Consumer understanding of nutrition labeling: the triangle alert model

Compreensão de consumidores sobre a rotulagem nutricional: o modelo de alerta em triângulos

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ABSTRACT

Introduction: Several researchers and government entities have currently pointed out the proposal for the triangle alert model in nutritional labeling, in order to allow consumers to better understand the label. This proposal describes that information such as excess of ingredients or nutrients that are harmful to health be highlighted on the labels by colors and symbols (triangle) that draw the consumer's attention. **Objective:** To analyze consumers' understanding of the nutritional triangle alert labeling model in comparison with the label currently used in Brazil. **Method:** Cross-sectional study carried out with 108 adults, randomly approached for convenience, while participating in two health fairs that took place in a municipality in Minas Gerais in April and May of 2019. Participants were interviewed based on a questionnaire that, in addition to characterizing, sought to investigate their behavior regarding labeling and their understanding of the triangle nutritional labeling alert model. The interviewee was presented with two food labels (salted crackers and soy oil) elaborated from the triangle proposal. The results were analyzed by distribution frequency and associations between understanding the label and characteristics of the participants (Pearson's chi-square test). **Results:** Among the participants, the majority were women, with higher education high school. The study showed that 81.00% understood that the frontal triangle warning indicated excess components in the food and 68.00% understood that the yellow highlight on the nutritional table indicated excess ingredient. When comparing the currently used label and the proposed triangle labeling, 88.00% of the respondents preferred the new proposal. **Conclusions:** There was a greater acceptance of the proposed nutritional labeling of warning in triangles in relation to the current label adopted in Brazil, specifically due to the ease of reading and understanding of the label and the alert for the quantity and nutritional quality of the food.

KEYWORDS: Food Labeling; Nutrition Labeling; Labeling Model; Consumer Understanding

RESUMO

Introdução: A proposta de rotulagem nutricional de alerta em triângulos tem sido apontada atualmente por diversos pesquisadores e entes governamentais, como a que possibilita melhor compreensão do rótulo pelos consumidores. A referida proposta descreve que informações como excesso de ingredientes ou nutrientes com baixo valor nutricional sejam destacadas nos rótulos por cores e símbolos (triângulo) que chamem a atenção do consumidor. **Objetivo:** Analisar a compreensão de consumidores sobre o modelo de rotulagem nutricional de alerta em triângulos em comparação com o rótulo atualmente utilizado no Brasil. **Método:** Estudo transversal, realizado com 108 adultos, abordados aleatoriamente por conveniência, enquanto participavam de duas feiras de saúde, ocorridas em um município mineiro, nos meses de abril e maio de 2019. Os participantes foram entrevistados com base em um questionário que, além de caracterizá-los, buscou investigar seus comportamentos quanto à rotulagem e sua compreensão sobre o modelo de rotulagem nutricional de alerta em triângulo. Foram apresentados dois rótulos

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de alimentos (biscoito salgado e óleo de soja) elaborados a partir da proposta de triângulos. Os resultados foram analisados por distribuição de frequência e associações entre compreensão do rótulo e características dos participantes (teste qui-quadrado de Pearson). **Resultados:** Entre os participantes, a maioria era de mulheres, com graduação ou ensino médio. Verificou-se que 81,00% dos entrevistados compreenderam que o alerta frontal em triângulo indicava os componentes em excesso no alimento e 68,00% que o destaque em amarelo na tabela nutricional indicava excesso de ingrediente. Quando comparados o rótulo usado atualmente e a proposta de rotulagem em triângulo, 88,00% dos entrevistados preferiram a nova proposta. **Conclusões:** Houve maior aceitação da proposta de rotulagem nutricional de alerta em triângulos em relação ao atual rótulo adotado no Brasil, especificamente em função da facilidade de leitura e de compreensão do rótulo e do alerta para a quantidade e a qualidade nutricional dos alimentos.

PALAVRAS-CHAVE: Rotulagem de Alimentos; Rotulagem Nutricional; Modelo de Rotulagem; Compreensão do Consumidor

INTRODUCTION

The main factors of health promotion and protection are adequate food and nutrition, which aim to guarantee the human body energy and nutrients for full growth, development and maintenance of nutritional status and health[1,2].

In the last three decades, changes in the dietary pattern of the Brazilian population have led to an increasing overweight due to the increase in the consumption of processed foods that contain many sugars and fats (excess calories), in addition to the reduction in the consumption of *in natura* or minimally processed foods, causing an imbalance in the supply of nutrients to the body. This trend, among other factors, is crucial for the onset of non-communicable chronic diseases, which are the main cause of morbidity and mortality among adults in Brazil.[1,3,4,5].

