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Nutritional composition of bread and comparison with the legislation of nutritional labeling

Composição nutricional de pães do tipo bisnaguinha e comparação com a legislação de rotulagem nutricional

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ABSTRACT

This study aimed to analyze the nutritional composition of *bisnaguinha*, a type of bread for the children's segment, and to compare the results with the nutritional information on the label and with current legislation. Six brands of breads were analyzed in relation to protein, fat, fiber, carbohydrates, moisture, ash, sodium and calories, following the methods of Adolfo Lutz and the Association of Official Analytical Chemists. The results were compared with the values in the nutritional labeling of packages and the tolerance of 20% recommended by the Brazilian Resolution number 360 of the National Health Supervision Agency, classifying the breads in agreement or not with the law. Of the six brands of *bisnaguinha* analyzed, all were in disagreement with the current legislation, because they presented nutrients that were not in compliance with the 20% established by the legislation.

KEYWORDS: Nutrients; Nutritional Information; Food for Children; Sanitary Surveillance

RESUMO

O presente estudo teve como objetivo analisar a composição nutricional dos pães do tipo bisnaguinha destinados ao público infantil, comparar os resultados com a informação nutricional contida no rótulo e com a legislação vigente. Foram analisadas seis marcas de pães, em relação aos teores de proteína, gordura, fibras, carboidrato, umidade, cinzas, sódio e valor calórico, seguindo os métodos do Adolfo Lutz e da *Association of Official Analytical Chemists*. Os resultados encontrados foram comparados com os valores apresentados na rotulagem nutricional das embalagens e com a tolerância de 20% preconizada pela Resolução da Diretoria Colegiada nº 360 da Agência Nacional de Vigilância Sanitária, classificando os pães de acordo ou não com a legislação vigente. Das seis marcas de pães do tipo bisnaguinha analisadas, todas estavam em desacordo com a legislação vigente, pois apresentaram nutrientes em desacordo com os 20% estabelecidos pela legislação.

PALAVRAS-CHAVE: Nutrientes; Informação Nutricional; Alimentação Infantil; Vigilância Sanitária

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INTRODUCTION

The label identifies the food. A label is any inscription, legend, image or any descriptive or graphic material printed on the food package[1]. This applies to any food that is produced, marketed and packaged in the absence of the consumer[2]. Nutrition labeling is dealt with in the Resolutions of the Collegiate Board (RDC) n. 259[1] and n. 360[2] of the Brazilian Health Surveillance Agency (Anvisa), in order to inform the consumer about the nutritional content of packaged foods. It is supported by Law n. 6.437/1977[3], whose infringement is subject to fines and other sanctions.

The nutrition information on food labels serves as a public health tool and has the function of ensuring the health of the population by assisting in their food choices[4,5]. Nutrition labeling that correctly informs the amount and the nutrients that are actually present in the food is a consumer right, since according to Law n. 8.078/1990[6], food products must provide correct information on their content, characteristics, composition and quality.

Some studies remarked that consumers read food labels and look for the nutrition facts related to calories, nutritional composition and expiration date[4,5,7,8,9]. However, other studies have observed that the nutrition facts on the labels are not reliable due to non-conformities found in the amount of nutrients analyzed, such as carbohydrates, proteins, fat, fiber and sodium[10,11,12,13].

Bisnaguinha-type buns are intended for children and appeal to them with children's characters printed on their packages. Children influence 92% of the purchases of foodstuffs and some decisive factors are advertising on TV and the presence of characters on the packages[14]. A study that evaluated the foodstuffs and beverages that children most consume identified 20 different types of marketing strategies targeted at children[15].

Furthermore, parents can make food choices for their children's snacks and meals based on the nutrition facts found on the labels on these products[7], however, they should be aware of the type and quality of the nutrient/food they are choosing for their children. It is important to care for infant feeding, since the prevalence of overweight in children in 2008 and 2009 was 33.5% among children aged five to nine, according to the Family Budget Survey (POF)[16].

