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Muskan Kaira

College of Community Science,
G. B. Pant University of
Agriculture and Technology,
Pantnagar, Uttarakhand,
India

Anirudh Chandra

College of Veterinary and
Animal Sciences, G. B. Pant
University of Agriculture and
Technology, Pantnagar,
Uttarakhand, India

Anshita Neekhrey

College of Fisheries, G. B. Pant
University of Agriculture and
Technology, Pantnagar,
Uttarakhand, India

Corresponding Author:

Muskan Kaira

College of Community Science,
G. B. Pant University of
Agriculture and Technology,
Pantnagar, Uttarakhand,
India

Consumer awareness of nutrition labels and its role in healthy food choices: A review

Muskan Kaira, Anirudh Chandra and Anshita Neekhrey

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Abstract

Nutrition labeling serves as an important public health tool to assist consumers in making informed and healthier food choices. In the context of the rising burden of diet-related non-communicable diseases worldwide, consumer awareness and use of nutrition labels have gained considerable attention. This review critically examines existing literature on consumer awareness, understanding, and utilization of nutrition labels, with a specific focus on comparing consumer practices in India with those in other countries. Evidence indicates that while general awareness of nutrition labels is relatively high in India, their effective use in guiding healthy food choices remains limited, with consumers often prioritizing expiry dates, price, and taste over nutritional information. In contrast, consumers in many developed and middle-income countries demonstrate higher levels of comprehension and more consistent use of nutrition labels, particularly where simplified front-of-pack labeling systems are implemented. The review further explores socio-demographic, educational, and regulatory factors influencing these differences in consumer behavior. Challenges such as low nutrition literacy, complex label formats, and misleading claims are highlighted as key barriers in the Indian context. Overall, the comparative analysis underscores the need for improved nutrition education, simplified and standardized labeling formats, and strengthened policy interventions to enhance the effectiveness of nutrition labeling in promoting healthier food choices, especially in developing countries like India.

Keywords: Nutrition labeling, consumer awareness, healthy food choices, food label utilization, comparative consumer practices, India and global perspective

1. Introduction

In recent decades, globalization, urbanization, and lifestyle changes have significantly transformed food consumption patterns, increasing the availability and intake of processed and packaged foods. This shift has contributed to the rising global burden of diet-related non-communicable diseases (NCDs) such as obesity, type 2 diabetes, cardiovascular diseases, and hypertension [1]. In response, nutrition labeling has emerged as an important public health strategy to support informed and healthier dietary choices by providing information on energy, macronutrients, micronutrients, and key components such as sugar, salt, and fat [2]. Nutrition labeling is a standardized regulatory mechanism that communicates the nutritional properties of food products through numerical, textual, or interpretive formats on packaging [3]. Its primary objective is to enhance transparency, reduce information asymmetry between manufacturers and consumers, and enable individuals to compare products and make healthier choices [4]. Globally, consumer practices vary due to differences in nutrition literacy, education, cultural habits, and regulatory frameworks. Many developed and middle-income countries have adopted simplified front-of-pack labeling (FOPL) systems—such as traffic light labels, health star ratings, and warning symbols—which improve understanding and promote healthier food choices compared to traditional back-of-pack formats [2]. Overall, nutrition labeling functions not only as an informational tool but also as a behavioral intervention, particularly when presented in simple and interpretive formats [6]. A comparative understanding of consumer awareness and practices across countries is therefore essential to identify gaps, adopt best practices, and strengthen nutrition labeling policies. This review aims to assess consumer awareness, evaluate the role of nutrition labels in promoting healthy food choices, and compare practices between India and global contexts to inform improved public health nutrition strategies.

2. Consumer Awareness of Nutrition Labels

Consumer awareness of nutrition labels refers not only to noticing nutrition information on food packaging but also to recognizing its relevance for making healthier food choices. Studies indicate that a majority of consumer report being aware of nutrition labels, but actual attention to and use of nutritional information varies widely across populations. For instance, urban Indian consumers often check brand and expiry dates, whereas less than 40% report reading nutrient information such as calories and macronutrients on food labels [7]. In international contexts, studies show that while consumers are generally aware of food labels and related regulations, this awareness does not always translate into consistent use during purchasing decisions [8]. National-level evidence further indicates that awareness of food labeling has increased over time; however, demographic factors such as age, education, and income significantly influence levels of understanding and utilisation [9]. Research from Pakistan found that consumers' awareness of nutrition facts positively influences food selection, although gaps remain in how frequently nutritional information is used [10]. Additionally, demographic and behavioral factors such as age, occupation, income, and personal health priorities are strongly associated with awareness and preference for food label use, highlighting the need for improved consumer education [9]. Overall, while many consumers are aware of nutrition labels and recognize their importance for healthier choices, this awareness alone is often insufficient for accurate interpretation and consistent use, indicating the need for clearer labeling formats and targeted education strategies [8, 10].