According to Souza et al.[6], "food consumption is a health determinant whose positive or negative character depends on information". From this perspective, it appears that food and nutrition education strategies should include interventions that facilitate the understanding of the population, which can provide the development of autonomy and the subject's ability to make healthier food choices. In this sense, industrialized food labels are an important vehicle of information, which allows consumers to compare different food products and choose them more consciously[6].

Food consumption is one of the main risk factors for high rates of non-communicable chronic diseases and a major public health problem in Brazil[1,2,3]. Changes in lifestyle and the increase in available food have shown a positive correlation for the rapid reduction of malnutrition in children and adults, but a negative correlation for the increase in the prevalence of overweight[7,8].

Currently, the National Food and Nutrition Policy establishes guidelines that seek to encourage, support, and protect the health of the population, based on the reorientation of health services and the dissemination of information that empowers the population to make healthier food choices; that is, the promotion of the practice of self-care[1,4].

Healthy eating, therefore, is an important target of health and nutrition education actions for greater independence of the individual. Thus, considering that, among the sources of information about food, those contained on food labels are the most accessible to the Brazilian population, nutrition labeling, if well understood, can provide the development of the individual's autonomy in healthy food choices[8].

According to article 6, item III, of the Consumer Defense Code (CDC)[9], the consumer has the right to "adequate and clear information about different products, and services, with a correct specification of quantity, characteristics, composition, quality and price, as well as the risks presented".

In order to comply with the CDC and the instruments harmonized in the Southern Common Market (Mercosur), it was necessary to review the Brazilian rules on nutrition labeling of foods and their adequacy in relation to the Mercosur Technical Regulation for Labeling Canned Foods[10,11].

The regulation of nutrition labeling in Brazil is defined through the Resolutions of the Collegiate Board of Directors (RDC) issued and published by the Brazilian National Health Surveillance Agency (Anvisa): RDC No. 360, of December 23, 2003, and RDC No. 359, of December 23, 2003. RDC No. 360/2003 defines nutrition labeling as any description intended to inform the consumer about the nutritional properties of the food, including the declaration of energy value and nutrients, in addition to nutritional properties[12,13]. RDC No. 359/2003 establishes the portion sizes of packaged foods, as well as the homemade measure by detailing the utensils commonly used[12].

However, mandatory labeling by manufacturers does not guarantee consumer understanding of the meaning of the information offered. In the study by Pontes et al.[14], in different regions of Brazil, it was found that 70% of people consult labels when buying food. However, more than 50% do not understand or cannot correctly interpret the information contained therein. The study by Machado et al.[15] showed that energy values and nutrient composition are observed, respectively, by 5% and 2% of consumers interviewed, when consulting food labels. In this sense, it is understood that changes or adjustments are necessary in the Brazilian nutritional labeling in such a way that it becomes more understandable for the consumer.

According to national and international scientific literature, the best proposal for a new Brazilian nutritional labeling that meets consumer needs was presented by the Brazilian Institute of Consumer Protection (IDEC) to the Work Group on Nutritional

Labeling (GTRN), created to assist Anvisa in creating regulations on the subject. This model is based on the current labeling in Chile and aims to include a front warning seal, represented by a triangle, on products with a high amount of nutrients that must have a reduced intake in the consumer's diet. The highlight in color on the nutritional table (on the back of the label) also includes this proposal, as well as the inclusion of a warning phrase for moderate use in culinary ingredients[5,16,17,18,19].

However, in a complementary way, further scientific studies on the effectiveness of this proposal for the Brazilian consumer become indispensable. In view of the above, the present research aimed to analyze the understanding of consumers about the nutritional labeling model of alert in triangles compared to the label currently used in Brazil.

METHOD

Type of study

This is an observational and transversal field survey. In this case, the researcher collects data only once, without intervening in the responses of the research participant[20,21]. This strategy was chosen due to its effectiveness for studies of opinions and attitudes, characterized by the direct interrogation of people whose understanding one wants to know[22,23].

Research participants and location

People over 18 years old, of both sexes, who participated in one of the two health fairs, open to the population, held by the Federal University of Juiz de Fora, *campus* Governador Valadares (UFJF/GV), in Minas Gerais. These fairs took place on April 27 and May 11, 2019, in two public squares in the municipality. The choice of these events is justified because it is a very attractive environment for the target audience of the research, that is, a diverse audience in age and sociodemographic characteristics, including the illiterate, since, usually, many of them are responsible for purchasing food.

The number of respondents was established for convenience. The participants of the fairs were approached by the researchers and, if they agreed to participate in the research, they were interviewed. If they refused, another participant was approached (Figure 1). This procedure was repeated uninterruptedly after each interview, during the 4h, which lasted for each of the health fairs. People who were over 18 years old and who signed the Free and Informed Consent Term were considered eligible for the study at the time of data collection. At the end of the two fairs, a total of 108 people were interviewed.