The objective of the present study was to analyze, through laboratory analyses, the nutritional composition of bisnaguinha-type buns intended for children, to compare the results with the nutrition facts presented on the labels and to check their compliance with RDC n. 360 of Anvisa[2].

METHOD

We visited the five biggest supermarkets in the city of Pelotas, Brazil. Six brands of bisnaguinha-type buns were identified, from different companies, all with children's appeal on the packaging. The brands were named A, B, C, D, E, and F.

For laboratory analysis, three different batches (triplicate) were purchased for each of the six brands at different times of purchase. The analysis of each nutrient was performed in duplicate for each of the three batches, obtaining six results for each nutrient and for each brand, totaling 36 samples analyzed. All analyses were carried out at the Bromatology Laboratory of the School of Nutrition of the Federal University of Pelotas/UFPel, from November 2014 to May 2015.

For the preparation of the samples, the entire content of the package was milled in a blender (Mondial®) for homogenization. Afterwards, the samples were placed in hermetically sealed plastic bags, identified and followed by laboratory analysis.

The moisture content was carried out by oven drying at 105-169° C to constant weight (16 to 24 hours) and the ash content by calcination in muffle at a temperature of 550° C to 600° C, according to the standards of the Adolfo Lutz Institute[17]. Analysis of the protein content was carried out by means of the Kjeldahl method with modifications, in which the sample was digested until the appearance of emerald blue, followed by distillation and titration, according to method 991.20 of the Association of Official Analytical Chemists (AOAC)[18]. For the determination of total fats, we used the Soxhlet method, according to the AOAC[18] standards and, for fiber, we used the gravimetric method, following the description of method 044/IV in the analytical standards of the Adolfo Lutz Institute[17].

The carbohydrate content was calculated by subtracting from 100 the levels of protein, ash, fat, fiber and moisture found in accordance with the norms of the Adolfo Lutz Institute[17]. The caloric value was determined based on the sum of the product of the multiplication of the protein content by 4 kcal/g, fat per 9 kcal/g, and carbohydrates per 4 kcal/g, according to RDC n. 360 of Anvisa[2]. Sodium analysis by determination of sodium chloride (NaCl) was carried out by calcination followed by titration with silver nitrate, according to the methodology of the Adolfo Lutz Institute[17].

All the results obtained from the analysis of the nutritional composition were compared with the values presented in the nutritional information on the labels of the packages and verified according to the tolerance limit established by RDC n. 360[2]. Buns that exceeded the value of 20% (higher or lower) were considered non-compliant with the current legislation.

RESULTS

Of the six brands of bisnaguinha buns in this study, all presented some type of irregularity with respect to the nutrients we assessed, with values below 20%, exceeding the margin imposed by RDC n. 360[2]. The results of the analyses and comparisons with the food labels can be seen in the Table below.

The content of fat, fiber and sodium was 100% non-compliant with the legislation in all the six brands of bisnaguinha buns. We note that the values were lower than those presented on the labels, ranging from 28.66% to 96.38% less fat, from 71.07% to 91.50% less fiber and 37.07 % to 78.67% less sodium than the values given on the nutrition label printed on the packages.

Table. Comparison between the values found in the analyses (100g) and the values presented on the labels (100g) and suitability with RDC n. 360, with tolerance of 20%.

