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Evaluation of nutritional information and ingredients declared on labels of whole grain bread marketed in supermarkets in Belém, Pará, Brazil

Avaliação das informações nutricionais e ingredientes declarados em rótulos de pães integrais comercializados em supermercados de Belém, Pará

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Resumo

O pão de trigo integral desponta como uma das opções alimentares em crescimento no país, atraindo consumidores que buscam produtos mais saudáveis. Questiona-se, no entanto, em relação à quantidade de farinha de trigo integral empregada na produção desses pães, pois não é fixado na legislação nacional um quantitativo mínimo para adição de farinha integral. Assim, o objetivo do estudo foi analisar a tabela de informação nutricional e a lista de ingredientes de pães integrais comercializados em Belém, PA. Realizou-se estudo observacional e descritivo de 21 produtos coletados em três redes de supermercados da cidade de Belém que apresentavam a informação "integral", lista de ingredientes e tabela "Informação Nutricional" para porção de 50g. Observou-se, também, se havia inserções quanto ao conteúdo ou não de glúten, alérgenos, lactose, presenças dos selos da Associação Nacional de Assistência ao Diabético e do *Whole Grains Council*. A análise dos dados foi feita no programa BioEstat 5.3. Observou-se que em 71,4% dos pães a farinha de trigo integral comparecia em primeiro lugar na lista de ingredientes. Em média, esses pães apresentaram maior teor de proteínas e fibra alimentar. 76,2% apresentaram algum tipo de açúcar como ingrediente e 81% atendiam aos requisitos da Resolução 54/2012 da Anvisa como fonte de fibras, com correlação positiva com a quantidade de ingredientes. 14,3% continham a informação obrigatória da quantidade de colesterol de acordo com a Resolução 360/2003. Verificou-se substancial uso de aditivos, que colocam tais produtos na categoria de ultraprocessados e a não presença da farinha de trigo integral como primeiro ingrediente em 28,6% das amostras analisadas. Conclui-se que a terminologia "integral" associada

ao pão integral comercializado em Belém seja capaz de induzir o consumidor ao engano, indicando que o produto pode não ser, nutricionalmente, a melhor opção.

Palavras-chave: Rotulagem de Alimentos. Pão. Informação Nutricional. Legislação sobre Alimentos

Abstract

Whole wheat bread emerges as one of the fastest growing food options in the country, attracting consumers who are looking for healthier products. However, the quantity of whole-wheat flour used in the production of these breads is questioned, since a minimum quantity for the addition of it is not fixed in the national legislation. Thus, the objective of the study was to analyze the nutritional information table and the list of whole-grain ingredients commercialized in Belém, PA, Brazil, by reading their labels. An observational and descriptive study was carried out on 21 products collected in 3 supermarket chains in the city of Belém, which presented the "whole grain" information, ingredient list and "Nutrition Information" table for 50g portion. It was also observed whether there were insertions regarding the content of gluten, allergens, lactose, preservatives of the National Association of Diabetic Assistance and the Whole Grains Council. Data analysis was done with the BioEstat 5.3 program. It was observed that in 71.4% of the breads, whole wheat flour ranked first in the list of ingredients. On average, these breads presented higher levels of protein and dietary fiber. 76.2% presented some type of sugar as an ingredient and 81% met the requirements of Anvisa Resolution 54/2012 as a source of fiber, with a positive correlation with the quantity of ingredients; 14.3% contained mandatory information on the amount of cholesterol, according to Resolution 360/2003. There was substantial use of additives, which put such products in the ultraprocessed category and, the non-presence of whole wheat flour as the first ingredient, in 28.6% of the analyzed samples. It is concluded that the "whole grain" terminology associated with the whole wheat bread commercialized in Belém is capable of inducing the consumer to deceive, indicating that, nutritionally, the product may not be the best option.

Keywords: Food Labeling. Bread. Nutritional Facts. Legislation, Food.

Introduction

The intense association between dietary habits and the state of health of a population, in different age groups, is remarkable. Research has shown a low frequency of fruit and vegetable consumption, and highlights the consumption of sweet drinks and treats by children up to 10 years of age,[1-4] as well as inadequate diet among adolescents,[5] prevalence of factors associated with dietary inducers of chronic non-communicable diseases (NCDs), including cancer, in adults[6,7] and low quality diet in the elderly and consequent inadequacy of nutrient intake.[8-10]

In general, these studies are consensual in anticipating that such eating habits lead to common prognoses: they are causal factors of physiological dysfunctions that allow the manifestation of various diseases, necessitating effective actions to improve the quality of the diet that compromises the quality of life of the people, as Moreira et al[11] conclude in a review of 32 articles that evaluated the food quality of several Brazilian population strata using the Healthy Eating Index (HEI) as a monitoring tool.

Premised by the situation, certain groups of people, more attentive to improve their nutrition or instigated by indications of health professionals, are in search of more nutritious foods. One of the alternatives practiced is the substitution of salt bread or French bread for that produced with whole wheat flour.

Whole wheat bread is consumed in Brazil at very modest levels: less than one gram per day (0.191kg / year), compared to 53g of French bread (12,529kg / year), representing 1.9% compared to 63% of consumption of the salt bread, according to the Family Budgeting Survey (FBS) 2008-2009 conducted by the Instituto Brasileiro de Geografia e Estatística (IBGE) (Brazilian Institute of Geography and Statistics).[12]

Data from the Associação Brasileira das Indústrias de Biscoitos, Massas Alimentícias e Pães & Bolos Industrializados (Abimapi) (Brazilian Association of the Industries of Cookies, Pasta, and Industrialized Breads and Cakes)[13] show that processed breads totaled 4% of the national production in 2016, a fraction that considers the production of whole grain breads.

