JHeS (Journal of Health Studies)
Vol. 7, No. 2 (2023), pp. 71-81
e-ISSN 2549-3353
p-ISSN 2549-3345
10.31101/jhes.3175

Original Research Paper

Knowledge, attitude, and practice of consumers towards "Front of Package Label" (FOPL) on food packages regarding nutrition in India

Arpit Prajapati [1*], Himadri Patel[2], Mansi Patel[3], Sahilkumari Chaudhari[4], Rajvee Soni[5], Saloni Soni[6], Vidhi Wadhwani[7]

[1,2,4] Community Medicine Department, GCS Medical College, Hospital and Research Centre, Opp. DRM Office, Near Chamunda Bridge, Naroda Road, Ahmedabad, Gujarat, 380025, India
[3]Community Medicine Department, Ananya College of Medicine & Research, Pratap Pura village, Kalol, Gandhinagar, Gujarat, 382721, India
[5,6,7] Undergraduate students, GCS Medical College, Hospital and Research Centre, Opp. DRM Office, Near Chamunda Bridge, Naroda Road,Ahmedabad, Gujarat, 380025, India
doc.arpitprajapati@gmail.com

Submitted: July 20, 2023 Revised: September 15, 2023 Accepted: September 20, 2023

Abstrak

Food labels give information about the elements of the food and can help people make healthy diet choices. Food labels are potential tools for improving the dietary patterns of populations and could change dietary behavior. The aims of this study were to assess the knowledge and attitude of consumers related to FOPL, evaluate the practices of consumers regarding FOPL, and identify consumers' purchasing preferences for packaged food. A cross-sectional study was conducted at selected supermarkets in Gandhinagar city using a convenient sampling method. A total of 500 participants were selected from 4 supermarkets (125 participants were selected from each supermarket). Exit interviews were done through pretested, semi-structured questionnaires. Out of 500 participants, 79% read food labels, but only 15% knew about FOPL. 88.2% of people noticed manufacturing and expiration dates on packaged food. Only 50% of the participants thought that FOPL contained nutritional information. 49.4% knew that FOPL was present on the front side of package food. 90% of people consume Namkeen food as packaged food. 59.4% thought that FOPL helped them choose healthier food, and 73% thought it should be mandatory on all food packages. Education level is significantly related to knowledge and information on the FOPL (P = 0.0001). Education programmes about nutrition labeling and how to read nutrition labels properly must be done to increase consumers' awareness, knowledge, and understanding of the importance of nutrition labeling information. It can be an effective means of helping consumers make healthier food choices and prevent NCDs.

Keywords: front of package labeling; food package; knowledge; nutrition

1. Introduction

Food labeling is vital in the food processing chain and should not be disregarded. The label is the first point of contact between a customer and the manufacturer. It is used to identify one product from another and decide which product to acquire (Samant & Seo, 2016). Food labels give you information about the fundamentals of the food and can help you decide what to choose as part of an overall healthy eating plan (CDC, 2022). When properly applied, used adequately, understood, and trusted by consumers, nutrition labeling can help consumers consider the nutritional value of foods in their purchasing decisions, allowing them to make informed decisions about healthy alternatives and healthier diets (Kaur & Singh, 2020).

In India, packaged food has detailed back-of-package (BOP) nutrient information but no front-of-package labels (FOPLs). The back of the package contains a wealth of information about nutrients, covering mandatory and voluntary measures, adding to consumer confusion. On the other hand, previous studies have shown that placing nutrition facts in front of packages is more effective than

placing them at the back (Neal et al., 2017; Rønnow, 2020). The FOPLs contain brief nutritional information in various formats on the front of the package. Due to its simplified format and prominent placement on the front of the package, some argue that the FOPLs are more visible than the BOP label (Becker et al., 2015). According to Roberto et al. (2021), the FOPLs have two main objectives: to improve the nutritional quality of food purchases and to inform customers about the nutritional quality of food straightforwardly and understandably. A secondary objective is encouraging food supply reformulation (Bablani et al., 2020; Roberto et al., 2021). The FOPLs guide healthier product choices and are potential tools to improve people's diets (Arrúa et al., 2017; Jones et al., 2019; Khandpur et al., 2019; Taillie et al., 2020). However, for a FOPL to be effective, it must be easy to understand, believable, personable, and able to influence purchasing decisions.

Additionally, the different country contexts should be considered when developing the FOPL system according to WHO recommendations (WHO, 2019). The New World Heart Federation (WHF) further emphasizes that when implementing the FOPL system, consumer literacy rates and common cultural norms about food and nutrition should be considered (Champagne et al., 2020). There are different FOPL formats in different countries. These formats include Health Star Rating (HSR), Nutri-score, Warning label, Multiple Traffic Light (MTL), Monochrome Guideline Daily Amounts (GDA) (Campos-Nonato et al., 2022; Cui et al., 2022; Egnell et al., 2018; Hamlin & McNeill, 2018; Packer et al., 2021; Pettigrew et al., 2023).

The WHO recommends that governments implement front-of-pack (FOP) nutrition labels as part of a comprehensive policy response to promote healthy diets and prevent non-communicable diseases (NCDs) (WHO, 2019). Non-communicable diseases (NCDs) are a significant public health concern. Of the 56.9 million deaths worldwide in 2016, an estimated 40.5 million (71%) were attributed to non-communicable diseases (NCDs) (Bennett et al., 2018). In India, non-communicable diseases (NCD) have replaced communicable diseases as the common cause of widespread morbidity and death. The NCDs-related fatalities rose in India from 37.9% in 1990 to 61.8% in 2016 (Ministry of Health and Family Welfare, 2022). In 2017, an estimated 4.7 million (49%) deaths in India were due to NCDs (Menon et al., 2019). Easy availability of energy-dense foods high in saturated fat, sugar, and salt is one of the leading factors contributing to the rise in obesity and NCDs (GBD 2017 Diet Collaborators, 2019; WHO, 2021).

