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Ana Karina Soares-Nascif , Carolina Soares-Nascif , Sheila Cavalca Cortelli 

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Rotulagem Nutricional Frontal e Letramento em Saúde em Crianças e Adolescentes: Uma Revisão Integrativa das Evidências Atuais e Implicações Regulatórias

Ana Karina Soares-Nascif^{1*}, Carolina Soares-Nascif², Sheila Cavalca Cortelli¹

AKSN - <https://orcid.org/0009-0004-7586-5591> CSN - <https://orcid.org/0009-0008-9159-230X> SCC - <https://orcid.org/0000-0003-0809-6935>

1- Universidade de Taubaté - UNITAU

2- Programa Institucional Adote um Cientista, Universidade de Taubaté - UNITAU

* ana.ksnascif@unitau.br

ABSTRACT

Health literacy is fundamental for promoting self-care and informed dietary choices, especially during childhood, a critical period for establishing lifelong eating behaviors. Front-of-package nutrition labeling has emerged as a public health strategy to provide clear and accessible information about critical nutrients, supporting healthier food decisions. Objective: To synthesize, through an integrative review, the scientific evidence on the effectiveness of front-of-package nutrition labeling in comprehension, risk perception, and food choices among children and adolescents, and its relationship with health literacy in this age group. Secondly, to discuss this evidence in light of the Brazilian regulatory context established by Anvisa. Data source: An integrative literature review was conducted using PubMed, SciELO, and LILACS databases, including studies published between 2018 and 2025. The following descriptors were used: *Health Literacy; Self-care; Food Labeling; Food, Processed; Front-of-package Labels; Child; Adolescent; Obesity*. Data synthesis: Twenty-four studies were included, representing diverse geographic and socioeconomic contexts. More direct warning



models, such as octagons and triangles, showed greater effectiveness in improving comprehension, risk perception, and healthier food choices among children and adolescents. The Brazilian magnifying glass model demonstrated comparatively limited impact. Educational interventions, including videos and digital games, consistently improved health literacy and behavioral outcomes. Methodological heterogeneity and contextual factors, such as marketing exposure and socioeconomic conditions, influenced overall effectiveness. Front-of-package nutrition labeling is a relevant strategy to support health literacy and promote healthier dietary choices in pediatric populations. Its effectiveness depends on graphic design, regulatory strength, and integration with educational and broader public health policies.

Keywords: food labeling, child, obesity.

RESUMO

O letramento em saúde é fundamental para a promoção do autocuidado e de escolhas alimentares informadas, especialmente durante a infância, uma fase crítica para o estabelecimento de comportamentos alimentares ao longo da vida. A rotulagem nutricional frontal tem emergido como uma estratégia de saúde pública destinada a fornecer informações claras e acessíveis sobre nutrientes críticos, favorecendo decisões alimentares mais saudáveis. Objetivo: Sintetizar, por meio de revisão integrativa, as evidências científicas sobre a efetividade da rotulagem nutricional frontal na compreensão, na percepção de risco e nas escolhas alimentares de crianças e adolescentes, e sua relação com o letramento em saúde nessa faixa etária. Secundariamente, discutir essas evidências à luz do contexto regulatório brasileiro estabelecido pela Anvisa. Fontes de dados: Foi realizada uma revisão integrativa da literatura utilizando as bases de dados PubMed, SciELO e LILACS, incluindo estudos publicados entre 2018 e 2025. Foram utilizados os seguintes descritores: *Health Literacy; Health Literacy; Self-care; Food Labeling; Food, Processed; Front-of-package Labels; Child; Adolescent; Obesity*. Síntese dos dados: Vinte e quatro estudos foram incluídos, representando diferentes contextos geográficos e socioeconômicos. Modelos de advertência mais diretos, como octógonos e triângulos, demonstraram maior eficácia na melhoria da compreensão, da percepção de risco e na promoção de escolhas alimentares mais saudáveis entre crianças e adolescentes. O modelo brasileiro da lupa apresentou impacto comparativamente limitado. Intervenções educativas, incluindo vídeos e jogos digitais, melhoraram consistentemente o letramento em saúde e os desfechos comportamentais. A heterogeneidade metodológica e fatores contextuais, como exposição ao marketing e condições socioeconômicas, influenciaram a efetividade global. A rotulagem nutricional frontal constitui uma estratégia relevante para apoiar o letramento em saúde e promover escolhas alimentares mais saudáveis na população pediátrica. Sua efetividade depende do desenho gráfico, da robustez regulatória e da



integração com estratégias educativas e políticas públicas mais amplas.