Brand	Adequacy	Fat (g)	Protein (g)	Fiber (g)	Carbohydrates (g)	Sodium (mg)	Calories (kcal)
	Mean analysis	2.39	10.64	0.64	60.81	107.95	307.31
A	Label	4.5	12.25	3.5	52.5	407.5	305
	Adequacy	**-46.88**	-13.14	**-81.6**	15.82	**-73.5**	0.75
	Mean analysis	2.5	8,67	0.21	63.4	174.04	310.78
B	Label	4.75	11	2.25	55	407.5	310
	Adequacy	**-47.36**	**-21.18**	**-90.7**	15.27	**-57.29**	0.25
	Mean analysis	2.68	7.49	0.2	63.55	231.89	308.28
C	Label	4.75	11	2.25	55	407.5	310
	Adequacy	**-43.57**	**-31.9**	**-91.1**	15.54	**-43.09**	-0.55
	Mean analysis	1.5	8.96	0.81	54.71	201.35	268.18
D	Label	5.6	8.4	2.8	54	320	304
	Adequacy	**-73.21**	6.66	**-71.1**	1.31	**-37.07**	-11.78
	Mean analysis	0.19	8.02	0.34	50.1	113.55	234.17
E	Label	5.25	8.5	2	57.5	532.5	312.5
	Adequacy	**-96.38**	-5.64	**-83.3**	-12.87	**-78.67**	**-25.06**
	Mean analysis	4.28	7.5	0.34	57.85	89.88	299.92
F	Label	6	16	4	68	400	340
	Adequacy	**-28.66**	**-53.13**	**-91.5**	-14.92	**-77.53**	-11.78

* Bold values exceeded the tolerance margin of 20% stipulated by RDC n. 360[2].

Regarding protein content, three brands were in disagreement with the legislation, with values ranging from 21.18% to 53.13%. The only nutrient of the bisnaguinha buns that did not present irregularity in relation to the legislation was the carbohydrate content, since all the samples were in agreement with the legislation in force.

However, when analyzing the caloric value, only one brand was irregular, with 25.06% below the value printed on the label. The same brand also proved to be in disagreement with the legislation regarding nutrients like fat (96.38%), fiber (83.25%) and sodium (78.67% less).

It is important to note that, of the six brands of buns we analyzed, three were in disagreement with the legislation regarding three nutrients, while the other three brands had four nutrients that exceeded the tolerance limit of 20%, also in disagreement with the legislation. Moreover, all irregularities were for values lower than 20%.

DISCUSSION

Other studies[10,12] also found irregularities in 100% of the food samples analyzed and compared with the nutrition labeling on the packages and with the legislation, just like the present study. These studies analyzed the centesimal composition of shoestring potato chips, corn and wheat snacks, potato chips, peanuts and cookies.

The results of disagreement with the fat content found in the present study corroborate other studies that also analyzed the fat content of corn and wheat snacks, potato chips, peanuts, cookies[12] and cheese bread[19], which found values higher or lower than 20% in comparison with the values allowed by RDC n. 360[2]. In addition, another study that measured the total saturated, monounsaturated, polyunsaturated and trans fat levels of *empanadas* marketed in school cafeterias showed that, of nine samples, all had some type of non-compliance (exceeding the 20% tolerance limit) in at least one of the evaluated fats, especially in relation to trans fats. Vegetable fat was the source of trans fats most frequently mentioned in the list of ingredients of these *empanadas*[20].

Even though in the present study the values found for fat were lower than those shown on the labels, this is not favorable for the consumer, since the lack of reliability in the information may cause less reliability in relation to the product and the company, especially in the case of a product intended for children. The information found on the labels should be as reliable as possible, since fat is a macronutrient whose ingestion by children sometimes needs to be controlled.

In relation to the fiber values found in another study[21] using the same method of fiber analysis of the present study, values were also found to be lower than those shown on the labels of three brands of nutrition bars, exceeding the tolerance limit of 20% established by the legislation. However, this can be due to the different methods adopted, since the method used to analyze fiber in both studies can cause fiber losses during the process. However, this method has also been adopted in different studies on the same research topic[13,21,22].

The most suitable method for analysis of dietary fiber (soluble and insoluble) would be the enzymatic method, with the use of enzymes that simulate the ideal means of digestion in the body, preserving the soluble and insoluble fibers, however, the cost of these enzymes is high, often limiting its use, as in the case of the

present study. What happens in the use of the gravimetric method is a reduction in the values of fiber, as well as an overestimation of the carbohydrate value, when it is calculated by the difference of the "NIFEXT" fraction. The ideal determinations of reducing and total sugars is achieved by the method of Lane Eynon.

