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Understanding Nutrition Labelling and Consumer Behavior in India: A Scoping Review

Memahami Pelabelan Gizi dan Perilaku Konsumen di India: Sebuah Tinjauan Ruang Lingkup

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ABSTRACT

Background: Growing burden of non-communicable diseases is a major public health concern in India, with nearly one in five individuals aged 15-49 overweight or obese. In this context, front of pack food labelling is often proposed to guide consumers towards healthier food choices. Yet, there is limited research on how Indian consumers actually interpret and respond to such labels, leaving a gap in understanding its real-world influence on purchasing decisions.
Objectives: To examine nutrition label literacy and its influence on consumer behavior in India. The study aimed to assess label understanding, identify factors to effective use, and explore strategies to enhance label functionality.
Methods: Scoping review was conducted adopting the PRISMA-ScR method. Literature published from January 2004 to July 2024 was systematically searched on Scopus, PubMed, and ProQuest databases. Studies were included if they examined knowledge, awareness or implementation of nutrition labelling among Indian consumers.
Discussions: 12 of 1256 cited articles were included. Findings showed that barriers to effective label use included inadequate use of detailed information, inclination towards user-friendly format such as warning labels, and pervasive misinformation related to packaged foods. Educational interventions, especially among youth, had the potential to enhance label literacy. While FSSAI has made regulatory progress, the voluntary and inconsistent Front-of-Pack (FoP) labelling remains insufficient.
Conclusions: Nutrition labelling in India has not reached its full effect. Mandatory warning labelling, standardized packaging, school-based education, and active regulatory action are proposed. Stepwise, multi-sectoral action is the key to labelling of food products becoming a stronger public health intervention.

INTRODUCTION

Promoting healthy living and eating habits continues to be one of the most complex goals of global public health initiatives[1]. In India, the rates of nutrition-related disorders like obesity, cardiovascular conditions, diabetes, and cancer have significantly risen during the last couple of decades[2].These disorders are strongly correlated with inappropriate food habits, nutritional deficiencies, and physical inactivities[3].To address these, the World Health Organisation (WHO) developed this regional nutrition strategy (2010 - 2019), focusing on the prevention of overnutrition and prevalence of diet related non- communicable diseases (NCDs)[4]. Food labelling regulations were an important part of this policy, specifically for foods containing excessive fat, sugar, and salt[4]. Food labels are invaluable tools for the consumers, providing essential information on the nutritional content of the product, thereby helping make informed food choices[5]. However, the impact of food labels largely hinges upon the precision and readability as confusing or deceptive labelling would make them ineffective[5].

NCDs are of significant public health concern in the Indian setting, and they are responsible for almost 74% of deaths worldwide, with dietary factors playing a key role[6]. Overweight and obesity are expected to more than double by 2040, further exacerbating the effects of diet-related NCDs[7]. In response, India has implemented various regulations. Food Safety and Standards Authority of India (FSSAI) is the regulatory body overseeing food regulations. Since 2011, packaged food items in India have been required to contain nutrition information, including energy, protein, carbohydrates, and fat content per 100 grams or milliliters[8–10]. Following previous initiatives, 2024 policy revision has mandated the prominent display of the percentage contribution of saturated fat, sugar, and sodium to recommended daily amounts (RDAs), aiming to make label display easier and consequently lowering diet related risks[11].

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Food labels are of two types - Back-of-pack (BOP) and front-of-pack (FOP) labelling. BOP labelling provides nutrient details like calories, fat, sugar, protein, and carbohydrate content per serving or 100 grams and have been made compuslory in India since 2011. FOP labelling, which aims to be accessible and user-friendly, provides simple visual signals towards helping consumers make healthier choices. These are traffic light labelling, warning labels, and star rating systems. Evidence suggests that the interpretive FOP labelling better improves understanding among consumers and promotes the selection of healthier food products than the ordinary format[5,12,13]. However, even with these advances in regulations, the use of nutrition labelling by consumers remains low. Studies conducted on label understanding and use within the Indian setting are few, and this represents an essential omission of the public health literature.

India represents an intricate situation with regards to labelling research. The country's vast socioeconomic, linguistic, and cultural diversity means that food labelling engagement by consumers cannot be understood homogenously[14]. Urban and rural populations have varied nutrition literacy and exposure levels[15]. For instance, while urban consumers are almost the sole target of present studies, rural communities, though having escalating risks of overweight and obesity, are vastly under-represented among nutrition research[16]. This observation raises questions of equity and inclusiveness of prevailing policy paradigms. In addition, food transitions of India, marked by an escalating consumption of ultra-processed foods by different socio-economic sections, are transforming the importance of nutritional labelling for both urban and rural consumers[14].