The use of whole wheat flour in bread, obtained from whole grains and composed of bran, germ and endosperm, guarantees a higher fiber content. According to Garcia et al,[14] adopting healthy habits with increasing consumption of high-fiber foods, coupled with adequate hydration, may decrease the incidence of intestinal constipation. Mello & Laaksonen[15] state that increased consumption of food products based on whole grains fiber sources have strong evidence for the prevention of metabolic syndrome and diabetes mellitus.

However, since September 22, 2005, there has been no specific official regulation in Brazil for the manufacture of whole grain breads, since the Agência Nacional de Vigilância Sanitária (ANVISA) (National Health Surveillance Agency), by Resolution RDC 263,[16] has defines the category "breads" as "products obtained from wheat flour and / or other flours, added with liquid, resulting from the fermentation process or not and cooking, and may contain other ingredients, provided that they do not de-characterize the products". As can be seen, the regulation failed to highlight the various classes of breads, including the whole grain bread, as well as the quantity of whole wheat flour composing this product.

According to Oro et al,[17] in Brazil, in general, mixtures with a maximum content of 60% of whole meal with refined flour are used, composition more in accordance with the preference of the consumer for more grown and soft breads than those produced only with whole meal. However, since a minimum quantity is not set in the legislation for the addition of whole meal, manufacturers are advised to offer products labeled 'whole grain' prepared with any percentage of whole wheat flour, perhaps without any added flour, or with bran added to refined flour, which may represent the supply of products nutritionally poorer than expected by the consumer.

On the other hand, as regulated by ANVISA, all packaged food put up for sale shall display on its labeling the list of ingredients, in descending order of their quantity in the composition of the product, according to Resolution RDC 259,[18] of September 20, 2002, and a standardized table with statement of the amount and energy value of the nutrients, in accordance with Resolution RDC 360,[19] of December 23, 2003.

In the booklet Compulsory Nutrition Labeling: Consumer orientation manual, ANVISA[20] states that labels are essential in the communication between products and consumers that, by examining the composition of nutrients and other information available by the instrument, can estimate the type and quality of the product that they intend to include in their diet and, therefore, enjoy its benefits.

This choice based on consumer knowledge of food properties, which is reliably labeled and easily understood, grows in importance as industrialized foods continue to grow at a steady pace since the 80's. Strategies to reduce or decelerate this consumerist expansion are missing, according to Martins et al.,[21] present in all income strata, as stated by Sparrenberger et al.[22]

Karnopp et al[23] reinforce this need for more attention to the deficient quality of the diet mainly of children under six years of age, but not restricted to them, according to the data of the Vigitel 2016 telephone inquiry.[24]

In this scenario, the study aimed to analyze the labels of the brands of whole grain bread marketed in supermarkets in Belém - Pará, Brazil, in order to verify the nutritional information, the ingredients used in its manufacture and compliance with the legislation in force in the country.

Methodology

This is an observational and descriptive study of the labels of all brands of whole grain breads marketed during the data collection period from July to September, 2017, in the three largest supermarket chains in the city of Belém - Pará, Brazil, selected by the 2016 ranking of the specialized magazine "*Supermercado Moderno*" (Modern Supermarket).[25] We examined products of different brands A (3), B (3), C (7), D (5), E (1) and F (2), totaling 21 specimens found on display on the shelves of the halls intended for the general public, at the headquarters and two branches of each establishment, in three alternating biweekly visits, no prior authorization for the collection being requested or required. The packaging of the products were photographed, each unit receiving a reduced identification code in order to carry out the respective analyzes and comparisons.

Only those products that contained the "whole grain" information, ingredient list and Nutrition Information table for 50g portion, were included in the study, excluding those that did not have this information.

The data of the respective energy value and the amounts of carbohydrates, sugars, proteins, total fats, saturated fats, trans fats, monounsaturated fats, polyunsaturated fats, omega-3, cholesterol, dietary fiber, sodium, calcium, iron, vitamin A, vitamin D and vitamin E were extracted and recorded in Microsoft Excel software spreadsheet.

It was also examined the suitability of the products to the Law 10,674,[26] of May 16, 2003 (presence of gluten), to the Resolution RDC 26,[27] of July 2, 2015 (food allergies), Law 13,305,[28] of July 4, 2016 (lactose content), presence of the seals of the Associação Nacional de Assistência ao Diabético (ANAD) (National Association for Diabetic Care)[29] and Conselho de Grãos Integrais (Whole Grains Council - WGC).[30]

Data analysis was done in the BioEstat 5.3 program, with the minimum, maximum, mean indicators, standard deviation and 95% confidence intervals (95% CI) being used to describe the quantitative variables, while for the qualitative variables, it was used the absolute, relative frequency and 95% CI.

The bilateral *Student's t-Test* was applied for independent samples and their corresponding non-parametric; when the variance was heterogeneous, *Mann-Whitney* test was applied to evaluate the association between the indication of whole wheat flour, as the first item in the list of ingredients, with the nutritional composition of the whole breads. In all analyzes, a significance level of 5% was considered.