3. Understanding and Utilisation of Nutrition Labels

Understanding and utilisation of nutrition labels refers to consumers' ability to correctly interpret nutritional information and actively apply it during food purchasing and consumption decisions. Evidence from multiple studies indicates that although many consumers report reading nutrition labels, their level of understanding is often partial, particularly when labels contain complex numerical data or technical terminology [11]. Research across different countries shows that consumers are generally able to identify basic information such as calories and total fat, but they frequently struggle with interpreting serving sizes, percent daily values, and added sugars, which limits effective utilisation of label information [12]. Educational level, nutrition literacy, and prior exposure to nutrition education have been consistently identified as strong predictors of both comprehension and use of nutrition labels [13, 14]. Studies further demonstrate that simplified and interpretive front-of-pack labeling systems significantly enhance consumer understanding and increase the likelihood of label use compared to traditional back-of-pack nutrition panels [15, 16].

4. Factors Affecting Food Choices of Packaged Food Items

Taste and sensory attributes are key determinants of food choice, often taking precedence over nutritional considerations even among health-conscious consumers [16]. At the same time, health consciousness, perceived health

benefits, exposure to nutrition labeling, and social norms encourage consumers to opt for healthier options [15, 17]. Socio-demographic factors such as education, income, and gender affect how consumers read and use nutritional information on labels [18, 19]. However, price sensitivity remains a key factor, with many consumers prioritizing affordability over nutritional quality [20]. Convenience, including time-saving features and longer shelf life, drives higher consumption of packaged foods, especially among urban and working populations [21]. Additionally, packaging design, branding, and marketing strategies such as front-of-pack labeling and health claims shape consumer perception and purchasing behavior [22, 23]. Finally, habitual consumption and previous purchasing behavior reinforce repeated choices, leading consumers to stick to familiar packaged food products regardless of their nutritional value [24].

5. Challenges in Food Choices of Packaged Food Items

Complex and unclear nutrition labels, along with misleading health claims, create confusion and reduce consumers' ability to accurately assess the nutritional quality of packaged foods [25, 27]. This issue is further intensified by low nutrition literacy and inadequate consumer education, which limit the effective interpretation and use of label information [19]. Barriers such as unfamiliar terminology, small font sizes, and non-standardized label formats make it difficult for consumers to understand nutrition information during purchasing decisions [11, 23]. Additionally, a strong preference for taste, convenience, and price often diminishes the impact of nutrition labeling on food choices [24, 20]. Low motivation, limited trust, and the perception that nutrition labels are irrelevant discourage consumers from actively engaging with such information [26]. Children and adolescents are especially vulnerable to persuasive packaging and promotional elements, which can distort their perception of a product's healthfulness [27]. Furthermore, time constraints, habitual buying behavior, and limited prior nutrition knowledge restrict consumers from effectively using available nutrition information, making informed food choices more challenging [28].

6. Comparative Analysis of Consumer Practices in India and Other Countries

Due to variations in nutrition literacy, regulatory implementation, and label formats, consumer practices related to nutrition labeling differ significantly across countries. Although awareness of food labels exists in India, consumers often prioritize factors such as price and taste, which limits the effective use of nutrition information in guiding healthier food choices [29]. In contrast, developed countries demonstrate higher levels of comprehension and utilization, largely due to the widespread adoption of simplified and interpretive front-of-pack labeling systems that are easier to understand [11, 12]. These differences across key dimensions—awareness, comprehension, and utilization—highlight important gaps in consumer engagement with nutrition labeling and provide insights for improving the effectiveness of labeling policies. A detailed comparison of consumer practices in India and other countries is presented in Table 1 [30].