Although these determinations are a limitation to the present study, we could observe that the carbohydrate content was the only compliant nutrient in all brands of *bisnaguinha* buns we analyzed, with no irregularity between the analysis by difference and the value presented on the label. Furthermore, only one brand presented irregularity in the declared caloric value, but it was a sample in which the fat obtained a reduction of 96.38%, which may have directly influenced the calculation.

Regarding the sodium content, the values found in disagreement were lower than those shown on the labels. On the other hand, in another study, the sodium content in potatoes was 51% higher than the amount allowed by the legislation[10]. Sodium is a nutrient that must be controlled in food, because its excess can cause several health complications, especially in children, due to the risk of increased blood pressure[23,24,25].

According to the POF (2008-2009)[16], the average consumption of sodium in Brazil per person is 4,700 mg of sodium (12 g of salt) per day. The Food Guide for the Brazilian Population[26] recommends 5 g of salt per day, therefore, the information on the amount of sodium presented in the nutritional labeling should be important to help the population choose food with lower sodium content.

For this reason, the Ministry of Health established the Term of Commitment n. 004/2011[27] with the food industries: Brazilian Association of Food Industries (ABIA), Brazilian Association of Pasta Industries (Abima), Brazilian Association of Wheat Industries (Abitrigo) and the Brazilian Association of Bakery and Confectionery Industries (ABIP), within the National Plan for Sodium Reduction in Processed Food, with the objective of reducing sodium intake in bread (group comprising *bisnaguinha* buns), seasonings and bouillons, dairy products, cookies, vegetable margarine, cold cuts, semi-prepared pasta, cakes, mayonnaise, snacks, cereal products, ready meals, among others[28,29].

Under the Term of Commitment n. 004/2011[27], *bisnaguinha* buns can have a maximum of 430 mg/100 g of sodium after the year 2014. Analyzing the sodium content found in the present study, all brands are already in accordance with the Term of Commitment, which could be related to compliance with the agreement and recommendations for sodium reduction, and the nutritional labeling printed on the label may not be up-to-date with the new sodium content. As in the study by Dias, Moraes and Camara[30], in which the four brands of *bisnaguinha* buns they analyzed were also below the established goal for sodium. However, the authors[30] note that the amount of 100 g of bisnaguinha buns (six units) accounts for a daily sodium intake ranging from 30.29% to 43.08% for the age group of children of one to three years and from 25.24% to 35.90% for the age group of four to eight years. It is also worth noting that *bisnaguinha* buns are usually consumed with food products with high sodium concentration, such as cream cheese, cheese, butter, among others, frequently exceeding the daily recommendation of this nutrient.

Additionally, another study that monitored the sodium content of processed food comparing it with the sodium reduction goals stipulated by voluntary agreements of the Brazilian government with the industry since 2009 showed that, even before the deadline, seven categories had already reduced the amount of sodium below the targets, however, the lack of standardization and poor monitoring of sodium content are a problem that may jeopardize the effectiveness of the strategy[31]. This data shows that stronger laboratory monitoring should be encouraged and that new agreements are necessary to gradually reduce the sodium and other nutrient content which, in excess, could harm the health of the population. In addition, in the present study, the highest and lowest concentrations of sodium were found to be 231.89 mg and 89.88 mg, respectively, showing a difference of 142.01% of sodium between the samples and the possibility of further reductions of this nutrient.

In the present study, the analyzed nutrient contents that proved most inadequate regarding the content presented on the labels were: fat, fiber and sodium. Similar fact occurred in the study by Lobanco et al.[12], in which no sample of the savory products complied with the dietary fiber, sodium and fat content. In that study, the methods for fat and sodium were the same as those used in the present study; only fiber analysis was performed by the gravimetric method. Corn snacks were the most frequently inadequate products, with values of 69% dietary fiber, 72% sodium, 85% total fat and 41% saturated fats.