Results and Discussion

After analyzing the 21 (twenty-one) product labels, a total of 64 (sixty-four) ingredients were observed, as shown in table 1, not including the chemical additives that were considered separately.

Table 1. Ingredients on labels of whole grain breads, by type and alphabetical order. Belém, PA, Brazil, 2017. 10=21]

Ingredients found*	N	%	IC95%
Sugar and candies			
Sugar	12	57,1	36,6 - 75,5
Brown sugar	9	42,9	24,5 - 63,5
Cane molasses	1	4,8	8,5 - 22,7
Cereals - Extract, Bran, Fibers and Flakes			
Malt extract	4	19,1	7,7 - 40,0
Barley malt extract	2	9,5	2,7 - 28,9
Wheat bran	5	23,8	10,6 - 45,1
Wheat Fiber	11	52,4	32,4 - 71,7
Oat flakes	6	28,6	13,8 - 50,0
Rye flakes	3	14,3	5,0 - 34,6
Barley flakes	1	4,8	8,5 - 22,7
Cereals - Flours			
Rice flour	1	4,8	8,5 - 22,7
Rye flour	2	9,5	2,7 - 28,9
Flax flour	6	28,6	13,8 - 50,0
Malt flour	3	14,3	5,0 - 34,6
Roasted malt flour	1	4,8	8,5 - 22,7
Corn flour	3	14,3	5,0 - 34,6
Whole grain corn flour	1	4,8	8,5 - 22,7
Enriched corn flour	1	4,8	8,5 - 22,7

to be continued

Ingredients found*	N	%	IC95%
Whole wheat flour	18	85,7	65,4 - 95,0
Fine whole wheat flour	1	4,8	8,5 - 22,7
Wheat flour enriched with iron and folic acid	14	66,7	45,4 - 82,8
Triticale flour	2	9,5	2,7 - 28,9
Cereals - Flour in bread mixes			
Dried pasta (durum wheat flour)	1	4,8	8,5 - 22,7
Light whole grain mixture	1	4,8	8,5 - 22,7
Ready mixture for whole wheat bread	1	4,8	8,5 - 22,7
Cereals - Grains			
Roasted barley	1	4,8	8,5 - 22,7
Oat grains	4	19,1	7,7 - 40,0
Rye grains	3	14,3	5,0 - 34,6
Barley grains	2	9,5	2,7 - 28,9
Millet grains	3	14,3	5,0 - 34,6
Quinoa grain	3	14,3	5,0 - 34,6
Triticale grain	3	14,3	5,0 - 34,6
Legumes – soy			
Soy flour	1	4,8	8,5 - 22,7
Degreased soybean meal	1	4,8	8,5 - 22,7
Soy Flakes	2	9,5	2,7 - 28,9
Soy grits	3	14,3	5,0 - 34,6
Oil and fat			
Vegetable fat of palm	2	9,5	2,7 - 28,9
Golden linseed oil	1	4,8	8,5 - 22,7
Soybean oil	1	4,8	8,5 - 22,7
Soybean oil	10	47,6	28,4 - 67,6

to be continued

Ingredients found*	N	%	IC95%
Salts			
Salt	17	81,0	60,0 - 92,3
Hyposodic salt	2	9,5	2,7 - 28,9
Iodized refined salt	1	4,8	8,5 - 22,7
Iodized salt	2	9,5	2,7 - 28,9
Potassium chloride	2	9,5	2,7 - 28,9
Oil seeds			
Cashew nut	2	9,5	2,7 - 28,9
Castanha do Pará	2	9,5	2,7 - 28,9
Sesame	5	23,8	10,6 - 45,1
Nut	1	4,8	8,5 - 22,7
Flax Seed	9	42,9	24,5 - 63,5
Golden linseed	2	9,5	2,7 - 28,9
Sunflower seed	9	42,9	24,5 - 63,5
Other			
Water	3	14,3	5,0 - 34,6
Cocoa	1	4,8	8,5 - 22,7
Cellulose	1	4,8	8,5 - 22,7
Biological yeast	4	19,1	7,7 - 40,0
Gluten	17	81,0	60,0 - 92,3
Inulin	1	4,8	8,5 - 22,7
Vinegar	11	52,4	32,4 - 71,7
Raisin	1	4,8	8,5 - 22,7

The most frequent compounds in the list of ingredients were: whole wheat flour (n = 19, 90.5%), salt (n = 17, 81.0%), gluten (n= 17; 81.0%), wheat flour enriched with iron and folic acid (n = 14, 66.7%), sugar (n = 12, 57.1%), wheat fiber (n = 11, 52.4%) and vinegar (n=11; 52.4%).

According to the Resolution RDC 259/2002,[18] packaged products shall display the list of ingredients, in descending order of the respective proportion used, on the labeling. Four products analyzed (19.0%), of the brand D, carried the phrase "All packages show the ingredients in order of quantity, the first one on the list being the one most present in the product", drawing the consumer's attention to the presence of the list of ingredients in the product and the meaning of the first ingredient in the list. This is what the consumer expects: breads with the "whole grain" inscription on the label must present the whole wheat flour as the most used ingredient, and thus it must take first place in the list of ingredients.

In the research, however, 19 products (90.5%) contained whole wheat flour, but only 15 products (71.4% included whole wheat flour as the first item in the list of ingredients, being seven products (33.3%) of brand C; five products (23.8%) of brand D; two products (9.6%) of brand F, and one product (4.8%) of brand E.