Previous reviews in international contexts and few in Indian contexts have examined consumer understanding of nutrition labels[17]. Nevertheless, available Indian literature has been predominantly urban-based, addressed single demographic groups or labelling formats, and limited to quantitative research . This scoping review broadens the focus by bringing together evidence across different states of India, combining qualitative and quantitative results, and making the promotion of consumer engagement overtly within the frame of FSSAI's dynamic labelling regulations. By addressing the gaps in literacy-related barriers, equity issues, and preferrable format of interpretive labelling, the review promotes an enriched understanding of nutrition label literacy within India. Moreover, the review identifies the urban bias of current studies, incorporates international policy lessons, and emphasizes strategies like digital innovations and school-based interventions, providing actionable policy lessons for both policy framers and implementers. This dual focus on consumer behaviour and regulatory evolution , along with overt attention to inclusivity and future directions, makes the current review both novel and policy-relevant.

Thus, this review aimed to critically assess literacy of nutrition labels by Indian consumers. It aims to discuss how consumers read and make use of food labels, understand frequent barriers in understanding the labels, and assess preferences of varied labelling fomats. Through these aspects, the research aims to help policy improvements and optimize the effectiveness of nutrition labelling as a public health measure to counteract diet-related NCDs in India.

METHODS

Nutrition labelling constitutes an essential instrument for facilitating healthier food decisions, particularly within the situation of increasing NCD burdens in India. However its effect hinges upon consumer comprehension, availability, and regulations. Due to the diverse barriers and the regulatory trends, the scoping review was selected to map the current evidence and highlight knowledge gaps .

This review aligns with the Arksey and O'Malley scoping review protocol, which comprises five stages: specifying the question of interest, identifying the relevant studies, study selection, data charting, and reporting/summarizing the findings. In addition, this scoping review is guided by the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) guidelines.

Identification of Research Questions

The research questions were constructed through PEOS framework (Population, Exposure, Outcome and Study design) to help frame the scope and focus of the review. PEOS assists in narrowing the eligibility criteria and the search strategy. It gives focus and clarity by ensuring the review addresses specific research questions.

P (Population)	E (Exposure)	O (Outcome)	S (Study Design)
Indian Consumers	Nutrition labelling	Label comprehension, consumer behavior	All original research on food label use

This review addressed three key questions: (1) “How well do consumers understand food labelling information?”, (2) “What are the challenges faced by consumers using food labels?”, and (3) “How can label effectiveness and understanding be enhanced by different strategies?”.

Article Identification

Systematic literature search was conducted using three bibliographic databases: Scopus, PubMed, and ProQuest, and covered studies between January 2004 and July 2024. This period was chosen because it is the period of time where significant developments on food labelling have both arisen and been solidified both globally and in India. Boolean operators were also used to limit the search and make results more relevant. Search terms were included such as "nutrition labelling," "food labels," and "nutritional information," along with "consumer behaviour," "consumer awareness," and "label understanding ." To ensure a focus on Indian scenario, additional keywords like "India," "Indian consumers," and "FSSAI regulations" were included. To eliminate studies not related to the topic, exclusion terms

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like "animal studies," "clinical trials," and "pharmaceutical labelling" were included.

Article Selection

Original articles in English, qualitative, cross-sectional, or interventional study designs, and related to nutrition labelling in India were selected. Those studies evaluating the impact , effect, or quality of nutrition labelling were included. Educational resources of the government like FSSAI, WHO, Food and Agriculture Organisation of the United States of America (FAO), and Eat Right India were referenced. Those studies irrelevant to the setting of India, lacked peer review or methodologically weak were eliminated.

A two-stage screening process was conducted using RAYYAN software. Titles and abstracts were independently screened by two authors (SS, SP). Discrepancies were resolved by a third reviewer (BP). Selected full-text articles were then imported to Mendeley for reference management.

Data Charting

Extraction of the data was through Microsoft Excel (2016), recording major variables such as setting of the study, study design, population, format of label assessed, and main findings. The review also aligned to the Arksey and O'Malley framework and the Joanna Briggs Institute scoping review protocols. PRISMA-ScR was also used to enable detailed reporting. Study characteristics are presented in Table 1.