Table 1: Comparative Analysis of Consumer Practices in India and Other Countries

Dimension	India	Other Countries (USA, UK, EU, Australia, Canada, etc.)
Primary consideration during purchase of packaged foods	Consumers prioritize price, taste, expiry/manufacturing date and brand over nutrition information [31, 29]	Consumers increasingly consider nutrition alongside price and taste, especially calories, sugar, fat, and sodium [11, 32].
Awareness of nutrition labels	General awareness exists but is mostly limited to expiry dates and basic safety labels [31]	High awareness of nutrition labels due to strong regulations and public health campaigns [4, 33]
Understanding of nutrition information	Understanding is often limited, with difficulty interpreting serving sizes and technical terms [34]	Better understanding where interpretive front-of-pack labels are used [11, 35].
Utilisation of nutrition labels in decision-making	Nutrition labels are not the primary decision tool; usage is higher among educated, urban, and health-conscious consumers [29]	Nutrition labels help compare products and support healthier choices, especially for those with diet-related concerns [11, 33]
Impact of front-of-pack labeling (FOPL)	FOP labels are easier and more effective than back-of-pack labels, but adoption and exposure remain limited [29]	FOP labels strongly influence understanding, purchases, and reformulation, especially when mandatory [25, 12]
Role of nutrition knowledge and literacy	Nutrition knowledge drives label use; low literacy remains a key barrier [34]	Simple, color-coded, and warning labels help even low-literacy consumers, reducing understanding gaps [35]
Overall effectiveness of nutrition labels	Labels mainly inform, with limited impact on population-level behavior [29]	Labels act as informational and behavioral tools, shaping choices and reformulation [33, 12]

7. Improving Nutrition Label Effectiveness Through Consumer Education and Standardized Packaging

Improving nutrition label effectiveness is an important public health strategy to support healthier food choices and reduce diet-related diseases. Evidence shows that interpretive front-of-pack labels such as warning labels, traffic light labels, and Nutri-Score improve consumer understanding more effectively than numeric-only labels [25]. Research further highlights that consumer education and nutrition literacy programs strengthen label comprehension and promote healthier purchasing behavior [11, 26]. Additionally, policy reviews emphasize that standardized packaging and mandatory label placement enhance label visibility, reduce confusion, and improve the overall effectiveness of nutrition labeling systems [36, 12].

7.1 Consumer Education

Consumer education plays a crucial role in improving the effectiveness of nutrition labeling by enhancing comprehension and enabling healthier food choices through increased awareness of key nutrients such as sugar, sodium, and saturated fat [11, 26]. Nutrition literacy training has been shown to improve the interpretation of front-of-pack labels and supports the application of label information in real purchasing situations [17]. Educational interventions also help reduce confusion related to serving sizes and numeric nutrient information, thereby improving the practical use of nutrition labels [11]. However, front-of-pack labels are often less effective among low-literacy and disadvantaged populations, highlighting the need for targeted education strategies to improve equity [19]. Education further enhances the understanding of interpretive labeling systems such as Nutri-Score and warning labels [17]. Comparative evidence suggests that the effectiveness of nutrition labeling varies across countries due to differences in awareness, literacy, and policy implementation [30]. Developed countries demonstrate higher levels of consumer engagement due to stronger regulations, better nutrition education, and widespread use of interpretive labeling systems [26, 19] whereas countries like India face challenges such as lower nutrition literacy and greater reliance on back-of-pack information [19]. Simplified and standardized interpretive labels have been found to be more effective across diverse

populations and contribute to reducing health inequalities [17, 12]. Overall, increased nutrition label knowledge is associated with greater label usage, and combining education with public health campaigns and school-based interventions supports long-term improvements in healthy food choices [36].

7.2 Standardized Packaging

Standardized packaging plays a crucial role in enhancing the effectiveness of nutrition labeling by ensuring consistent label placement, font, and design, which increases visibility and reduces confusion during food selection [36]. Systematic reviews further indicate that standardized interpretive labels, such as traffic light systems, warning symbols, and Nutri-Score, are more effective than non-standardized numeric labels in improving consumer understanding [17]. Meta-analytic evidence confirms that standardized front-of-pack labeling systems enhance consumer decision-making by simplifying complex nutrition information and increasing trust in label credibility [25]. Additionally, standardized packaging reduces the misleading influence of marketing claims, as consumers tend to rely more on consistent front-of-pack nutritional information for product evaluation [34]. Policy-oriented reviews also highlight that standardization prevents food industries from manipulating packaging design to obscure nutrition labels, thereby ensuring uniform implementation and fairness for consumers [36]. Furthermore, research indicates that standardized label formats improve the speed and accuracy of product comparisons, supporting healthier food choices in time-constrained shopping environments [25]. Evidence from warning label policy studies shows that standardization of packaging and label placement increases consumer noticing and strengthens the overall effectiveness of warning labels [12]. Finally, studies demonstrate that standardized packaging can encourage food reformulation, as companies are motivated to improve their label scores or grades when labeling systems are uniform and publicly visible [12].