Technique and instruments for data collection and analysis

The technique used for data collection was the interview. The interviewee answered a structured questionnaire, which was read and filled in by the researcher and trained applicators. The questionnaire consisted of 12 questions divided into three parts. In the first one, the questions were about the sociodemographic profile and the interviewees' sex, age, and education were investigated. The age group studied was the adult (18 to 60 years old), divided, for analysis purposes, into: young
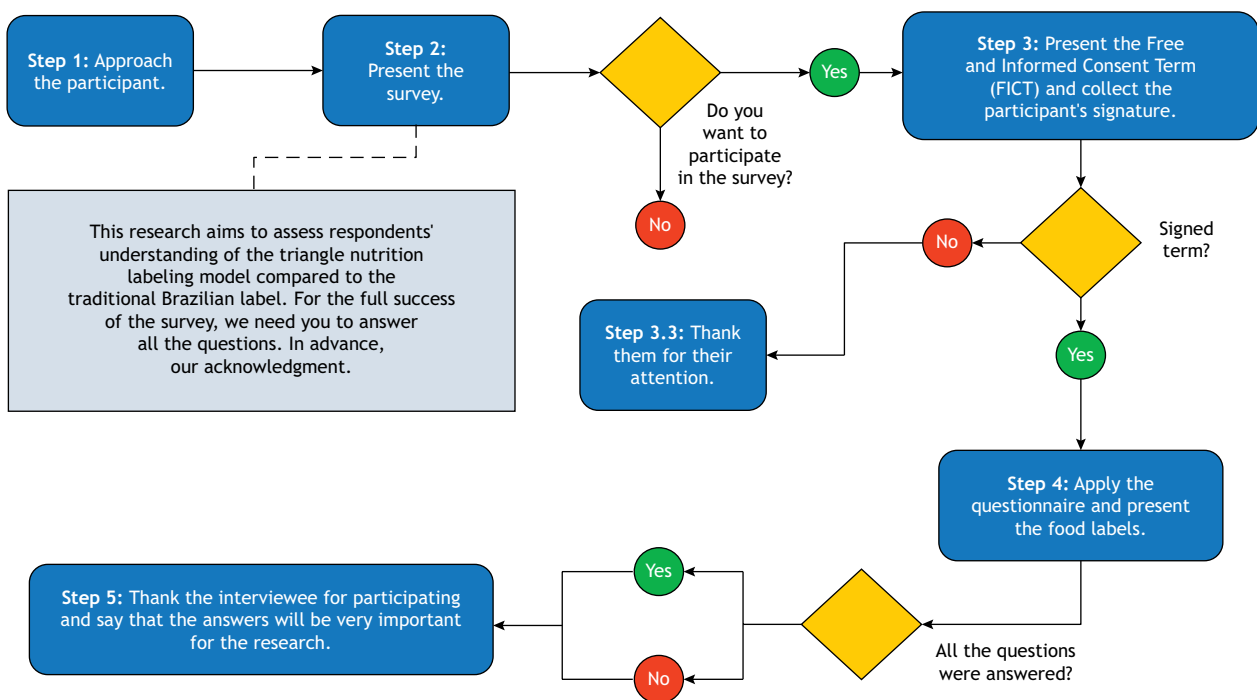
Source: Elaborated by the authors, 2019.

Figure 1. Steps for data collection.

adults (18 to 34 years old), mature adults (35 to 59 years old)[24], and elderly (over 60 years old).

In the second part of the questionnaire, the objective was to investigate the behavior of the interviewee regarding food labeling. To this end, questions were asked about the frequency of purchase, reading, and understanding of nutritional information on food labels.

The third and final part investigated the respondent's understanding of the proposed changes to the triangle warning nutrition labeling. At that moment, the applicators presented the interviewee with two labels, one of an industrialized food with a current label (exact reproduction of how it is currently marketed, but in larger size to facilitate viewing in an environment with as many distractions as an open-air market, and another label, of the same food, adapted to the proposal of nutritional labeling of alert in triangles (Figure 2).

The intention when presenting these two labels to the interviewee was to allow the consumer to visualize the way it is currently and the way it would be if it were adapted to the nutritional labeling proposal of alert in triangles. This way of presenting also sought to encompass the audience of illiterate interviewees. The aim was to verify if, even without knowing how to read, the illiterate consumer could minimally understand what the warning in triangles intends to indicate.

When designing the labels that would be used for the research, we sought to encompass the entire labeling standard established in the triangle alert proposal, namely: 1) front warning seal in the shape of a triangle; 2) highlighted in color on the nutritional table (on the back of the label) in products with a high amount of nutrients that must have a reduced intake in the consumer's diet; 3) warning phrase to moderate use in culinary ingredients such as oil, salt, and sugar.