Prisma Flowchart

Selection of studies included for this review has been explained in PRISMA flow diagram (Figure 1). It represents the number of records identified, screened, and excluded throughout the review, and the number of the studies included. It gives an explicit outline of the selection of the studies and makes the whole review process systematic.

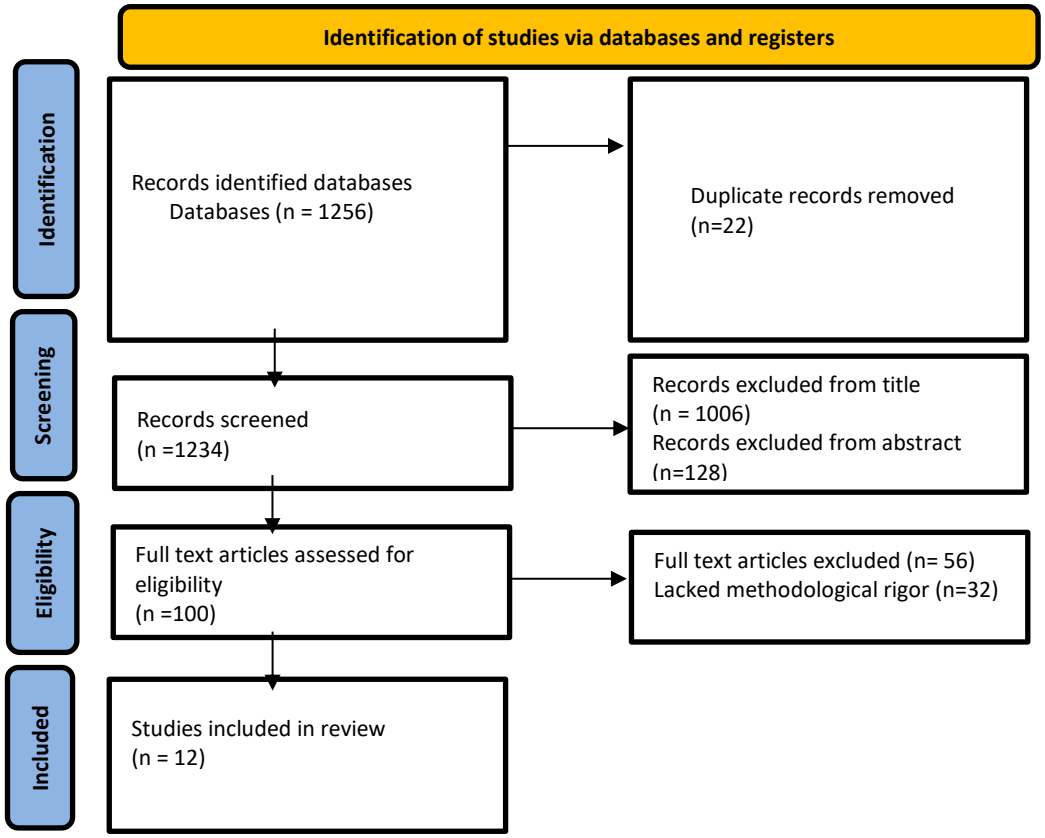

Figure 1. PRISMA flowchart illustrating the identification, screening, and inclusion of studies

DISCUSSIONS

Nutrition Label Literacy and Consumer Comprehension

Literacy of nutrition labels is defined as an individual's ability to read, process, and understand nutrition-related information in order to make healthy food choices[18] . In spite of this, there is evidence that Indian consumers, particularly adolescents, possess scarce knowledge about labels. For instance, it has been indicated that 49% of children do not check expiration dates, and 50% are unaware of crucial label components. Further, 59% of adolescents do not change their purchase pattern based on nutritional information[19,20].

Although there was a fairly high proportion of self-reported awareness of nutrition labels, these were actually used infrequently, particularly in urban areas where consumption of ultra-processed foods (UPFs) was observed to be increasing. A Pondicherry study noted that 9.3% of the dietary energy of young adults was derived from UPFs, illustrating a clear gap between

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awareness and behaviour change[21]. Among adult populations, individuals with higher income and educational backgrounds were significantly more likely to read labels. In Delhi, prevalence of reading labels was seen in 79% of respondents and claims were noticed by 76% of the respondents. Notably, women were more likely to comprehend labels than men (OR = 1.52, p-value = 0.04) and paid more closer attention to nutrient claims (OR = 1.99, p-value < 0.01)[22].