Six products (28.6%) did not have whole wheat flour as the first item in the list of ingredients: four of them (19.0%) contained whole wheat flour in positions other than the first in the list of ingredients: two products (9.6%) of brand A and two products (9.6%) of brand B; but the remaining two products (9.6%), one product (4.8%) of brand A and one product (4.8%) of brand B, did not contain any amount of whole wheat flour in their composition, even presenting the inscription "whole grain" on their labels, which can be considered as serious consumer misinformation.

In the evaluation of 30 labels of whole grain breads, conducted in 2014 by Silva et al[31] in the city of Caxias do Sul (RS), Brazil, the authors observed that 60% of the samples (n = 18) did not present the whole wheat flour as the first item in the list of ingredients. They also recorded a percentage close to that found by Proteste - Associação Brasileira de Defesa do Consumidor (Brazilian Association of Consumer Protection)[32] which in 2012 performed a quality test on a total of seven products, verifying that four breads (57%) did not have whole wheat flour as the first ingredient.

In another study, conducted in 2016 by Silva et al[33] in hypermarkets in Salvador-BA, Brazil, with ten whole wheat flour breads, the authors observed that 40% (n = 4) did not contain whole wheat flour as the first ingredient. These studies show a gradual reduction (2012=57%; 2014=60%; 2016=40%) in the percentage of products without whole wheat flour as the first ingredient until the data of this work (2017 = 28.6%) which still indicate a high probability that the consumers - not attentive to the reading of the list of ingredients - will acquire a product of inferior quality than they intended to, if they are restricted only to the observation of the "whole grain" labeling, and with the aggravating circumstance that, as placed in the present research, two products did not even have whole wheat flour in their composition.

Another verification was the relation of the presence of whole wheat flour as the first ingredient and the nutritional composition of the product (table 2). It was observed that the products of the research with whole wheat flour as first component presented higher average amount of dietary

fiber and proteins (3.31 g and 6.11 g), respectively ($p < 0.05$). The study carried out by Silva et al,[31] in 2014, with 30 labels, found a mean fiber content of 3.3g for the products with whole meal as the first ingredient, similar to the average of the present findings.

Table 2. Association between whole wheat flour as 1st ingredient and nutritional composition of breads. Belém, PA, Brazil, 2017.

Nutritional Composition	Whole wheat flour as the first item in the list of ingredients								
	Yes				No				
	Minimum	Maximum	Average	SD	Minimum	Maximum	Average	SD	p†
Energy (kcal)	105,00	137,00	117,90	7,79	105,60	126,00	114,50	9,11	0,452
Carbohydrates (g)	12,50	22,00	18,41	2,42	19,00	23,00	20,62	1,65	0,072
Sugar (g)	0,20	1,00	0,50	0,44	0,00	0,00	0,00	0,00	0,164
Protein (g)	2,40	8,70	**6,11**	1,33	3,40	5,30	4,48	0,99	0,021*
Total fat (g)	0,70	2,80	1,74	0,66	0,30	2,40	1,02	0,88	0,061
Saturated Fat (g)	0,00	1,00	0,37	0,21	0,00	0,90	0,38	0,41	0,935
Trans Fat (g)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-
Monounsaturated fat (g)	0,00	0,80	0,15	0,26	0,00	0,70	0,26	0,30	0,427
Polyunsaturated fat (g)	0,00	1,40	0,29	0,45	0,00	0,50	0,24	0,23	0,801
Linoleic Fatty Acid (mg)	0,00	430,00	26,88	107,50	0,00	0,00	0,00	0,00	0,836††
Cholesterol (mg)	0,00	0,00	0,00	0,00	0,00	0,30	0,12	0,16	0,186††
Food Fiber (g)	2,00	4,30	**3,31**	0,64	1,00	3,30	2,06	1,13	0,005*
Sodium (mg)	71,00	208,00	163,09	32,31	1,70	252,00	141,32	128,23	0,509††
Calcium (mg)	0,00	209,00	15,13	52,35	0,00	6,95	2,77	3,79	0,457††
Iron (mg)	0,00	0,75	0,05	0,19	0,00	0,02	0,01	0,01	0,302††
Vitamin A (Mg)	0,00	95,00	5,94	23,75	0,00	0,00	0,00	0,00	0,836††
Vitamin D (Mg)	0,00	0,80	0,05	0,20	0,00	0,00	0,00	0,00	0,836††
Vitamin E (Mg)	0,00	1,80	0,11	0,45	0,00	0,00	0,00	0,00	0,836††

Source: Data collection (n=21) †Bilateral Student t test for independent samples; ††Mann-Whitney test for independent samples, heterogeneous variance.

*Significant differences.

On the other hand, when the hypothesis of the correlation between the amount of ingredients and the nutritional composition of the product was tested, a significant correlation with the amount of total fat (strong positive; $r = 0.70$, $p = 0.001$) was observed with the values of protein (moderate positive, $r = 0.65$, $p = 0.001$) and fibers (weak positive, $r = 0.43$, $p = 0.047$).

These distinct results may derive from the fact that some of the ingredients added for the purpose of adding nutritional value - such as flour and linseed meal, sunflower seed, sesame, bran and wheat fiber, flakes and grains of oats, rye and barley, cashew nuts and Brazil nuts, millet grains, wheat, triticale and quinoa - affect differently the breads with or without wholemeal flour as the first ingredient, because of the higher fiber and protein content, but also because of the added fat content. This addition of other ingredients is provided by Resolution RDC 263,[16] since no not in character with the products.