Palavras-chave: letramento em saúde, rotulagem de alimentos, criança, adolescente, obesidade.

INTRODUCTION

The promotion of self-care is closely linked to literacy and health literacy. Health literacy refers to the capacity to obtain, process, and understand information necessary to make appropriate decisions (CENTERS FOR DISEASE CONTROL AND PREVENTION, 2025), expanding to encompass the practical application of knowledge, the use of accessible language, and institutional responsibility (WORLD HEALTH ORGANIZATION, 2013).

According to the World Health Organization (WHO), health literacy is defined as a set of cognitive and social skills that determine individuals' motivation and ability to access, comprehend, and use information in ways that promote health (WORLD HEALTH ORGANIZATION, 2013). This concept guides everyday decisions, raises awareness, and strengthens individual responsibility in adopting behaviors that promote well-being.

In this context, reading front-of-package nutrition labeling is highlighted as a health literacy practice that should be encouraged from childhood. Although children and adolescents read nutrition labeling less frequently than adults, studies have demonstrated that, when stimulated to interpret information presented on real nutrition labeling, they develop improved nutrition comprehension. In addition, evidence indicates that associating

nutrition education with nutrition labeling enhances learning about healthy eating, particularly when schools and families actively participate in the process (KATZ et al., 2011; DE VLIEGER et al., 2021).

Front-of-package nutrition labeling (FOPNL) emerges as a strategic tool for health literacy, as it provides clear and accessible information on the principal display panel regarding the high content of critical nutrients, thereby facilitating more informed food choices. Introduced in the late 1980s as a response to the progression of obesity and other noncommunicable diseases (NCDs) and the absence of effective policies, it has become established as an important public health strategy (WORLD HEALTH ORGANIZATION, 2019; BRASIL, 2020a) and has been recommended since 2004 by the WHO to reduce the consumption of ultra-processed foods, with continuous reinforcement and refinement of this guideline (WORLD HEALTH ORGANIZATION, 2013; WORLD HEALTH ORGANIZATION, 2019).

Childhood obesity represents one of the greatest public health challenges, with rising prevalence and projected growth from 22% in 2016 to 39% by 2035 among children and adolescents aged 5 to 19 years (WORLD OBESITY FEDERATION, 2024). Evidence shows that obesity frequently persists from childhood into adulthood, and that many NCDs originate in the early stages of the life course. These



findings reinforce the urgency of early and more robust interventions, particularly because current strategies have been shown to be limited, especially in the pediatric population (GBD 2021 ADOLESCENT BMI COLLABORATORS, 2025).

In the last decade, FOPNL policies have rapidly disseminated, particularly in the Americas. Initial evidence from these countries indicates positive population adherence, changes in purchasing patterns, and reformulation of products marketed by the food industry (FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS; PAN AMERICAN HEALTH ORGANIZATION, 2017; CROSBIE et al., 2022). Currently, 15 countries have mandatory regulations, and another 36 have adopted voluntary nutrition labeling policies (SMITH-TAILLIE; DURAN, 2024).

The mandatory adoption process of FOPNL in Brazil was conducted by Anvisa and represented a regulatory milestone, as it included front-of-package warnings regarding excess critical nutrients — sodium, added sugars, and saturated fat. The Brazilian model adopted a semi-interpretative rectangular symbol, accompanied by a magnifying glass icon and the expression “High in” (BRASIL, 2020b).

Studying the impact of packaged food labeling on the pediatric population constitutes a field of growing interest, considering that children are frequently targets of marketing for foods and beverages with low nutritional value (CAIRNS et al.,

2013; KELLY et al., 2019). Currently, this age group has greater purchasing power than in the past and actively participates in family consumption decisions. In addition, it is a particularly vulnerable group, as children do not always possess sufficient critical skills to make informed decisions regarding their own health (SADEGHIRAD et al., 2016).

The majority of packaged food labeling studies have been conducted with adults and have demonstrated positive outcomes, such as improved comprehension of nutrition information, healthier food choices, and stimulated voluntary product reformulation by the industry (SONG et al., 2021; GRUMMON et al., 2023; DE MORAIS SATO et al., 2019; BANDEIRA et al., 2021; KHANDPUR et al., 2022).

Although evidence supports the effectiveness of FOPNL in adult populations, studies focusing specifically on children and adolescents remain limited and heterogeneous, indicating the need for a comprehensive synthesis of the available data.

The objective of the present integrative review is to synthesize scientific evidence on the effectiveness of FOPNL in comprehension, risk perception, and food choices among children and adolescents, and its relationship with health literacy during childhood, based on evidence from different countries and methodologies. Secondly, this evidence is discussed in light of the regulatory context established by Anvisa in Brazil.