Challenges in Label Usage

A number of problems inhibited the proper use of nutrition labels, thus affecting their potential to inform healthier food selections. While 90% of shoppers claimed to read food labels, most simply looked at expiry and manufacture dates and not nutritional data[17]. Furthermore, small font and technical language were great inhibitors, around 30% of consumers were unable to read the font, while many struggled to interpret technical terms on food labels[23,24]. About one-third of consumers consistently checked nutrition panels and ingredient listings, while others were more concerned with brand name and cost than nutritional value[17,25].

Label Preferences and Effectiveness

Consumers consistently showed a strong preference for straightforward, easy-to-read label designs: Warning Labels were favoured by 93% of consumers, showing significantly more favourability than multiple traffic light system (p-value < 0.05)[26,27]. Front-of-pack labelling (FOPL) were favoured to 57.2% of shoppers, yet 46.6% admitted they ignored them when shopping[26]. Traffic light labelling was generally one of the most readable formats and was particularly popular with women and more affluent groups[22]. Despite the prevalence of nutrition labels, 55.4% of shoppers still perceived packaged food as healthy, an alarming discrepancy between label prevalence and actual understanding of nutritional information[27].

Public Health Implications: Packaged vs Unpackaged Foods

Comparative analysis of food availability in India revealed that packaged foods rule the retail market (89%), yet are generally less healthy than their unpackaged counterparts, with a mean health star rating of 2.0 vs 3.5 (p-value < 0.001)[28]. The "Health Star Rating" system, which has been widely adopted in some countries, provides a quick visual summary of the general healthiness of a food item, and the higher the number of stars allocated,indicates healthier the option. Furthermore, only 23% of packaged products met recommended labelling standards, despite 96% complying with current regulations. This is a critical result, suggesting that current labelling policy might not be adequately effective at leading consumers toward healthy options, thus underscoring the potential value of strengthened policy interventions[28].

Impact of Educational Interventions

Programs in schools and communities have helped individuals understand nutrition labels better. For instance, a school program in Bangalore helped teens comprehend better and showed 33% improvement. This intervention revealed greater engagement and comprehension skills. Interventions that used pictures also helped teens understand better, with rates of improvement as high as 81.5%, especially for nutrients like fat and fibre[29]. Additionally, consumers with special dietary needs reflected better labelling knowledge, and it has been proposed that tailored nutrition labelling initiatives could be particularly advantageous in improving labelling efficacy[20,23,24].

Table 1. Study characteristics

Author & Year	Region / State	Study Design	Population & Sample Size	Study Period	Key Findings
Sangeetha Kansal et al, 2022[19]	Tikari Village, Varanasi, Uttar Pradesh	Qualitative research	Adolescents (10–19 years); n=44 (29 boys, 15 girls)	Dec 2021 – Feb 2022	Adolescents frequently consumed prepackaged snacks. While brand/expiry/cost were checked, nutrition labels were not understood. Most preferred native language labelling. Suggests school-based food literacy is needed.
Sudershan R Vemula et al, 2013[17]	New Delhi & Hyderabad	Cross-sectional (qual + quant)	Adolescents, adults & elderly; n=1832	Not specified	99% educated, 90% read labels, mostly checking expiry/manufacturing dates. Only ⅓ checked nutrition panels. Education positively correlated with label interpretation. Women/girls more