Use of Complementary Nutrition Information

The study also collected data regarding the use of Complementary Nutrition Information (Declarations of Nutritional Properties), standardized by ANVISA in Resolution 54,[34] of November 12, 2012, as summarized in table 3.

Table 3. Complementary nutritional information on labels of whole grain breads. Belém, PA, Brazil, 2017.

Complementary Nutrition Information	It states				It fits			
	Yes		No		Yes		No	
	N	%	N	%	n	%	n	%
Low energy value or does not contain it	0	0,0	21	100,0	0	0,0	21	100,0
Low sugar value or does not contain it	2	9,5	19	90,5	2	9,5	19	90,5
With warning (This is not a food with low content of...)	2	9,5	19	90,5	2	9,5	19	90,5
No added sugar	4	19,0	17	81,0	5	23,8	16	76,2
Protein source	2	9,5	19	90,5	8	38,1	13	61,9
Low total fat or does not contain it	4	19,0	17	81,0	7	33,3	14	66,7
With warning (This is not a food with low content of...)	3	14,3	18	85,7	3	14,3	18	85,7
Low saturated fat content	2	9,5	19	90,5	20	95,2	1	4,8
Does not contain trans fat	8	38,1	13	61,9	20	95,2	1	4,8
Source of Omega 3 fatty acids	1	4,8	20	95,2	1	4,8	20	95,2
Low in cholesterol or does not contain it	3	14,3	18	85,7	9	42,9	12	57,1
Source of fibers or high content	18	85,7	3	14,3	17	81,0	4	19,0
Low or very low in sodium, or does not contain it	1	4,8	20	95,2	3	14,3	18	85,7
Reduced in sodium	2	9,5	19	90,5	2	9,5	19	90,5
Without added salt	0	0,0	21	100,0	1	4,8	20	95,2
Calcium source	1	4,8	20	95,2	1	4,8	20	95,2
Source of Vitamin A or high content of it	1	4,8	20	95,2	1	4,8	20	95,2
Source of Vitamin D or high content of it	1	4,8	20	95,2	1	4,8	20	95,2
Source of Vitamin E or high content of it	1	4,6	20	95,2	1	4,8	20	95,2

Source: Data collection (n=21)

Said resolution defines that Supplementary Nutritional Information (Nutrition Properties Statements) "is any representation that affirms, suggests or implies that a food has particular nutritional properties, especially, but not only, in relation to its energetic value and / or its content proteins, fats, carbohydrates and dietary fiber, as well as its vitamin and mineral content."[34]

As a rule, they are statements about the content of nutrients contained in the food or comparisons with reference food that serves as a parameter for various attributes, such as "no addition" (the food has no added sugar), "does not contain" or " low "(maximum of 4 or 40 kcal per serving), "source" or "high content" (minimum of 2.5g or 5g of fiber), "reduced"(minimum reduction of 25% in energy value) or "increased" (minimum increase of 25% in dietary fiber content), etc.

No product (0%) met the requirement to qualify as a low energy product. The results indicate high energy values in all the products surveyed, around triple the maximum of 40kcal per 50g portion. The lowest caloric value in the samples was 105.0 kcal and the highest one was 137.0 kcal, with an average energy value of 117.07 kcal. For carbohydrates, the minimum quantity was 12.5g and the maximum of 23g, average of 18.93g per 50g portion.

These values are close to the study of Silva et al,[33] in 2016, which also observed high levels in the energetic value (minimum of 104,0kcal and maximum of 138,0kcal; average of 115,9kcal) and in the amount of carbohydrates (minimum of 14,0g and maximum of 28g; average of 19.6g) in a sample of 10 whole grain breads in hypermarkets of Salvador-BA, Brazil.

With regard to the sugar content, two products (9,5%) of brand D claimed to contain zero sugar (maximum 0.5g per serving); four products (19.0%), being two of brand D (9.5%), one of brand B (4.8%) and one of brand F (4.8%) reported not containing or adding sugars, and three products (14.3%), being two of brand D (9.5%) and one of brand F (4.8%) reported the amount of sugars in the nutritional information table. 18 products (85.7%) did not present such information, although in 16 samples (76.2%), being three products (14.3%) of brand A; two (9.5%) of brand B; seven (33.3%) of brand C; three (14.3%) of brand D and one (4.8%) of brand F presented at least one type of added sugar (cane syrup, sugar or brown sugar) in the respective list of ingredients.

In the latter case, even if mandatory only when there is a declaration of nutritional properties, according to item 3.1.4 of Resolution 360/2003,[19] express reference to the amount of sugars in the separate "Nutritional Information" table, below the amount of carbohydrates, would give greater transparency to the added ingredient, serving as a warning especially to obese and diabetic consumers.

In relation to the protein source claim, two products (9.5%) of brand B, presented such information, however, the quantities shown on the labels (2.4g and 3.4g) were lower than the minimum quantity of 6g expected, in breach of Resolution 54/2012.[34] A total of eight products (38.1%), being four (19.0%) of brand C, two (9.5%) of brand D, one (4.8%) of brand E and one (4.8%)

of brand F provided the conditions to characterize themselves as a protein source, but did not claim this condition on the labels, while 13 samples (61.9%) did not meet the minimum condition of the attribute, being three products (14.3%) of brand A, three (14.3%) of brand B, three (14.3%) of brand C, three (14.3%) of brand D and one (4.8%) of brand F.