8. Policy Interventions to Enhance the Effectiveness of Nutrition Labeling

Policy interventions play a crucial role in strengthening the impact of nutrition labeling by ensuring that label formats

are clear, standardized, and easily interpreted by consumers. Among the most widely supported interventions is the implementation of mandatory interpretative front-of-package (FOP) labeling systems, which use simplified visual formats such as warning symbols, traffic light colors, or graded scoring systems to communicate nutritional quality quickly. Evidence from systematic reviews and policy evaluations indicates that interpretive FOP labels improve consumer understanding, support healthier food selection, and are more effective than voluntary or purely numeric nutrition information panels [35]. Such labeling policies are increasingly recognized as effective public health tools to reduce diet-related non-communicable diseases by guiding consumers toward healthier purchasing decisions [12].

8.1 Mandatory interpretive front-of-package (FOP) nutrition labels

Mandatory interpretive front-of-package (FOP) nutrition labels, including warning labels, traffic lights, Health Star Ratings, Nutri-Score, and spectrum healthfulness scores, have been shown to improve consumer understanding and help distinguish healthier from less healthy packaged foods [2-39]. The following interventions come under this policy:

8.1.1 Mandatory warning labels that clearly indicate high levels of nutrients of concern

Front-of-package warning labels are designed to clearly inform consumers when a product contains high levels of nutrients of concern such as sugars, sodium, or saturated fats, thereby helping them make healthier choices. These labels reduce the perceived healthfulness of such products and discourage their consumption. For example, “high-in” warning labels (e.g., high in sugar or salt) have been shown to make consumers less likely to choose unhealthy foods, as they provide simple and direct nutritional guidance [12].

8.1.2 Multiple Traffic Light (MTL) labeling to quickly show nutrient levels using colors

Multiple Traffic Light (MTL) labeling is a front-of-package system that uses intuitive colour coding to quickly convey the levels of key nutrients such as sugar, sodium, and fat, making it easier for consumers to interpret nutritional information briefly. This approach enhances consumers' ability to identify healthier options and improves overall understanding compared to non-interpretive labels. For example, MTL labels use green, amber, and red colours to indicate low, moderate, and high levels of nutrients, respectively, helping consumers make quicker and more informed choices [37].

8.1.3 Health Star Rating (HSR) system providing a summary health score

The Health Star Rating (HSR) system is a front-of-package labeling approach that provides a simple summary score reflecting the overall nutritional quality of a product, helping consumers make quick and informed choices. It evaluates the product's nutrient profile and presents it on a scale from 0.5 to 5 stars, making it easier to compare foods briefly. Research shows that HSR labels improve consumers' ability to accurately identify and rank healthier products compared to having no interpretive label. For example, products displaying higher star ratings are

perceived as healthier, guiding consumers toward better options [38].

8.1.4 Nutri-Score color-coded graded label indicating overall nutritional quality

Nutri-Score is a front-of-package labeling system that provides a simple, colour-coded grade to indicate the overall nutritional quality of a product, enabling consumers to quickly assess its healthfulness. It summarizes complex nutrient information into a single indicator, making comparisons between products easier and more intuitive. Research across multiple countries shows that Nutri-Score is highly effective in helping consumers distinguish between healthier and less healthy options, often performing better than other labeling formats. For example, it uses a graded colour-coded scale from A to E to represent overall product healthfulness in a clear and easily understandable way [33].

8.1.5 Interpretation-based spectrum labels that rate foods from least to most healthy

Interpretation-based spectrum labels are front-of-package systems that rate foods along a continuum from least to most healthy, providing an overall assessment of nutritional quality rather than focusing on individual nutrients. These labels aim to simplify decision-making by presenting a comprehensive view of product healthfulness in a single, easy-to-understand format. Policy discussions and research suggest that such interpretive labels can support consumers in quickly evaluating food quality in context, alongside other labeling formats like warning or daily value labels. For example, spectrum-style labels may display a graded scale indicating overall healthfulness, helping consumers compare products more effectively [39].