The industrialized food labels used in the research were salted biscuits and soy oil, as these foods are among the most consumed by the Brazilian population according to the National Food Survey (INA), carried out by the Brazilian Institute of Geography and Statistics (IBGE)[25]. In addition, the oil was chosen because it is a culinary ingredient that has specific regulations in the proposal for triangle warning nutritional labeling. In this way, the interviewee was presented with a conventional food label (salted biscuit) and a culinary ingredient (oil).

The labels were made exclusively for the research. For this, the characteristics of the current labels of each food were observed with the addition of the changes proposed by the triangle warning nutritional labeling model. Thus, on the adapted oil label (Figure 2A), the following sentence was inserted on the front of the package: "Use sparingly, as recommended by the Dietary Guidelines for the Brazilian Population!"[4].

In the adapted label of the salty biscuit (Figure 2B), three warning seals were introduced on the front of the package to indicate excess of the critical nutrients of this food. These stamps were triangular in shape, black with a white background, and each had the following phrases: "HIGH IN SODIUM", "HIGH IN TOTAL FAT", and "HIGH IN SATURATED FAT". In addition, these critical and excess ingredients were highlighted in color on the food nutrition table contained on the label based on the Pan American Health Organization model[15].

Still in relation to the questionnaire, the last part also evaluated the opinion of the interviewees, using the five-point hedonic scale (hate, disliked, indifferent, liked, and loved), on the proposal for triangle nutritional labeling. The last question investigated the opinion of the interviewees about the comparison in degree of superiority (better, worse, not better or worse, I don't know) of the labels of the proposed triangle alert nutrition labeling, with the current labels made for the research

For the elaboration of the data collection instrument, the questionnaire prepared by Nascimento[26] was taken as reference, which covered the identification of the consumer and their diet, food labeling, and nutritional attributes. In the present research, the parameters used by this author were used and adapted, which were coherent with the objective of the research, that is, the comparison of the current labeling with the proposal of triangle alert nutritional labeling.

The information collected was organized with the help of a spreadsheet prepared using the Microsoft Excel program. The analysis of results was performed by frequency distribution and analysis of associations by calculating the p-value < 0.05, and Pearson's chi-square test was used to determine the level of significance for the purposes of this research.

This project was approved by the UFJF ethics committee under CAAE number: 00776818.0.0000.5147 and opinion number: 3,065,930. The free and informed consent term was applied to all research participants.

RESULTS

Of the total number of respondents, 78.70% were female and 21.30% were male. The age group distribution consisted of: 41.67% between 18 and 34 years old, 36.11% between 35 and 59 years old, and 22.22% with 60 years old or more. Regarding education, 50.00% of them were graduates and/or postgraduates, 21.30% completed high school; 23.15% completed or were in elementary school; and 5.56% declared themselves illiterate.

In this study, 66.67% of respondents said they were the main person responsible for purchasing food for their home and 33.33% were not (Chart 1). Responsibility for purchasing was more associated with females and older age groups. This fact can be explained by the greater frequency of visits to the supermarket and the greater interest in reading food product labels by this consumer profile[26,27]. In the analysis of statistical significance (p = 0.376), this study showed no association between the participant's education and responsibility for the purchase.

Source: Elaborated by the authors, 2019.

Figure 2. Oil and salty biscuit labels adapted to the nutritional labeling proposal.

Chart 1. Profile of respondents about the triangle alerts model on food labels, in the city of Governador Valadares, MG, in 2019.