An integrative review was chosen for this study because front-of-package nutrition labeling



regulation is still recent in Brazil and the available evidence encompassed markedly heterogeneous study designs; this approach allows the integration of studies with diverse methodological approaches into a single synthesis, supporting an exploratory analysis capable of generating hypotheses to be tested in future research. An integrative literature review was conducted using the main scientific databases – PubMed, SciELO, and LILACS – employing the following descriptors and search terms: Health Literacy; Self-care; Food Labeling; Food, Processed; Front-of-package Labels; Child; Adolescent; Obesity. The articles were selected in the English and Portuguese languages and were published between 2018 and 2025. All records identified in the searched databases were screened in stages: title screening, followed by abstract review, and full-text reading of potentially eligible articles. Studies involving children and/or adolescents addressing front-of-package nutrition labeling and its relationship with comprehension, health literacy, risk perception, or food choices were included, regardless of study design. Studies not addressing this population or theme were excluded, as well as studies outside the pediatric age range established for this review, congress abstracts without a corresponding full published article, and records of ongoing clinical trials. Overall, 25 records were identified through the database search and assessed for eligibility; 24 met the inclusion criteria and were included in this review, and one record,

identified by the authors as an ongoing randomized controlled trial ("RCT ongoing"), was excluded (AVILA-MONTIEL et al., 2024). Data from the selected studies were organized in a spreadsheet recording participants' age range, number of participants, methodology used, main results, country where the study was conducted, and the type of front-of-package nutrition labeling assessed. As this is an integrative review, formal appraisal of methodological quality or risk of bias is not a requirement and, given the heterogeneity of study designs included, was considered of limited efficiency; it was therefore not performed. Study selection and analysis were independently conducted by two of the authors (AKSN and SCC).

RESULTS

Twenty-four articles were identified as central to the analysis, addressing nutritional labeling and health literacy themes, with emphasis on FOPNL in the pediatric population, across the databases consulted. The included studies encompass different geographic and socioeconomic contexts, allowing a comprehensive overview of the impact of FOPNL in distinct scenarios.

For systematization purposes, the studies were analyzed according to previously established methodological criteria, including study design, country of origin, number of participants, age group, and type of labeling investigated.

This approach enabled the construction of a



critical and comparative synthesis, presented in an organized manner in table 1, providing relevant support for understanding the effectiveness of

FOPNL in the pediatric population.

Table 1. Characteristics of studies on front-of-package nutrition labeling and health literacy in the pediatric population.

Tabela 1. Características dos estudos sobre rotulagem nutricional na embalagem e rotulagem nutricional frontal e letramento em saúde na população pediátrica.

Country	Population (age)	Model / Method	Main results
Brazil (NASCIF, 2025)	238 (8–11 years)	Magnifying glass and video	Label ineffective; video improved behavior
Brazil (SOARES et al., 2025)	437 (15–18 years)	Control vs. octagon vs. magnifying	Octagon increased risk perception
Brazil (CASTAGNOLI et al., 2023)	410 (7–10 years)	Labels + educational intervention	Intervention improved knowledge
Brazil (MONTEIRO et al., 2022)	241 (13–18 years)	Label reading survey	Low use and understanding
Brazil (LIMA et al., 2018; LIMA et al., 2019)	318 children; 278 parents	Traffic light vs. octagon	Improved health perception
Chile (FRETES et al., 2023)	349 children; 294 adolescents	Dietary recall	Reduced school consumption
Chile (CORREA et al., 2019)	84 mothers	Octagon	Improved dietary habits
Taiwan (WANG et al., 2022)	343 (mean age 11 years)	Multiple labels	Improved perception
China (JUNJIE et al., 2024)	452 (10–12 years)	Nutri-Score	Improved choices
United States (GRAHAM et al., 2023)	175 child–parent pairs	Health stars + video	Video improved choices
United States (MUSICUS et al., 2022)	5,005 mothers	Warning triangle	Increased risk perception
United States (BECKER et al., 2019)	80 (6–10 years)	Game-based labels	Reduced unhealthy choices