In the study carried out by Silva et al,[33] in 2016, in a sample of 10 breads, 6 products (60.0%) met the conditions of protein sources, while the remaining four (40%) did not meet the terms of Resolution 54/2012.[34] Comparing both studies, this research had a higher percentage (61.9%) of non-protein sources, contrary to the expectation that the breads were also rich in nutrients.

Regarding the attribute 'does not contain total fats', two products (9.5%) of brand B met the requirements (maximum of 0.5g of total fats) and did not contain other fats above zero or other ingredients that would be understood as food with fats. Three other products (14.3%), being one product (4.5%) of brand A and two (9.5%) of brand D claimed to have low total fat content (maximum 3g), complying with the requirements of the legislation. The remaining 18 products (85.7%), although containing less than 3g of declared total fats, did not meet the other requirements of Resolution 54/2012[34] (sfulfill the conditions for the "low or reduced energy value" attribute or insert the phrase "This is not a low or energy-reduced food").

All products (100%) met the low saturated fat conditions (maximum of 1.5 g of the sum of saturated and trans fats; meet the conditions for the attribute "does not contain" trans fats; and do not exceed saturated fats, 10% of the total energetic value of the food) and trans fats (maximum 0.1 g and fulfill the low content conditions for saturated fats).

None of the 21 products (100.0%) complied with the minimum requirements for the framework as source of omega 6 and 9 fatty acids, and one product (4.8%) of brand C claimed and met the source conditions of omega 3. In the study carried out by Silva et al,[33] in 2016, all ten products met the requirements of low total fat sources, none presented trans fat values, four products (40.0%) contained no saturated fat and six products (60.0%) contained low saturated fat under the terms of Resolution 54/2012.[34]

As for the cholesterol content, the Resolution 360/2003[19] determines that, when the amount of cholesterol present in the food is declared, it must be affixed to the label below the quantity of total fat, with nine products (42.9%) presenting register in the regulatory form. Concerning the conditions of Resolution 54/2012,[34] six products (28.6%), being three products (14.3%) of brand A, two (9.5%) of brand C and one (4.8%) of brand F presented conditions to claim the "not-containing" or "low" attribute in cholesterol (maximum 5 mg or 20 mg of cholesterol, respectively, and "low saturated fats"), but did not present it, and three products (14.3%), being two products (9.5%) of brand D and one (4.8%) of brand F presented this property in accordance with the regulations.

In relation to the fiber content, 16 products (76.2%), two products (9.5%) of brand A, seven (33.3%) of brand C, five (23.8%) of brand D, one (4.8%) of brand E and one (4.5%) of brand F

claimed to be fiber sources and met the minimum content of 2.5g per serving to ensure the attribute provided in Resolution 54/2012.[34] One product (4.8%) of brand F did not make such a claim, but met the requirements to do so. The remaining four products (19.0%), being one product (4.8%) of brand A and three (14.3%) of brand B, did not meet the minimum requirements of fiber sources, and two products (9.5%) of brand B incorrectly presented such a condition.

The study carried out by Silva et al,[33] in 2016 found that of the ten products examined, six products (60.0%) could be classified as "source" of fibers (minimum of 2.5g per 50g portion) and one product (10.0%) complied with the requirements for framing as "high content" of fibers (minimum of 5g per 50g portion).

Regarding the sodium content, this was the micronutrient found in greater quantity, with a minimum of 1.7mg and a maximum of 252.0mg, an average of 157.9mg (SD 64.51). One product (4.8%) of brand C, with 71mg of sodium, stamped the claim "I have less sodium", being in the condition of "reduced in sodium" also indicating the reference product; one product (4.5%) of brand E announced the condition "LIGHT: 31% less sodium than the average", had 173mg of sodium and did not meet the condition of "low" (maximum of 80mg of sodium). Two products (9.5%) of brand B reported containing only 1.7mg and 1.9mg of sodium, each one, but did not claim to fit the attribute "Does not contain" sodium, even considering the condition of containing a maximum of 5mg of sodium per 50g portion. Eighteen products (85.7%) contained high amounts of sodium (above 80mg per serving). Twenty products (95.2%) included in the list of ingredients the addition of salt with the name 'sodium chloride' (17 = 81.0%); 'hyposodium salt' (2 = 9.5%) and iodized salt or iodized refined salt (3 = 14.3%).

In the research of 30 labels carried aout by Silva et al,[31] in 2014, the authors found an average of 185.3mg (SD = 54.5) for the amount of sodium, more than double the amount for the "low" attribute, observing that it is one more factor to consider when choosing the product for consumption. They also observed an inverse correlation between the amount of fibers and sodium, although not statistically significant ($p = 0.55$).

Another study carried out by Silva et al,[33] in 2016 found that, in the 10-unit sample, one product (10.0%) met the "low" sodium content, and also reported that the sodium content in the samples was lower as the amount of fiber was higher.

The high sodium content found in these studies refers to the concern to reduce the addition of salt in Brazil, which, in the words of Louzada et al,[35] goes through both the reduction in sodium content added to industrial products and the reduction of salt added in cooking preparations.

Regarding vitamins and minerals, one product (4.8%) of brand C claimed to be a source of vitamins A, D, E and calcium, taking into account the regulatory conditions (at least 15% of the IDR per serving). A further three products (14.3%) of brand B contained calcium and iron, but did not fulfill the conditions of the attributes to be sources of these minerals (minimum of 15% of the IDR).