Regarding protein content, it was also observed in Sauerbronn's study[32] that 16% of its pasta samples were in disagreement with the legislation, with values below the labeling, as in the present study. The values of protein in the study of Pereira et al.[19] and Jesus et al. [33] were lower than the values presented on the labels of cheese bread – therefore, also inadequate. On the other hand, in the study by Pederzoli et al.[22], which analyzed cake intended for children, no sample was inadequate in relation to the protein content.

Carbohydrate was the only nutrient that was compliant in all brands of the present study, however, compared with the study by Fregonesi et al.[34] (96.67%), fat (83.33%), proteins (70%), fiber (83.33%) and caloric value (86, 67%) were in disagreement with RDC n. 360, when the comparison was made between the values found in the analyses and in the values presented in the labels.

According to Silva and Dutra[13], who evaluated the conformity of nutritional labeling of instant soup preparations (*sopão*) using the same methods of the present study, all 21 samples were in accordance with the legislation on caloric value, albeit other macronutrients were irregular. In the study by Pereira et al.[19] on cheese bread, all three samples were inadequate in terms of caloric value. One presented values below those shown on the label and the other two presented values above those on the label. In the present study, only one brand was inadequate regarding caloric value.

Even though the buns were irregular in relation to fat content in six brands and protein in three brands, the total caloric value

did not change in five samples. The only sample that presented irregularity in relation to the caloric value was the same that had the highest value of irregularity in its fat content (96.38% less). This lower amount may have influenced the reduction of the caloric value, since the fat represents 9Kcal per gram.

The caloric value is the most visible piece of information on the label[5], since consumers rely on it to make their food choices[7] and thus purchase the food. Although the caloric value is important, it should not be the only piece of information that determines the purchase of food, since other nutrients like fiber, fat, carbohydrate, protein and sodium content should also be analyzed. This would enable the population to decide their purchases based on the nutritional quality of the food.

The lack of time to eat and prepare meals is a challenge to most families every day, making it difficult to eat healthily. Convenient and instant snacks that are easy to buy and consume are some of the options that parents choose as snacks for their children. *Bisnaguinha* buns are some of these options offered to the children for they have packages that appeal this audience. Parents or caregivers may choose food purchased for their children based on the nutritional information contained in the labels and nutrition facts[22].

However, in order for adequate food choices to occur, the nutrition facts on the labels should be consistent with the food product offered. This was not observed in the present study with the brands we analyzed, since all the brands were not compliant with the legislation. Therefore, the non-compliant label hurts consumers' rights as per Decree n. 5,903[35], which assesses infringing practices that undermine the consumer's basic right to obtain adequate and clear information about products and services.

The information contained in the food product must be presented clearly and accurately so that the population receives true nutrition facts. This is true both for companies that should always seek to update the information and for surveillance bodies and legislation. These bodies allow the use of ready-to-use food composition tables, which can be misleading, since not all tables present adequate methodologies and sampling, reproducing errors when the tables are consulted for the elaboration of the nutritional labeling. In addition, information provided in a clear and accurate manner increases the credibility of the company among consumers. This enables consumers to better evaluate the product and thus have more confidence in their food choices[9].

CONCLUSION

Of the six samples of *bisnaguinha* buns we analyzed, none was in accordance with the legislation in force in all the analyzed nutrients, since they presented nutrients in disagreement with the 20% limit established by the law. We emphasize the important role of both the food industry in providing true information to its customers and of the surveillance bodies that allow the use of food composition table with errors due to differences in methodologies and lack of standardization. In order to ensure food safety and to enforce the Brazilian legislation of nutritional labeling in a reliable fashion, we believe in actions that include laboratory control using standardized and official methods.

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Conflict of interest

The authors report that there is no potential conflict of interest with peers and institutions, political or financial, in this study.