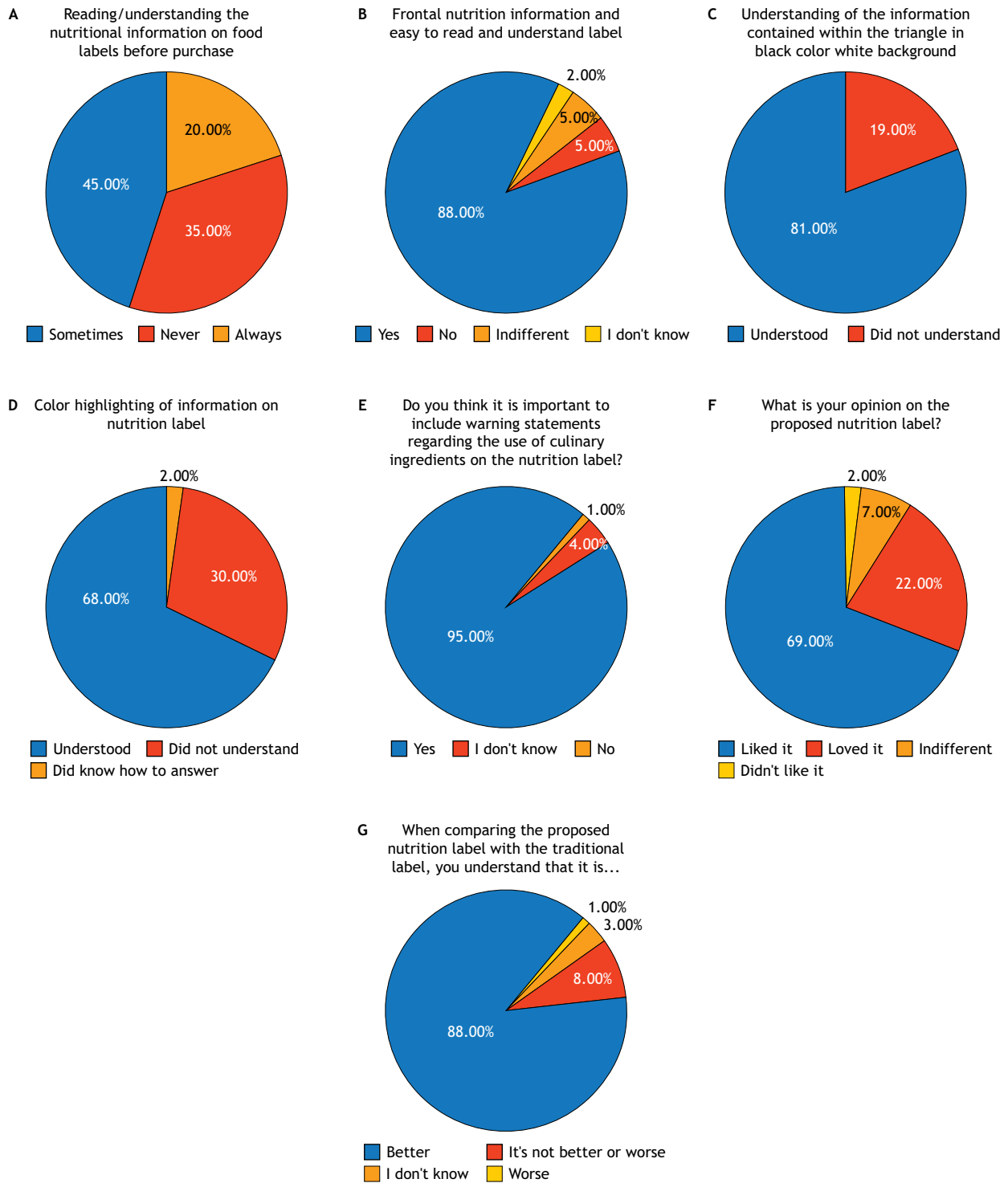| Sociodemographic/Alternative characteristics and p-value	Sex (%)		Age (%)			Education (%)			
	F	M	18 to 34 years	35 to 59 years	60 years or older	Illiterate	Elementary school	High school	Superior education
Responsible for food purchase									
Yes (66.67%)	56.48	10.19	20.37	29.63	16.67	2.78	18.52	13.89	31.48
No (33.33%)	22.22	11.11	21.30	6.48	5.55	2.78	4.63	7.41	18.51
P-value > 0.05	0.031		0.004			0.376			
Reading/Understanding nutrition labels									
Always	17.59	1.85	11.11	8.33	0.00	0.00	1.85	4.62	12.96
Sometimes	36.11	9.26	17.59	17.59	10.19	0.00	9.26	18.52	8.33
Never	25.00	10.19	12.96	10.19	12.04	5.55	12.04	8.33	9.26
P-value > 0.05	0.214		0.049			0.001			
Understanding the color highlighting on the nutrition label on labels									
Yes	56.52	69.41	82.22	58.97	50.00	33.33	56.00	60.87	77.78
No	43.48	30.59	17.78	41.03	50.00	66.67	44.00	39.13	22.22
P-value > 0.05	0.245		0.011			0.054			

Source: Elaborated by the authors, 2020.

Of the total number of respondents, 20.00% said they "always" read/understood food labels at the time of purchase, 45.00% said they "sometimes" read/understood, and 35.00% said they "never" read/understood (Figure 3A). This result was positively associated with those who answered that they read/understood and were primarily responsible for the purchase at home (p = 0.015, Chart 2), that is, most of the respondents who were responsible for the purchase were also the ones who best understood the labels.

Likewise, there was a statistical difference for the population of young adults (18 to 34 years old, p = 0.049) and for the

A Reading/understanding the nutritional information on food labels before purchase

- 45.00% Sometimes
- 35.00% Never
- 20.00% Always

B Frontal nutrition information and easy to read and understand label

- 88.00% Yes
- 5.00% No
- 5.00% Indifferent
- 2.00% I don't know

C Understanding of the information contained within the triangle in black color white background

- 81.00% Understood
- 19.00% Did not understand

D Color highlighting of information on nutrition label

- 68.00% Understood
- 30.00% Did not understand
- 2.00% Did know how to answer

E Do you think it is important to include warning statements regarding the use of culinary ingredients on the nutrition label?

- 95.00% Yes
- 4.00% I don't know
- 1.00% No

F What is your opinion on the proposed nutrition label?