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Author & Year	Region / State	Study Design	Population & Sample Size	Study Period	Key Findings
					conscious of nutrition info.
Sindhu S et al, 2023[29]	Bangalore, Karnataka	Educational intervention study	Adolescents (13–15 years); n=200 (72.5% girls)	Sept – Oct 2021	Only 40.5 percent of participants, had calculated the total intake of nutrients prior to taking a food item before the intervention, which increased to 73.5 percent of participants after the intervention
Madhur Verma et al, 2023[20]	Bathinda, Punjab (Malwa region)	Cross-sectional	School children (14–18 years) & parents; n=722	Mar – Jun 2022	46% ate outside food >3 times/week. 49% never checked expiry date. Half unaware of label contents. 59% never changed purchase based on label. Parental concern & celebrity ads influenced eating out frequency.
Sudip Bhattacharya et al, 2022[27]	14 States, India	Questionnaire-based survey	Adults; n=2024	Jan – Mar 2021	91.3% consumed packaged food; 95% knew about labelling; 88.6% found it useful. WL (93%) and traffic light labels were most preferred (p-value < 0.05).
Prerna Verma et al, 2024[23]	Pimpri Chinchwad, Pune	Cross-sectional descriptive	Shoppers aged 15–55; n=226	Sept – Dec 2021	72.12% aware of labels; 78.32% read labels. MRP & expiry were most checked. Only 17.7% used nutrient composition in buying decisions. 30.38% found small font hard to read.
A S Nagalatha et al, 2019[25]	Chennai	Analytical survey	Adults; n=165	Not specified	Education level, eating habits, and trust influenced label perception.
Tejaswi Nagireddi et al, 2023[26]	AIIMS Mangalagiri, Andhra Pradesh	Cross-sectional	Gastritis patients (20–60 years); n=208	2022	57.2% could interpret front-of-pack labels; 46.6% never considered FOPL in purchases. Knowledge significantly associated with age (OR=0.178, p-value=0.02).
Manisha Singla, 2010[24]	New Delhi	Questionnaire survey	Adults; n=100	Mar 2008	Labels used more for brand comparison than nutrition. Issues: small font, complicated terms. Use influenced by dietary needs, not income or family size. Strong correlation with RDA knowledge (p-value < 0.000).
Menon et al, 2023[21]	Puducherry	Mixed-methods	Young adults; n=630	Mar 2022 – Apr 2023	28.3% overweight/obese.

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Author & Year	Region / State	Study Design	Population & Sample Size	Study Period	Key Findings
					UPFs made up small % of diet, mostly from chips, biscuits. No strong correlation with body measures.
Mediratta et al, 2023[22]	Delhi	Cross-sectional	Adults (20–40 years); n=589	Mar 2019 – Feb 2020	79% read labels; 76% check nutrient claims. Women more likely to understand/use nutrition info (OR=1.99, p-value<0.01). Traffic light labels were easy to understand.
Dunford et al, 2022[28]	Four States, India	Cross-sectional	Packaged food items; n=1443	May – Aug 2018	89% products were packaged. Healthier & cheaper unpackaged items had better Health Star Ratings (3.5 vs 2.0). While 96% of packaged products conformed to the current Indian labelling standards, only 23% adhered to the proposed labelling standards.

The results of the research provide significant findings. Although Indian consumers reportedly had high awareness of nutrition labels, their actual understanding and application were significantly lacking. The disparity mainly exists among young people and low-income areas, where there is a tendency to focus solely on expiration dates rather than nutritional value, despite a high consumption of ultra-processed foods.

While label understanding is greater in women and better educated groups, problems like small font and jargon still detract from labelling effectiveness. Hence, response to the limitations in current labelling measures, improvement in readability and specific educational intervention are key to enhancing public health response.

The effectiveness of nutrition labelling as a public health measure, however, depends not just on its presence but also on consumer awareness, accessibility, and policy implementation. This review finds the gap between knowledge of nutrition labels and use, reflecting that knowledge alone does not explain better purchase choices[30]. Even though regulations by FSSAI require nutrition labelling on pre-packaged food, Indian consumers are largely concerned with expiry and manufacture dates, with little interest in nutritional information[17]. This is particularly significant in the light of India's increased consumption of ultra-processed foods (UPFs) or highly processed foods from raw ingredients, a trend further associated with increased risk of obesity, diabetes, and cardiovascular disease[21].

Another striking trend in the evidence base is its high density in urban and metropolitan settings like Delhi, Bangalore, Chennai and Pune and very low representation of rural populations. The imbalance is not just methodological, but also substantive because the rural populations in India might engage with nutrition labels in different ways because of their lower level of literacy, different food habits and limited exposure to packaged foods. Earlier research in other low and middle income nations have also pointed out that urban dwellers are increasingly researched in nutrition labelling studies making rural consumers relatively invisible in the evidence base[31]. Prioritizing urban populations for the most part tends to miss rural and other disadvantaged groups, who would stand to gain the most from easily readable nutrition labels due to lower literacy levels and lesser exposure to packaged food[19]. Acknowledging this difference is important since it demarcates the point that future Indian research needs to systematically explore nutrition label understanding and utilization in rural communities, so that policies on labelling as well as educational interventions are both inclusive and sensitive to the varied contexts of both urban and rural consumers[32,33].