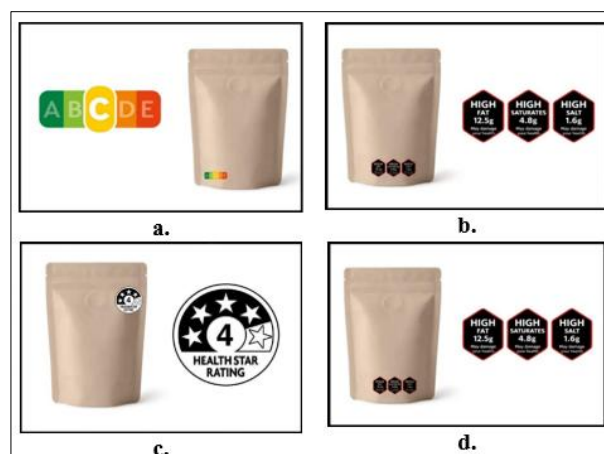


Fig 1: Mandatory interpretive front-of-package (FOP) nutrition labeling systems: (a) Nutri-Score, a color-coded graded label (A-E) reflecting overall nutritional quality; (b) mandatory warning labels indicating high levels of nutrients of concern (e.g., sugar, salt, fat); (c) Health Star Rating (HSR), a summary indicator providing an overall health score; (d) Multiple Traffic Light (MTL) labeling, using color coding (red, amber, green) to denote nutrient levels

9. Types of nutrition- and health-related front-of-pack labels

Front-of-pack nutrition labeling (FOPL) systems are widely recognized as an important public health strategy designed to help consumers quickly understand the nutritional quality of packaged foods at the point of purchase. These labels can be broadly classified based on how they communicate information, including non-interpretive labels, which

provide numerical nutrient values such as reference intake or guideline daily amounts, and interpretive labels, which use visual aids like colours, symbols, or grading systems to simplify nutritional evaluation. Common interpretive formats include traffic light labels, which indicate nutrient risk levels through colour coding, and summary indicator labels such as Nutri-Score and the Health Star Rating, which provide an overall rating of product healthfulness. Additionally, directive labels such as nutrient-specific warning labels and positive endorsement logos provide clear signals to encourage or discourage consumption of specific products. Evidence suggests that interpretive and directive label types tend to improve consumer understanding and influence healthier purchasing decisions more effectively than purely numeric formats, making label classification an important consideration for nutrition policy design [6, 23].

10. Classifications of Front of Pack Labeling

Front-of-pack (FoP) labeling systems are important public health tools that help consumers understand nutritional quality and make healthier food choices. Labels are commonly classified based on interpretation into non-interpretive (numeric information), interpretive (e.g., Traffic Light, Nutri-Score), and directive (e.g., warning symbols) formats [6, 23]. Another classification is based on information focus, including nutrient-specific labels, summary indicators (overall score/grade), and positive endorsement labels [40-41].

10.1 Classifications of Front of Pack Labeling based on Interpretation

Front-of-pack (FoP) food labeling systems are widely used public health tools designed to help consumers quickly understand the nutritional quality of packaged foods and make healthier choices. These labeling systems are commonly classified based on the level of interpretation they provide, ranging from non-interpretive to directive formats. Non-interpretive labels mainly present numeric nutrient information (such as calories, sugar, or fat values) and require consumers to apply their own nutrition knowledge to evaluate the product [6]. In contrast, interpretive labels (such as Traffic Light Labels, Nutri-Score, and Health Star Ratings) provide simplified visual or graded evaluations that improve consumer understanding and support faster decision-making [23]. Additionally, directive labels, including warning labels and endorsement logos, deliver strong guidance by clearly highlighting unhealthy products or recommending healthier options, making them especially effective for discouraging consumption of foods high in critical nutrients such as sugar, salt, and saturated fat [23].

Overall, evidence suggests that interpretive and directive FoP labels are generally more effective than numeric-only labels in improving consumer comprehension and encouraging healthier food choices [6, 23].

10.1.1 Non-Interpretive Labels (Numeric / Information-Based Labels)

Non-interpretive labels, also referred to as numeric or information-based labels (such as Nutrition Facts panels, Guideline Daily Amounts, and Reference Intake labels), primarily present quantitative nutrient information including calories, fat, sugar, and salt. These labels require consumers to independently interpret the healthfulness of a product, thereby increasing cognitive burden. Evidence indicates that

such formats are less effective among populations with low nutrition literacy, as their understanding is strongly influenced by educational level and prior nutrition knowledge. Furthermore, research shows that numeric-only labels often fail to influence quick purchasing decisions because they demand time, comparison skills, and motivation to process multiple nutrient values simultaneously. Systematic reviews suggest that while these labels may support informed decision-making among health-conscious individuals, they have limited impact on the general population. Additionally, studies highlight that numeric front-of-pack labels may contribute to health inequalities, as higher-income and more educated groups tend to benefit more from them compared to vulnerable populations [6, 23].