- 69.00% Liked it
- 22.00% Loved it
- 7.00% Indifferent
- 2.00% Didn't like it

G When comparing the proposed nutrition label with the traditional label, you understand that it is...

- 88.00% Better
- 8.00% It's not better or worse
- 3.00% I don't know
- 1.00% Worse

Source: Elaborated by the authors, 2020.

Figure 3. Set of graphs (from A to G) referring to the reading and service of food labels by consumers in Governador Valadares, MG, in the year 2019.

Chart 2. Understanding of food labels, in the city of Governador Valadares, MG, in the year 2019.

Reading/Understanding food labels	Responsible for purchase	
	Yes (%)	No (%)
Always	66.67	33.33
Sometimes	79.59	20.41
Never	50.00	50.00
P-value > 0.05	0.015	

Source: Elaborated by the authors, 2020.

highest levels of education (p = 0.001) with a report of greater reading and understanding of labels (Chart 1). When asked whether the frontal information on the biscuit label (Figure 2B) would facilitate the visualization and identification of more relevant information for understanding the nutrition labeling, 88.00% of respondents answered "yes", 5.00% said "no", 5.00% of them were indifferent to the location of the nutritional information to understand the label, and 2.00% did not know how to answer (Figure 3B).

The proposal to add a warning about excess components on the label in the shape of triangles in black color on the front of the biscuit label packaging (Figure 2B) was understood by 81.00% of respondents, while 19.00% did not understand the proposal, claiming, for example, that the main ingredient of the food was highlighted (Figure 3C).

Regarding the highlight in yellow, which warns about the composition of excess nutrients on the biscuit nutrition label (Figure 2B), this study found that 68.00% of respondents understood the proposal, 30.00% did not understand, and 2,00% did not know how to answer (Figure 3D). Highlighting in colors showed a positive association for younger age groups (p = 0.011, Chart 1). Which demonstrates that this type of highlight facilitated the understanding of respondents aged 18 to 34 years.

As for the product label that includes the warning phrase to warn about the moderate consumption of culinary ingredients (Figure 2A), 68.52% of respondents saw the inclusion of the warning phrase and 31.48% did not see it. Of the interviewees who saw the phrase, 95.00% thought it was important to include it on the labels of cooking oils; 1.00% did not think it was important, and 4.00% did not know how to answer (Figure 3E).

The analysis of the opinion of the interviewees on the nutritional labeling proposal in triangles (Figure 2) showed that 69.00% liked it, 22.00% loved it, 2.00% did not like it, and 7.00% were indifferent (Figure 3F).

When comparing the models of labels presented (current and proposed, both for the biscuit and for the oil), 88.00% of the interviewees said that the proposed one with the triangle alert was "better" than the current one; 1.00% claimed to be "worse"; 8.00% answered that it was neither better nor worse; and 3.00% did not know how to answer (Figure 3G).

Among those who answered that the proposed label is "better", the main reasons were ease of reading and understanding; alert to the quantity and nutritional quality of food; the possibility of better food choices. Those who answered that it was neither better nor worse justified that the information was insufficient for understanding the label or that the change would not interfere with the individual's food choice. Respondents who rated it as "worse" did not justify it.

In view of this, it can be considered that the proposal for nutritional labeling of the triangle alert was well accepted and easily understood by the interviewees, regardless of age or schooling, since there was no statistical difference for the understanding of this proposal among the research public. On the other hand, when considering the current labeling, there was greater understanding by younger participants (Chart 1, p = 0.049) and with higher education (Chart 1, p = 0.001). It can be inferred that there is a possibility of understanding the alert proposal in triangles regardless of the sociodemographic characteristics of the interviewees.

DISCUSSION

The positive association for reading and understanding the food label with education was found both by Cavada et al.[27] and in the present study. In the latter, it was also possible to observe that the elderly and the illiterate reported shopping habits in the same proportion as the other age groups, however, this public reported not having the habit of reading and showed difficulty in understanding the current Brazilian label.

Consumer understanding of nutrition labels has been investigated in several other studies. In one of them, Marins and Jacob[28] interviewed consumers in supermarkets in Niterói/RJ and found that 64.80% of them always read and 65.30% understand the nutritional label. In another survey carried out by Cavada et al.[27], in Pelotas/RS, 62.07% of respondents reported the influence of nutritional information contained on the label for food choices.

Due to the variability of the educational level of the interviewees in this research, the percentage of reading and understanding of the label found was below the results of the aforementioned surveys. As highlighted by Ferreira et al.[29], Marins and Jacob[28], and Anvisa[16] this result can be explained by several factors: the ineligibility of the fonts (small sizes) and the difficult visualization; inadequate contrast; the lack of highlights; and the lack of standardization of information (location and quantities). In addition to these factors, the authors highlighted other aspects that contributed to the misunderstanding of labels and negatively influenced food choices, such as the lack of food and nutrition education of the Brazilian population, the technical language of the labels, and misleading advertising about the presence of nutrients in foods. All these factors highlight the urgent need to change the Brazilian nutrition labeling.