The urban-rural differences noted in the use of nutrition labels can be further contextualized within the larger dietary change of India. Historically, rural diets have been based on minimally processed staples, legumes and fresh vegetables with minimal use of packaged foods. Urban, in contrast, have more rapidly embraced conventional dietary patterns marked by increased levels of ultra-processed foods (UPFs), convenience foods and sweetened beverages. This difference partially accounts for the reason that nutrition labelling is more prominent and applicable in urban markets, whereas its usefulness continues to be limited in rural areas where traditional foods continue to predominate[14,34].

Nonetheless, new evidence suggests that food changes are no longer only limited to urban areas. Obesity rates in many rural regions have doubled over the

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past decade, particularly in areas with growing market connectivity where packaged foods are increasingly affordable and accessible[35]. A longitudinal cohort from rural Birbhum, West Bengal showed a marked rise in overweight prevalence among women between 2008 and 2017[36]. Similarly, surveys from rural South India report a "double burden" of malnutrition, with persistent undernutrition coexisting alongside overweight and obesity[37]. Together, these patterns suggest that nutrition labelling can no longer be treated as an exclusively urban concern.

One major hindrance to the success of nutrition labels in India is their readability. More than 30% of Indian consumers have difficulty with small fonts and technical jargon[23,24]. Likewise, similar hindrances have been reported in Brazil, where excessively technical label wording reduced label performance[38]. To facilitate better access, especially for low-literacy individuals, labels need to include clearer and larger font , simplified vocabulary, and visual signals such as colour codes or icons.

Although an impressive 93% of Indian consumers indicate a preference for warning labels[26,27] visibility alone does not guarantee behavioural change. Nearly half of the Indian consumers still report ignoring FOP labels when shopping, highlighting the critical need for complementary educational interventions. Evidence from Canada and Mexico clearly indicates that well-structured nutrition education makes a strong impact on label use and purchasing behavior[39]. School-based programs initiated in India may play a vital role in developing label literacy since childhood, leading to long-term healthier dietary habits[19].

Front-of-Package Labelling (FOPL) has become an effective instrument around the world to encourage healthier foods. For example, Chile's black octagonal warning labels reduced the purchase of sugary beverages by 24%, and Canada's sodium warnings lowered the consumption of processed foods[39,40]. In India, however, as of 2024, while FSSAI has mandated bold display of certain nutrients on BOP labels, the broader FOP labelling policy framework, specifically for warning labels or interpretive systems, remains under development and is currently voluntary or in a phased implementation stage, with ongoing discussions about its final form. Recent regulatory relaxations, such as exemptions for alcohol and minimally processed foods[41] raise concerns that they may further diminish the visibility of crucial health information, potentially undermining public health efforts.

However, India's successful regulation of industrially processed trans fats provides a strong and encouraging precedent. Through a phased reduction strategy, the FSSAI mandated that trans-fat levels in oils and fats be brought below 2% by 2021 and introduced mandatory labelling along with a "trans-fat free" logo[42]. These initiatives, grounded in public health priorities,establish India as capable of formulating and implementing effective nutrition regulations. The success story implies that such firm action may be taken for FOPL, especially for products containing high amounts of added sugars, salt, and saturated fats. A robust public health rationale, along with graded implementation and mandatory compliance, can achieve the positive impact as observed with trans-fat regulation potentially leading to healthier consumer consumption patterns and lowered disease burden.

Digital innovations offer an important and largely untapped potential for enhanced nutrition label use. Japan's barcode-scanning applications, offering real-time tailored nutritional data, inform consumers directly at the point of purchase[43,44]. With India's high smartphone penetration, the nation could reap significant benefits from such technologies that enable nutrition information to be made more interactive, real-time and accessible[44]. Next-generation technologies like augmented reality (AR) labels, QR codes that connect to brief edutainment videos, and AI-based customized nutrition advice could further enhance understanding among tech-savvy youth and low-literacy groups[45,46].

One major obstacle to the large-scale adoption of better nutrition labelling policies is industry resistance. Across the world, food companies have resisted tighter labelling owing to valid concerns about falling sales[47]. The same resistance can be expected in India. In order to successfully work through this, a pragmatic, staged regulatory strategy starting with high-risk food groups and gradually expanding might be effective, permitting adjustment while still meeting key public health goals[44,47]. Additionally, India's inherent diversity poses specific challenges. Literacy levels, income and deeply rooted diet practices require localized approaches, such as multilingual labelling and community public health messages[28,47]. Economic constraints also play a role : low income group consumers may be able to read labels but might not be able to act upon, due to affordability issues[48]. Combining nutrition labels with price incentives or subsidies could potentiate the higher purchase of healthier alternatives.