No whole breads have been identified with low energy claims or 'do not contain'; reduced energy value; reduced sugars; reduced total fat content; rich or source of monounsaturated and polyunsaturated fats, and source or high content of iron.

Chemical additives in whole grain breads

The use of food additives is justified for technological reasons to maintain quality, to intensify or modify organoleptic properties and to increase durability, and its use in bakery products is regulated by the ANVISA Resolutions 383,[36] of August 5, 1999, 45[37] and 46,[38] both of November 3,2010. They can always be used in sufficient quantity to obtain the expected technological effect, without altering the identity and the genuineness of the food and, according to what Romeiro & Delgado stated,[39] not for nutritional purposes.

28 types of chemical additives (table 4) were identified in the list of ingredients, among acidifiers, acidulants, flavorings, conditioners, preservatives, sweeteners, emulsifiers, enzymes, thickeners, treatment agents and flour improvers. The average of chemical additives added was 5.7 (SD 2.8), ranging from one to twelve. The most present additives were calcium propionate (n=19; 90.5%), ascorbic acid (n=17; 81.0%) and sorbic acid (n=12; 57.1%). 2 products (9.5%) of brand C contain unspecified flavorings.

Table 4. Chemical additives on labels of whole grain breads, according to type and alphabetical order. Belém, PA, Brazil, 2017. (n=21)

Chemical Additives*	n	%	IC95%
Acidifier / acidulant			
Citric acid	1	4,8	8,5 - 22,7
Lactic acid	6	28,6	13,8 - 50,0
Aromatizers			
Not Specified	2	9,5	2,7 - 28,9
Mass conditioner			
Not Specified	1	4,8	8,5 - 22,7
Conservative			
Sorbic acid	12	57,1	36,6 - 75,5
Calcium propionate	19	90,5	71,1 - 97,4

to be continued

Chemical Additives*	n	%	IC95%
Artificial sweetener			
Sucralose	1	4,8	8,5 - 22,7
Emulsifiers / thickeners			
Diacetyl tartaric acid	3	14,3	5,0 - 34,6
Sodium carboxymethylcellulose	1	4,8	8,5 - 22,7
Calcium stearoyl-2-lactyl lactate	9	42,9	24,5 - 63,5
Sodium stearoyl 2-lactyl lactate	2	9,5	2,7 - 28,9
Guar gum	3	14,3	5,0 - 34,6
Mono and diglycerides of fatty acids	6	28,6	13,8 - 50,0
Monoglycerides	3	14,3	5,0 - 34,6
Polyoxyethylene (20) sorbitan monooleate	1	4,8	8,5 - 22,7
Polysorbate 80	8	38,1	20,8 - 59,1
Enzymes			
Phospholipase	1	4,8	8,5 - 22,7
Hemicellulase	1	4,8	8,5 - 22,7
Improvers / treatment agents			
Ascorbic acid	17	81,0	60,0 - 92,3
Alpha amylase	3	14,3	5,0 - 34,6
Calcium carbonate	1	4,8	8,5 - 22,7
Ammonium chloride	4	19,1	7,7 - 40,0
Monocalcium phosphate	10	47,6	28,4 - 67,6
Calcium sulphate	1	4,8	8,5 - 22,7
Vitamins			
Vitamin A	1	4,8	8,5 - 22,7
Vitamin D	1	4,8	8,5 - 22,7
Vitamin E	1	4,8	8,5 - 22,7

Source: Data Collection IC95: Confidence Interval of 95%; (n=21).

The large amount of additives in the whole breads examined arouses apprehension. Even though they are allowed by health professionals and have passed a toxicological evaluation, the additives can cause adverse reactions mainly in children, as they are the most susceptible, according to a systematic review by Polonius et al.[40]

Fai et al,[41] state that chemical preservatives are related to toxicological risk and to consumer health, a conclusion similar to that of Conte,[42] which reports that processed / industrialized foods have chemical elements that are cumulative in the body and have the potential to cause adverse effects with continued, short or long term use.

In a review of the literature on food additives, their applications and toxicology, Honorato et al,[43] consider that, while their intentional addition in controlled doses is allowed by the Ministry of Health, more trials are needed to determine the potential for harmful effects of these ingredients.

Other Regulations

Law 10.674/2003,[26] determines that marketable food products in the country must contain the inscriptions "contains Gluten" or "does not contain Gluten" as a means of preventing and controlling celiac disease. All 21 products (100%) examined met the legal precept.

Concerning the declaration of interest of allergic consumers, addressed in Resolution RDC 26/2015[27] and which should be included in the potential foods that cause food allergies, 18 products (85.7%) presented the warning, with three products (14.3%) not presenting it, being two (9.5%) of brand B and one (4.8%) of brand E.

Law nº 13.305/2016[28] provides that the labeling must indicate the presence of lactose or its remaining content when the original content has been altered. Two products (9.5%) of brand A complied with the legal precept. 19 products (90.5%), being one product (4.5%) of brand A, three (14.3%) of brand B, seven (33.3%) of brand C, five (23.8%) of brand D, one (4.5%) of brand E and two (9.5%) of brand F disregarded the law by failing to record information of fundamental interest to intolerant consumers.