In the survey by the Brazilian Institute of Public Opinion and Statistics (IBOPE)[30], 82.00% ± 2.43 of the participants indicated ease of reading and understanding the nutritional information on the label that had a frontal alert, which is in line with the findings of the present research. According to Arrúa et al.[17], frontal nutrition labeling is desirable by consumers due to its simplicity and emphasis on product packaging. In addition, the alert system for excess components, such as sugar, fat, and sodium, allows for a better perception of the healthiness and integrity of industrialized products, which can discourage the purchase of products perceived as unhealthy.

Another advantage is that it captures the consumer's attention for the nutritional information in less time, when compared to other frontal labeling proposals, that is, it is found more quickly, which makes it more effective for communication with consumers, who usually have little time and attention to read labels when buying food[17]. In fact, frontal nutrition labeling is able to arouse the consumer's attention at the time of food choices due to the ease of visualization when compared to traditional nutrition labeling. Thus, the proposal helps in understanding the labels and can lead to changes in behavior when buying food[18].

Regarding the addition of the warning about excess components, in black, on the front of the package, as proposed by the nutritional labeling of warning in triangles, the finding in this research is consistent with the result found by the Center for Epidemiological Research in Nutrition and Public Health at University of São Paulo (NUPENS/USP) and by IDEC. The survey carried out by these bodies was carried out electronically with 1,607 Brazilians in order to compare two alert models, the triangle and the octagon. In the end, they found greater visibility for the triangle model[30].

Other national surveys[29,30] also found positive results for the nutrition labeling of alerts with black triangles and suggest possible benefits to the population such as increased attention capture and the perception of safety of nutritional information. The studies by Griffith and Leonard[31] and Sato et al.[5] associated the triangle shape and the black color with danger stimuli, as they are usually used in packaging of products potentially harmful to health. Thus, the use of the warning label is intended to alert consumers to critical nutrients that exceed tolerable intake levels.

Farina *apud* Silva Filho[32] explained that color preference is related to age. Younger people identify more with products with the colors "from yellow to red", while the elderly prefer packaging with colors that vary "from blue to purple". Among several possibilities, this fact may explain the findings of the present research, in which the youngest showed a better understanding of the meaning of alert in yellow.

Studies have shown that colors arouse people's attention, in addition to promoting action and behavior stimuli[31,33]. For example, in research that studied the influence of aids in the interpretation of nutrition labels, with participants mostly young women (from 19 to 29 years old), there was an increase in attention capture for packaging of nutrition labels that used the polychrome scheme compared to the monochrome. The colors also helped to understand the nutritional information on the packaging and to increase the ability to choose healthier foods, compared to labels that did not have colors[33].

Despite the good acceptance of the proposal and the positive relationship between the understanding of nutrition labeling and eating behavior beneficial to health, the decision of what consumers choose to consume is based on numerous factors. Among them are: the organoleptic characteristics of the food; the personal aspects of the individual (emotions and education); cultural and religious factors; biological, physiological, and psychological factors; socioeconomic factors; and factors external to the individual, such as environmental, situational, and advertising. These determinants of eating behavior are well integrated and rooted in people's unconscious, which makes it difficult to distinguish which of them has the greatest impact on food choice[34].

The food industry conveniently explores these aspects in its advertisements, which strengthens the food behavior factor in relation to others and promotes an increasingly unconscious and automated food consumption relationship. This lack of control in the act of eating leads to an excessive intake of foods with low nutritional density[29,35,36,37].

Studies have reported unethical behavior regarding food and beverage advertising by the business environment, such as claims of beneficial health effects in products with high levels of salt, sugar, and fat[36,37]. The various marketing strategies of the food industry, especially the practicality of industrialized products, have been shown to be quite effective in increasing the consumption of ultra-processed foods, which reduces the consumption of those with less processing and *in natura*; leading to poor food quality and a higher prevalence of diseases, such as overweight and obesity[35].

In some European countries, such as Germany, Italy, and France, the mandatory determination of the frontal warning system on food labels has encouraged the food industry to reduce the amounts of sugar, fat, and sodium in its products, which makes it possible to reduce the intake of these components by consumers[17]. In Brazil, in 2013, the process of regulating food advertising proposed by Anvisa with the collaboration of civil society organizations weakened due to interventions by the Brazilian Food Industry Association (ABIA), which resulted in a simplification of the requirements of RDC No. 24, of June 15, 2010[38], which establishes the minimum terms for advertising foods with high levels of fats, sugars, and sodium, as well as beverages of low nutritional value. However, the aforementioned entities still claim improvements in the regulation of marketing aimed at promoting unhealthy foods as a form of consumer health protection[39].