Ecuador (CABRERA et al., 2023)	1,172 (mean age 14 years)	Traffic light	Healthier choices
Guatemala (KROKER-LOBOS et al., 2023)	356 participants	Octagon vs. GDA	Increased awareness
France (DUCROT et al., 2022)	1,201 (11–17 years)	Nutri-Score	Easy to understand
Multicenter (HOCK et al., 2021)	10,762 (10–17 years)	Multiple models	Increased risk perception
Multicenter (HAMMOND et al., 2023)	More than 10,000 (10–17 years)	Mandatory vs. voluntary labels	Better recognition and use
Peru (SAAVEDRA-GARCIA et al., 2022)	449 (10–14 years)	Octagon	No significant change
Peru (DIEZ-CANSECO et al., 2024)	98 mothers	Octagon	Limited impact
India (PATIL et al., 2024)	206 (16–18 years)	Labels	Knowledge increased, use decreased
India (VERMA et al., 2023)	722 adolescents	Labels	Low awareness
Mexico (CONTRERAS-MANZANO et al., 2022)	280 (6–13 years)	Labels + media	Labels effective; characters reduced efficacy
Systematic review (ARRAZTIO-CORDOBA et al., 2022)	20 studies	Review	Inconsistent evidence

GDA: guideline daily amount; RCT: randomized controlled trial.

GDA: diretriz quantidade diária; RCT: ensaio clínico randomizado.

DISCUSSION

The analysis of the 24 studies included in this review indicates that FOPNL constitutes a relevant public health strategy, particularly when associated with educational interventions. The results

synthesized in table 1 suggest that more direct graphic models, such as octagons and triangles, tend to demonstrate greater effectiveness in the comprehension of nutritional information, risk perception, and influence on food choices,



especially among children and adolescents (SOARES et al., 2025; LIMA et al., 2018; LIMA et al., 2019; CORREA et al., 2019; MUSICUS et al., 2022; KROKER-LOBOS et al., 2023).

From a conceptual perspective, FOPNL may be understood as a structural strategy to promote critical health literacy, as defined by Nutbeam (2000), by facilitating access to simplified and actionable information that supports autonomous and informed decision-making in food environments. In this sense, labeling policies extend beyond information provision and contribute to empowering individuals within complex commercial contexts (NUTBEAM, 2000).

In Brazil, however, studies indicate that the magnifying glass model presents important limitations and is frequently considered less effective than other alternatives, such as octagons, in influencing risk perception and purchase intention (NASCIF, 2025; SOARES et al., 2025; LIMA et al., 2018; LIMA et al., 2019). These findings raise relevant considerations regarding the graphic format adopted and its capacity to communicate nutritional risk rapidly and intuitively.

In contrast, educational interventions — including short videos, digital games, and school-based activities — have shown consistent results in strengthening health literacy and promoting healthier food choices (DE VLIEGER et al., 2021; NASCIF, 2025; CASTAGNOLI et al., 2023; GRAHAM et al., 2023). Such strategies reinforce interactive and

critical dimensions of health literacy (NUTBEAM, 2000), particularly when integrated into structured educational settings.

Studies conducted in Latin American countries (Chile, Mexico, Ecuador, Peru, and Guatemala) reinforce that the adoption of mandatory warning models, especially octagons, is associated with greater FOPNL recognition, reduced consumption of ultra-processed products, and positive changes in dietary habits (FRETES et al., 2023; KROKER-LOBOS et al., 2023; SAAVEDRA-GARCIA et al., 2022). Robust real-world evidence from Chile demonstrated that the implementation of mandatory warning labels was associated with a significant reduction in purchases of sugar-sweetened beverages (TAILLIE et al., 2020), reinforcing the potential population-level impact of such regulatory strategies.

However, socioeconomic factors, the absence of complementary educational campaigns, and the persistence of child-targeted marketing strategies may limit the impact of these measures (DIEZ-CANSECO et al., 2024; CONTRERAS-MANZANO et al., 2022). There is consistent evidence that exposure to unhealthy food advertising increases children's immediate food intake and influences preferences, representing a structural barrier to healthier choices (BOYLAND et al., 2016). In Brazil, FOPNL regulation has not been accompanied by restrictions on child-directed advertising, which may reduce its effectiveness compared with other Latin



American experiences (SATO et al., 2022).

Moreover, methodological heterogeneity among studies, lack of standardized effectiveness indicators, and scarcity of longitudinal analyses compromise the consolidation of evidence (ARRAZTIO-CORDOBA et al., 2022). These limitations highlight the need for stronger evaluation frameworks capable of capturing sustained behavioral outcomes.