10.1.2 Interpretive Labels (Evaluative / Semi-Directive Labels)

Interpretive labels, also known as evaluative or semi-directive labels (such as Traffic Light Labels, Nutri-Score, and Health Star Rating), translate complex nutrient information into simple, easy-to-understand visual evaluations, thereby reducing the need for technical nutrition knowledge. Evidence strongly suggests that these labels improve consumers' ability to correctly identify healthier products when compared to non-interpretive numeric labels. Research further indicates that interpretive formats support faster decision-making, as elements like color coding, letter grades, or star ratings provide immediate signals of a product's nutritional quality. These labels are consistently associated with enhanced consumer understanding of overall product healthfulness, particularly with respect to nutrients of concern such as sugar, saturated fat, and sodium. Additionally, studies highlight that interpretive labels can encourage product reformulation by manufacturers, as companies strive to achieve more favorable ratings, such as higher star scores or better Nutri-Score grades. Evidence also indicates that interpretive labels are especially beneficial in fast-paced supermarket environments, where consumers often lack the time to read detailed nutrient information.

10.1.3 Directive Labels (Warning / Endorsement Labels)

Directive labels, also known as warning or endorsement labels (such as "High in Sugar" warnings, black stop-sign symbols, and health endorsement logos), provide clear recommendations or alerts, eliminating the need for consumers to interpret complex nutrient data and making them highly effective in guiding behavior. Evidence shows that warning labels are particularly effective in reducing purchase intentions for products high in sugar, sodium, or saturated fat, as they create a strong negative health signal. These directive warning labels are often more impactful than interpretive labels because they trigger risk perception and avoidance behavior, especially in the case of unhealthy foods. Studies further suggest that directive labels are more successful in influencing real-world consumer behavior because they rely on simple attention cues and fear-based messaging rather than requiring detailed evaluation. At the same time, research indicates that endorsement-type directive labels, such as "healthy choice" logos, can enhance positive product perception but may sometimes lead to a health halo effect, where consumers perceive a product as healthier than it is.

Overall, directive labeling systems are considered particularly valuable for public health strategies, as they enable quick decision-making and remain effective even among populations with low nutrition literacy [6, 2].

10.2 Classifications of Front of Pack Labeling based on Ingredients

Front-of-pack (FoP) food labeling systems can also be classified based on the way they communicate ingredient- or nutrient-related information, ranging from nutrient-specific disclosures to overall summary evaluations and endorsement-based symbols. Nutrient-specific labels highlight the levels of nutrients of concern (such as sugar, sodium, saturated fat, and calories) and help consumers identify which specific ingredient-related component makes a product unhealthy [23]. In contrast, summary indicator labels (such as Nutri-Score or Health Star Rating) provide a single overall rating that integrates multiple nutrient components into one simplified score, allowing consumers to quickly assess overall nutritional quality without analyzing each nutrient separately [41, 11]. Additionally, positive endorsement labels (such as tick marks or “healthy choice” logos) identify products that meet predefined nutritional criteria and act as a simple cue for healthier options, although evidence suggests they may sometimes create a “health halo effect” where consumers overestimate the healthfulness of endorsed foods [40, 12]. Overall, research indicates that nutrient-specific and summary indicator FoP labels generally improve consumer understanding and healthier food selection more effectively than purely promotional endorsement logos, especially in real-world purchasing environments [23, 40].

10.2.1 Nutrient-Specific Labels (Nutrient / Ingredient-Specific Information Systems)

Nutrient-specific labels, also referred to as nutrient or ingredient-specific information systems (such as Traffic Light Labels, “High in Sugar/Salt/Fat” warnings, and nutrient-specific front-of-pack panels), provide information about individual nutrients of concern, including sugar, salt, saturated fat, and calories. This allows consumers to identify which specific nutrient contributes to the unhealthiness of a product, making this approach particularly useful for reducing the intake of harmful nutrients. Systematic evidence suggests that nutrient-specific interpretive labels, such as traffic light systems, significantly improve consumer understanding of nutrient levels and support healthier product comparisons across different food categories [23]. Furthermore, nutrient-specific warning labels (e.g., “High in Sugar”) have been found to be effective in discouraging the purchase of unhealthy products, as they clearly and quickly highlight nutrient-related risks [42]. Evidence also indicates that such warning labels are associated with reduced consumption of products high in critical nutrients, particularly among populations with low nutrition knowledge, as they do not require detailed interpretation [43].