Behavioural economic principles also suggest that placing information alone on a label may not be sufficient to overcome cognitive bias. Optimism bias, health halo effect, and brand loyalty can lead consumers to ignore or misinterpret nutritional warnings[49,50]. Visual warnings or summary scores on a label can override these biases by simplifying decision making.

Strength and Limitations

This review presents the analysis of nutrition label literacy, consumer response to labels, and the broader policy environment in India. Through the utilization of academic databases and government reports, it efficiently captures empirical research and regulatory developments to present an overall analysis of challenges and prospects.

At the same time, a few limitations should be acknowledged. One noticeable gap is the limited availability of long-term studies that track whether any improvement in label understanding actually sustains over time and translates into healthier food choices or better health outcomes. Much of the existing literature is based on short-term exposure or experimental settings, which makes it difficult to say with confidence if increased label literacy brings lasting behavioural change.

Another area where this review could not go very deep relates to industry perspectives. Although consumer behaviour and policy-related issues have been

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discussed, there is relatively less insight into how the food industry itself perceives and responds to changing labelling norms. A closer look into industry compliance, resistance, and reformulation practices may offer a more balanced picture, and future studies could explore this dimension more systematically.

It is also worth mentioning that most of the studies reviewed were conducted in urban or semi-urban settings. Rural consumers, who often have different food purchasing patterns, literacy levels, and exposure to packaged foods, remain largely under-represented. This limits the broader applicability of the findings. Including rural voices and contexts would greatly enrich the understanding of how nutrition labels are actually interpreted across diverse population groups in India.

Recommendations

If nutrition labelling is to serve as an effective public health measure in India, a few practical steps should be considered. To begin with, front-of-pack warning labels for products high in sugar, fat, and salt need stronger policy backing, drawing on experiences from countries such as Chile and Canada[27,40]. Many consumers, particularly those with limited literacy, seem to benefit from simple and direct warnings rather than dense numerical information. Standardising the presentation of labels across products could also reduce confusion. Larger font sizes, simpler wording, and the use of clear visual cues or symbols have been shown to improve comprehension among consumers with varying literacy levels [23,24].

School-based nutrition education programmes, if implemented consistently and not just as isolated initiatives, may help children and adolescents develop healthier food habits early in life[19,29], which can benefit families and communities as well. Given the increasing use of smartphones, especially among younger consumers, digital interventions such as barcode-based applications that provide instant nutritional information may help bridge knowledge gaps. Such tools could make label reading less intimidating and more engaging[44]. At the policy level, stronger enforcement of labelling rules, complemented by routine monitoring and proportionate penalties for non-compliance, appears necessary. A gradual, phased-in approach, beginning with high-risk food groups, may help address industry pushback while still moving the system forward[47]. India's success in reducing trans-fats through regulatory and industry-aligned measures[42], suggests that a similar multi-pronged, regionally sensitive, and multilingual approach to nutrition labelling could work well, given the country's linguistic and cultural diversity.

CONCLUSIONS

India is currently at a stage where its nutrition labelling policies are evolving, but the framework still feels fragmented and voluntary in nature. The rising burden of NCDs linked to unhealthy diets adds urgency to strengthening this area of public health policy. Mandatory labelling, clearer and uniform label designs, consumer-focused awareness efforts, and the use of digital tools should not be viewed as optional extras but as essential components of a more robust policy response.

Evidence from other countries shows that when labelling reforms are well-designed and firmly implemented, they can lead to real improvements in public health. For India, the need of the hour is to convert labelling from a mere regulatory requirement into a meaningful tool that genuinely enables people to make informed and healthier food choices. If supported by strong political will, consistent implementation, and culturally attuned communication strategies, nutrition labelling can contribute to reducing the growing tide of diet-related NCDs in the country.

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AUTHOR CONTRIBUTIONS

SS: conceptualization, investigation, methodology, formal analysis, writing-original draft, writing-review and editing; BP: supervision, conceptualization, methodology, formal analysis, writing review and editing, project administration; SP: supervision, investigation, methodology, formal analysis, writing-review and editing.

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