This movement to regulate food marketing is encouraged by public policies, as in the 8th Directive – Food Control and Regulation

of the National Food and Nutrition Policy – that seeks to protect the population's health through the reorientation of health services and the dissemination of information that enables the population to make healthier food choices; that is, the promotion of the practice of self-care[1,4]. In this sense, food and nutrition education becomes a process of citizen training, as health promotion actions continue and are able to reduce inequalities in the consumption relationship[40,1] Food and nutrition education, based on the Freirean vision that reinforces curiosity, and autonomy and critical capacity for the collective construction of knowledge, make it possible to raise awareness of the population, in a process of action-reflection committed to the transformation of the social environment that favors all[41,42].

Nutrition labeling is an important means of informing consumers of food products. Its understanding helps in choosing healthier foods, promotes health and prevents diseases more effectively due to the possibility of making individuals aware of food products at the time of purchase[8,42,28].

After many debates after the data collection of this research, in October 2020, Anvisa published RDC No. 429, of October 8, 2020[43], and Normative Instruction No. 75, of October 8, 2020[44], which update the 2003 Resolutions, providing for nutrition labeling on food product packaging. The main innovations were: the inclusion of total sugars and added sugars in the list of ingredients in the nutritional information table, the mandatory nutritional information in 100 g and the presence of front flags in foods that contain high levels of added sugars, saturated fats, and sodium.

These frontal symbols will be rectangular in shape with a magnifying glass over the critical components of the food. This model was inspired by one being studied in Canada. However, research carried out by the Brazilian Agricultural Research Corporation (Embrapa) and the University of Brasília (UnB) under the coordination of Anvisa did not show significant results of greater acceptance by the Brazilian population for this proposal of nutritional labeling warning with the magnifying glass in relation to the triangle model, for example[30,45].

The evidence that led to the approval by Anvisa of the magnifying glass frontal beacon and not the triangle is questionable, since the magnifying glass does not warn, it only signals the critical components on the label. Another important issue to be highlighted refers to the long term (twenty-four months), determined in RDC No. 429/20[43], for the adaptation to the Resolution by the food industries, when compared to the urgency of the matter and the deadlines usually sanctioned in other resolutions[45].

On the other hand, authors[45,46,47,48] indicated that the use of the labeling model that reports nutrients harmful to health in excess, regardless of the symbol adopted, is an advance for health promotion due to the greater degree of information for the consumer when making their food choices. For example, the study by Santos-Antônio et al.[46] showed that research carried out in Australia, New Zealand, Germany, and the Netherlands indicated that frontal labeling models, regardless of the logo adopted, enabled consumers to select healthier products. A systematic review study, carried out in the United States of America by Hersey et al.[47], indicated that the frontal labeling models allowed an improvement in the purchase behavior for healthy foods, making the diet of these consumers healthier.

Another systematic review study carried out by Sanjari et al.[48], affiliated with the University of Goettingen in Germany, investigated the dominant processing style of the consumer at the actual time of purchase and address certain aspects such as: knowledge of nutrition, motivation, and time for purchase. The result demonstrated effectiveness in the perception of healthiness for foods with the front labeling on the packages and, still, highlighted that the different models of front labels (traffic lights, alerts, etc.) are preferable by the same consumer when exposed in different situations, that is, changes in the context of the purchase may alter the consumer's preference in relation to the type of front label included in the packages.

In the present study, however, a limitation is the fact that it was not carried out in a real food purchase environment. It is known that the environment can influence the reading habit and understanding of labels. It is suggested, in future research, the simulation of the purchase environment for the comparison of different warning models for food labels (triangle model, octagon), as well as the comparison between the signaling model of critical nutrients in excess (magnifying glass model) to facilitate consumer understanding of nutrition labeling.

CONCLUSIONS

The present research pointed to the greater acceptance of the participants of the nutritional labeling proposal of alert in triangles, when compared to the current label model adopted in Brazil. This proposal was better accepted specifically due to the ease of reading and understanding the label and the alert to the quantity and nutritional quality of foods.

The socioeconomic diversity of the research participants deserves to be highlighted, which made it possible to show the acceptance of the alert proposal in triangles, regardless of sex, age or education, since it was well accepted not only by adults or people with a higher level of education, but also by the elderly and illiterate.

The present study collaborates to guide new proposals for nutritional labeling of foods that aim to facilitate the reading and understanding of consumers who, more informed, can be positively influenced in their food choices.

In addition, studies like this need to be permanently carried out in order to provide subsidies to raise the debate on food labeling and the real interests involved in its regulation, be they civil society, government entities, or the food industries. The most important thing is that the focus on the consumer should not be lost, as it is the role of government entities to ensure the best information and education for the population, with a view to promoting their health and self-care.

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