10.2.2 Summary Indicator Labels (Overall Nutritional Quality Scores)

Summary indicator labels, also known as overall nutritional quality score systems (such as Nutri-Score, Health Star Rating, Guiding Stars, and other grading formats), provide a single overall score or grade representing the nutritional quality of a product. This approach simplifies decision-making and reduces the effort required by consumers to evaluate multiple nutrients separately [23]. Evidence shows that summary indicator systems, particularly Nutri-Score, improve consumers’ ability to correctly rank products based on overall healthfulness and are generally more effective than numeric-only labels [11]. Research further suggests that these summary indicators support healthier food choices by offering a quick interpretive signal, making them highly suitable for real-world supermarket environments where time is limited [4]. Additionally, reviews indicate that such scoring systems can motivate food manufacturers to reform.

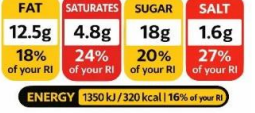
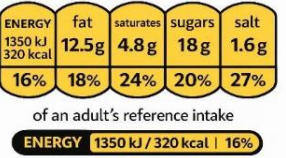
10.2.3 Positive Endorsement Labels (Approval / “Healthy Choice” Symbols)

Positive endorsement labels, also known as approval or “healthy choice” symbols (such as “Healthier Choice” logos, Heart Check marks, tick symbols, and endorsement seals), highlight products that meet specific nutritional criteria and act as simple positive cues, encouraging consumers to perceive these products as healthier options [23]. Evidence suggests that endorsement logos can increase purchase intention; however, their effectiveness largely depends on consumer trust in the authority issuing the endorsement, such as government agencies, health organizations, or industry bodies [12]. At the same time, research indicates that endorsement labels may lead to a “health halo effect,” wherein consumers overestimate the overall healthfulness of a product simply because it carries a positive symbol, even when the product may still contain moderate levels of sugar or fat [40].

11. Front-of-Pack Labeling (FOPL) Schemes Used Worldwide

Front-of-pack labeling (FoPL) schemes are widely used as public health interventions to support consumers in identifying healthier food products quickly and improving dietary choices. Different countries have adopted a variety of FoPL systems based on their regulatory priorities and nutrition policy goals. These schemes may be implemented as mandatory, where the government legally requires food manufacturers to display the label on packaged foods, or voluntary, where the use of the label is optional and depends on industry adoption. Globally, FoPL schemes include warning labels, summary indicator systems such as Nutri-Score and Health Star Rating, endorsement logos, traffic light labels, and non-interpretive nutrient reference formats, reflecting diverse approaches to nutrition communication and policy implementation [6, 23].

Table 2: Front-of-Pack Labeling (FOPL) Schemes Used Worldwide

FOPL Schemes	Countries	Type	Mandatory/ Voluntary
Warning Labels 	Chile, Mexico, Peru, Uruguay, Argentina, Ecuador, Colombia	Interpretive, nutrient-specific	Mandatory
Nutri-Score 	France, Belgium, Germany, Spain, Netherlands, Luxembourg, Switzerland	Interpretive summary	Voluntary
Health Star Rating 	Australia, New Zealand	Interpretive summary	Voluntary
Nordic Keyhole 	Sweden, Norway, Denmark	Endorsement logo	Voluntary
Healthier Choice Logos 	Malaysia, Singapore, Thailand	Endorsement logo	Voluntary
Multiple Traffic Light PER SERVING 	UK, Ecuador, South Korea	Hybrid interpretive	Voluntary
Reference Intakes / GDA EACH PORTION CONTAINS 	European union, UK	Non-interpretive	Voluntary

12. Policy Screening and Selection Criteria (Inclusion and Exclusion Framework)

12.1 Inclusion Criteria

Inclusion criteria for nutrition labeling policies in research and review studies typically focus on government-endorsed or legally implemented policies, as these ensure enforceability, wider population coverage, and greater impact [6, 44]. Front-of-pack labeling (FoPL) policies are consistently included because they help consumers quickly identify healthier and less healthy foods at the point of purchase, influencing real-time decisions [6, 23]. Back-of-pack labeling (BOPL) policies are also considered, as they provide standardized and detailed nutrient information, including sugar, salt, fat, and protein, supporting informed choices [6, 44]. Additionally, policies regulating nutrient content claims (e.g., “low sugar,” “high fiber”) are included to prevent misleading practices and enhance label credibility [6, 40]. Both mandatory and voluntary labeling schemes are examined to compare regulatory strength and implementation across countries [6, 44]. Studies generally include only officially published or adopted policies and prioritize those with clear nutrient thresholds or

standardized criteria, enabling better comparability and evaluation of effectiveness [42, 44].

