12. In: ANVISA, editor. Brasília: Ministério da Saúde; 1978.

8. Brasil. Resolução - RDC nº 263:. In: ANVISA, editor. Brasília: Ministério da Saúde; 2005.

9. Sundar A, Kardes FR. The Role of Perceived Variability and the Health Halo Effect in Nutritional Inference and Consumption. Psychol. 2015;32:512-21.

10. Euromonitor I. Passport: Grocery Retailers in Brazil. 2016.

11. IBGE. Censo demográfico 2010. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística; 2010.

12. Kanter R, Reyes M, Corvalán C. Photographic Methods for Measuring Packaged Food and Beverage Products in Supermarkets. Curr Dev Nutr. 2017;1(10):e001016.

13. Rayner M, Vandevijvere S. INFORMAS Protocol: Food Labelling Module.: University of Auckland; 2017.

14. Hallgren KA. Computing Inter-Rater Reliability for Observational Data: An Overview and Tutorial. Tutor Quant Methods Psychol. 2012;8(1):23-34.

15. Brasil. Resolução - RDC nº 184. In: ANVISA, editor. Brasília: Ministério da Saúde; 2002.

16. PAHO. Pan American Health Organization Nutrient Profile Model. Washington, DC: PAHO, WHO; 2016.

17. Brasil. Resolução - RDC nº 259. In ANVISA (Ed.). Brasília: Ministério da Saúde. 2002.

18. WHO. Diet, nutrition and prevetion of chronic diseases. Geneva: World Health Organization; 2003.

19. Mozaffarian D, Aro A, Willett WC. Health effects of trans-fatty acids: experimental and observational evidence. Eur J Clin Nutr. 2009;63 Suppl 2:S5-21.

20. Te Morenga L, Mallard S, Mann J. Dietary sugars and body weight: systematic review and meta-analyses of randomised controlled trials and cohort studies. BMJ. 2013;346:e7492.

21. WHO. Sugars intake for adults and children. Geneva: World Health Organization; 2015.
22. PAHO/WHO. Ultra-processed products in Latin America: trends, impact on obesity, policy implications. Washington: Pan American Health Organization / World Health Organization 2015.

23. Sumanac D, Mendelson R, Tarasuk V. Marketing whole grain breads in Canada via food labels. Appetite. 2013;62:1-6.

24. Schwartz MB, Vartanian LR, Wharton CM, Brownell KD. Examining the nutritional quality of breakfast cereals marketed to children. J Am Diet Assoc. 2008;108(4):702-5.

25. Brasil. Resolução - RDC nº 18. In: ANVISA, editor. Brasília: Ministério da Saúde; 1999.

26. Brasil. Resolução - RDC nº 54. In: ANVISA, editor. Brasília: Ministério da Saúde; 2012.

27. Food and Drug A. 21 Code of Federal Regulations. Part 21 current good manufacturing practice for finished pharmaceuticals United State. 1994.

28. Instruments UKS. The bread and flour regulations. 1998.

29. ANVISA. Alimentos à Base de Cereais Integrais: Documento de base para discussão regulatória. In: Alimentos G-Gd, editor. Brasília: Ministério da Saúde; 2018.

30. Machado PP, dos Santos Kraemer MV, Kliemann N, Colussi CF, Veiros MB, da Costa Proença RP. Serving sizes and energy values on the nutrition labels of regular and diet/light processed and ultra-processed dairy products sold in Brazil. British Food Journal. 2016.

31. Martins A, Andrade G, Bandoni D. Evaluation of food sodium level monitoring: a comparative analysis of goals for voluntary reduction in sodium intake in Brazil. Vigil sanit debate. 2015;3(2):56-64.

32. Ricardo CZ, Peroseni IM, Mais LA, Martins APB, Duran AC. Trans fat labeling information on brazilian packaged foods. Nutrients. 2019;11(9):2130.