With a similar purpose, the Associação Nacional de Atenção ao Diabetes (ANAD) (National Association of Diabetes Care),[29] a philanthropic entity, authorizes producers to exhibit their "ANAD Quality and Trust Seal". Two products (9.5%) of brand D had the seal, with 19 products (90.5%), being three (14.3%) of brand A, three (14.3%) of brand B, seven (33.3%) of brand C, three (14.3%) of brand D, one (4.5%) of brand E and two (9.5%) of brand F abstaining from doing so.

The adhesion of producers to the control carried out worldwide by the private institution *Whole Grains Council* - WGC[30], of voluntary nature, can assist the consumer in verifying the quantity of whole grains that the manufacturers offer in their products.

The WCG[30] certifies products containing at least 8g of whole grains per serving, without requiring a minimum of 50% whole grains, on the basic seal; 8g of whole grains and at least half of whole grains, in the 50%+ stamp; and minimum of 16g with all 100% whole grains, for the 100% seal.

Twelve products (57.1%) analyzed, being seven products (33.3%) of brand C and five products (23.8%) of brand D, had the seal, being ten with the basic seal (47.6%), one with the seal 50%+ (4.8%) and one with the 100% seal (4.8%).

Industrialized Products

As already reported, the acquisition by Brazilians of industrialized products increases, and thus, the consumption of high energy products due to the high levels of sodium, total saturated fats and sugars, and low levels of dietary fibers and nutrients in foods.[44]

It should be noted that according to the Guia Alimentar para a População Brasileira - 2014 (Dietary Guidelines for the Brazilian Population),[45] "Breads and baked goods become ultraprocessed foods when, in addition to wheat flour, yeast, water and salt, their ingredients include substances such as hydrogenated vegetable fat, sugar, starch, whey, emulsifiers and other additives". In addition, the Guide warns that the consumption of these nutritionally unbalanced and highly caloric foods favors the outbreak of heart disease, diabetes, obesity, various types of cancer and nutritional deficiencies.

Indeed, it cannot be ignored that very high quantities of ingredients, mainly chemical additives, for reasons already said, make foods ultraprocessed and therefore unsuitable for regular consumption, even in small quantities, because the benefits that would come from the potential of fibers, as sustained by Silva & Mura,[46] or any other nutrient that these products may contain, may be canceled out by the inconveniences caused by the excessive content of "cosmetic" components employed, far from being considered harmless, as Monteiro et al. state.[47]

Compulsory Labeling

There is a set of tests that refers well to the importance of labeling with reliable information for clarifying the quantities and nutritional properties of foods to consumers. Lobanco et al,[48] in the evaluation of nutritional information declared on labels of 153 foods commercialized in the city of São Paulo-SP, Brazil, report that they found high levels of nonconformities, pointing out also other studies with similar results and stressing that it is fundamental to have absolute legitimacy in the data on the labeling.

Câmara et al,[49] in a literature review, found that there are many inadequacies in food labels, especially nutritional information, resulting from lack of supervision.

Finally, Lindemann et al[50] recognize the reading of the labels as a useful tool for health promotion, needing to be popularized by educational campaigns and interaction between health professionals and users. These actions, as reinforced by Garcia et al,[51] associated with the correct information on the labels, will allow the consumer to choose foods that are more suited to their different needs.

Other Considerations

By the way, in the Chamber of Deputies, the Bill 6.797,[52] of 2017, with a view to amending the Law Decree 986,[53] of October 21, 1969 is in process for defining whole grain food and stipulating conditions so that products made from cereals and their flours can receive the denomination of "whole grain".

This would restore the conditions in force at the time of Resolution RDC 12,[54] of July 24, 1978, which classified whole wheat bread as the product prepared with at least 50% whole wheat flour and thus remedy the existing legal gap and the vulnerability of the consumer to the market.

This work presented some limitations: the main factor was the absence of legal prescription for the minimum amount of presence of whole wheat flour that did not allow to verify if the analyzed products were effectively characterized as whole grain breads, leaving only the alternative to rely on the register of the content of whole wheat flour as the first component in the list of ingredients.

Another issue is the reduced number of studies addressing the nutritional composition of whole grain breads, making it difficult to evaluate the effective composition of the products. The fragile emphasis on ingredient lists and nutritional information in the transparent plastic casings also made it difficult to read the labels for data extraction. Certainly, this is one of the difficulties that the consumer faces in reading the labels of these products.

Conclusion

The evaluation of the labels of the whole grain breads made it possible to size products that did not contain whole wheat flour as the first ingredient, but it cannot be said that there was negligence regarding the applicable legislation, due to the legal non-mandatory minimum value of whole wheat flour in its composition. On average, the products had high energy values, quantity of ingredients, chemical additives and sodium.

Incorrect claims were made as to sources of fiber and protein, and also in relation to other potential ingredients causing food allergies, and high non-compliance with the legislation on lactose content, which in theory was a non-compliance with the regulative norms and false communication to the consumer.

The study warns about the wide use of ingredients, mainly chemical additives, with the purpose of making the products more attractive and / or longer lasting, characterizing them as ultraprocessed, besides accumulating factors capable of modifying the chemical or biological characteristics of the products, with risk of undesirable effects to consumers.

There is also an urgent need for regulation by the competent bodies regarding the production of whole wheat bread, which is currently insufficient, and also for the production of more studies, especially those for physico-chemical analysis, in order to subsidize nutrition professionals and consumers to check the quality and reliability of the information stamped on the labels of such products.

Contributors

JM Nascimento and AO Souza participated in the conception and design of the study, writing, critical review of content and approval of the final version of the manuscript.

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