12.2 Exclusion Criteria

Exclusion criteria in nutrition labeling policy reviews typically omit industry-led or private voluntary initiatives due to their self-regulated nature, inconsistent adoption, and limited population-level impact [6, 40]. Menu labeling policies are often excluded as they target restaurant settings rather than packaged foods, while allergen labeling regulations are omitted because they focus on safety rather than nutritional quality [6, 44]. Policies limited to ingredient list disclosure are also excluded, as they lack interpretive guidance and do not support nutrient-level evaluation [6]. Health and risk-reduction claims are frequently excluded due to their potential to mislead or confuse consumers [40, 12]. Additionally, policies that do not address key nutrients of concern, such as sugar, sodium, and fat, are excluded as they contribute less to preventing non-communicable diseases [23]. Pilot programs, informal guidelines, and temporary campaigns are also excluded due to their lack of standardization, consistency, and enforceability, limiting their suitability for systematic evaluation [44].

Table 3: Differentiation Between Inclusion and Exclusion Policies

Criteria	Inclusion Policies	Exclusion Policies
Definition	Policies officially endorsed, regulated, or implemented by governments to communicate nutritional quality of foods.	Policies or initiatives that are not government-backed, not nutrition-focused, or may mislead consumers.
Policy Authority	Government ministries, regulatory bodies, or national public health authorities or officially approved voluntary national systems [6, 44].	Private companies, NGOs, civil society groups, or voluntary industry initiatives with limited enforcement [6, 40].
Implementation Type	Usually mandatory or officially approved voluntary national systems [44].	Mostly self-regulated voluntary schemes with limited enforcement [40].
Focus	Communicating nutrient quality and discouraging foods high in sugar, salt, fat, etc. [23].	Focus on marketing, safety, or product promotion rather than nutritional evaluation [12].
Labeling Schemes Included	Front-of-pack warning labels, Traffic Light Labeling, Nutri-Score, Health Star Rating [23].	Non-standard private “healthy” logos, promotional tags, and unregulated claims [40].
Regulated Nutrient Thresholds	Included if nutrient cut-offs are clearly defined (e.g., “high in sodium”) [44].	Excluded if no standardized thresholds exist or criteria are unclear [6, 12].
Included Policy Types	Front-of-pack nutrition labels, mandatory nutrient declarations, nutrient content claim regulations, France: Nutri-Score; Australia: Health Star Rating [6, 23, 42, 44].	Ingredient-only rules, allergen-only labeling, menu labeling, and health/risk reduction claims [6, 12].
Examples	Chile: Mandatory warning labels; France: Nutri-Score; Australia: Health Star Rating [23, 42].	Private “healthy choice” symbols used by companies without regulation [40].

14. Conclusion

This review highlights that interpretive front-of-package (FOP) nutrition labeling systems—such as warning labels, traffic light formats, and summary indicators like Nutri-Score—are effective tools for improving consumer understanding and guiding healthier food choices. Evidence consistently shows that simplified, interpretive labels outperform numeric nutrition panels by reducing cognitive burden and enhancing the ability of consumers to quickly identify products high in nutrients of concern. However, labeling alone is not sufficient to achieve sustained dietary change at the population level.

The findings emphasize the need for standardized and mandatory regulatory frameworks to ensure consistency, transparency, and protection against industry manipulation. Complementary strategies, particularly nutrition education and literacy programs, further strengthen the impact of labeling by improving comprehension and long-term behavior change. Moreover, embedding labeling policies within broader food policy packages—including fiscal measures, marketing restrictions, and product reformulation initiatives—amplifies public health benefits and contributes to healthier food environments.

Overall, a comprehensive, multi-component approach that integrates clear interpretive labeling, supportive education, regulatory standardization, and ongoing monitoring is essential to maximize equity and effectiveness in reducing diet-related non-communicable diseases.

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