The magnifying glass-shaped label adopted in Brazil lacks robust evidence demonstrating superiority over other models. Several studies indicate better performance of triangular and octagonal warning symbols in aspects such as comprehension, perception of healthfulness, and purchase intention (BANDEIRA et al., 2021; KHANDPUR et al., 2022; GOODMAN et al., 2018; KHANDPUR et al., 2019). Anvisa opted for the magnifying glass model because it highlights excess nutrients without constituting an explicit warning. In contrast, triangles and octagons are widely recognized as warning symbols, favoring rapid identification and greater risk perception (BRASIL, 2020a; BRASIL, 2020b; AGÊNCIA NACIONAL DE VIGILÂNCIA SANITÁRIA, 2019).

Studies conducted in Canadian adults suggest effectiveness in promoting informed food choices; however, such findings cannot be directly extrapolated to the Brazilian pediatric population (MANSFIELD et al., 2020).

According to Anvisa regulations, products

carrying FOPNL warnings for sugars, fats, or sodium cannot make claims regarding these nutrients; however, they may still emphasize vitamins and minerals, potentially generating contradictory messages. Additionally, the absence of specific regulation for the school environment restricts the measure's capacity to influence dietary practices in this population (CROSBIE et al., 2022).

Brazil did not adopt the Pan American Health Organization (PAHO) Nutrient Profile Model and established less restrictive thresholds for sugars, saturated fats, and sodium. Consequently, several ultra-processed products remain without the magnifying glass label, which may reduce the effectiveness of FOPNL in alerting consumers and limit alignment with the Brazilian Dietary Guidelines (BRASIL, 2014).

From a policy perspective, front-of-package labeling is recognized as an important public health strategy for tackling noncommunicable diseases due to its cost-effectiveness, broad population reach, and potential to support healthier dietary choices at the population level (PAN AMERICAN HEALTH ORGANIZATION, 2020). Nevertheless, optimal impact depends on coherent regulatory design, enforcement, monitoring, and integration with complementary public health strategies.

Educational interventions consistently demonstrate potential to improve comprehension of nutrition labeling and to encourage healthier food choices among children and adolescents. Nascif



(2025) showed that the use of a short classroom video was effective, similarly to the findings of Castagnoli et al. (2023). In Mexico, video-based interventions were 2.23 times more effective than informational posters (CONTRERAS-MANZANO et al., 2022), corroborating findings from the United States (GRAHAM et al., 2023). Other approaches, such as educational programs and digital tools like VitaVillage (KATZ et al., 2011; DE VLEIEGER et al., 2021), also demonstrated positive outcomes.

Although FOPNL is generally more cost-effective in guiding rapid decisions than isolated educational campaigns, the integration of mandatory warning labels with continuous educational strategies appears to generate broader and more sustained effects, as recommended by PAHO (PAN AMERICAN HEALTH ORGANIZATION, 2020).

The adoption of FOPNL in Brazil represents regulatory progress. However, its effectiveness may depend on revisions to graphic format, strengthening of educational initiatives, and integration with broader policies addressing child-directed marketing and school environments. Continuous monitoring and post-implementation evaluation remain essential.

To date, comprehensive impact evaluation data regarding FOPNL implementation in Brazil remain limited, restricting public access to information on population response, purchasing behavior changes, and industry compliance beyond visual adjustments (CROSBIE et al., 2022).

Future research should prioritize real-world evaluations, longitudinal analyses, standardization of outcome measures, and investigation of family influence and marketing interactions. Further investigation is necessary to clarify the concrete contribution of FOPNL to the prevention and control of childhood obesity, supporting evidence-based refinement of public policies.

CONCLUSIONS

Front-of-package nutrition labeling (FOPNL) represents a relevant public health strategy with potential to improve nutritional perception and support healthier food choices among children and adolescents. Evidence suggests that more direct warning models, particularly octagons and triangles, demonstrate greater communicative effectiveness than the magnifying glass model currently adopted in Brazil. The integration of FOPNL with structured educational interventions appears fundamental to strengthening health literacy and enhancing behavioral outcomes. Because the evidence synthesized here derives from exploratory and methodologically heterogeneous studies rather than confirmatory trials, this review does not support definitive policy directives. Instead, based on the patterns identified, the following hypotheses are proposed for testing in future research and policy piloting in Brazil: that, given how recently the magnifying glass symbol was adopted in Brazil, replacing it would be premature; rather,



complementing it with a more direct warning format, such as an octagon, would improve risk perception and food choices among Brazilian children and adolescents; that pairing FOPNL with structured school-based educational interventions, such as videos or digital games, would produce larger and more sustained gains in health literacy than labeling alone; and that extending FOPNL regulation to restrict child-directed marketing of ultra-processed foods would enhance its effectiveness, as observed in other Latin American countries. Prospective and experimental studies designed to test these hypotheses in the Brazilian context are needed to inform future regulatory refinement and monitoring.

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