Consumers are more worried about what they eat and how much of a certain food product they should consume due to the rising incidence of non-communicable diseases and their link to lifestyle variables, including diet (Bhattacharya et al., 2022). Providing nutritional information at the point of sale through labeling may be one of the few cost-effective strategies to support healthy diets and prevent future non-communicable diseases (Khandpur et al., 2018; Soederberg Miller & Cassady, 2015). These FOPLs are crucial for lowering consumption of the main unhealthily processed foods eaten in India. These labels may be particularly helpful for those with low reading levels because they distill complex dietary facts into understandable information (Singh et al., 2022). However, the lack of understanding about the effective use of nutrition labeling is a matter of concern. The lack of awareness about FOPL among consumers will have a negative impact on public health. This study aimed to assess the knowledge and attitude of consumers related to FOPL, evaluate the practices of selected supermarket consumers regarding FOPL, and identify the consumer's purchasing preference for packaged food.

2. Research Methods

This was a cross-sectional study conducted in Gandhinagar city, Gujarat, India. The study was conducted during the period October 2022–December 2022. The population in this study was a general population above 18 years of age visiting a supermarket in Gandhinagar, Gujarat, India.

Gandhinagar is the capital of the state of Gujarat in India. It lies on the west bank of the Sabarmati River and north of Ahmedabad. The subjects of this study were selected based on inclusion and exclusion criteria. Inclusion criteria: Selected supermarket consumers above 18 years of age residing in Gandhinagar, Gujarat, India. Exclusion criteria: subjects not willing to participate in the study. Considering prevalence as a 45% reference value, Kaur & Singh (2020) estimated sample size was calculated using the formula of 4p(1-p)/L2, where p= prevalence, L= allowable error (10% of prevalence), the total sample size was 488 and rounded up equivalent to 500 after considering.

For data collection, four supermarkets situated in Gandhinagar were selected conveniently. One hundred and twenty-five subjects were selected from each supermarket by convenient sampling. Thus, this study's total number of participants was 500 from four supermarkets in Gandhinagar city. Visits to each supermarket were done till the required sample size was achieved. A pretested, semi-structured physical questionnaire containing demographic details and food package shopping-related behavior was given to the participants at the supermarket to assess their knowledge, attitude, and practices related to food package labeling. The Institutional Ethics Committee approved the study. (GCSMC/EC/Project/ Approve/2022/452 dated 19/12/2022). The data entry was done in Microsoft Office Excel, and analysis was done using Epi in software version 2.0 using appropriate statistical tests.

3. Result and Discussion

3.1.Result

Out of 500 participants, 275 were females, and 225 were males. Among the study population, females predominate the study population with 55%. The mean age of the participants was 34.87±12.27 years. The minimum age is 18, and the maximum age is 68 years. Of 500 participants, 96.6% had completed their graduation, and 11.6% had done post-graduation (Table 1).

Table 1. Sociodemographic details of the participants

Socio-Demographic Details	Responses	Frequency (N=500)	Percentage (%)
Age Mean Age (±SD) (4.87±12.27 years)	18-30	240	48
	30-40	91	18.2
	40-50	108	21.6
	50-60	51	10.2
	60-70	10	2
Sex	Male	225	45
	Female	275	55
Education	Illiterate	4	0.8
	Primary/secondary/tertiary	90	18
	Graduate	348	69.6
	Postgraduate/professional	58	11.6
Occupation	Service	154	30.8
	Business	56	11.2
	Housewife	110	22
	Labourer	3	0.6
	Other	177	35.4
Socio Economic Class*	I	396	79.2
	II	73	14.6
	III	17	3.4
	IV	8	1.6

Socio-Demographic Details	Responses	Frequency (N=500)	Percentage (%)
	V	6	1.2

*According to Modified BG Prasad's classification

Of the 500 participants who visited the supermarket, 45.2% purchased groceries alone. Among the total participants, 78.2% participants were consuming packaged food. The majority of the people (90.2%) consume namkeen as packaged food, 84.4% people purchase cookies/biscuits, 43.8% people consume breakfast cereals, 33% people buy cakes, 71.4% people purchase chocolate, 26.4% consume packaged juices, and 32% consume aerated beverages (Figure 1).

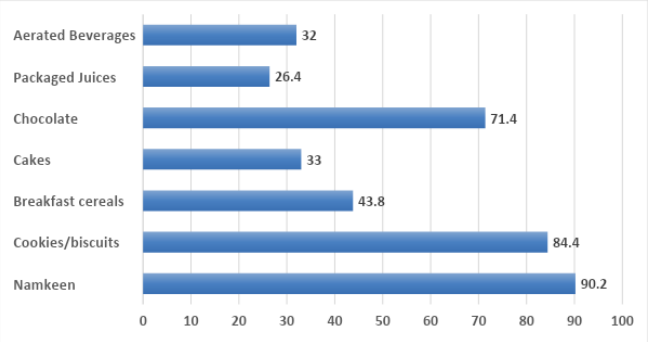

Figure 1. Purchasing preference of participants for packaged food

Of 500 people, 35.2% purchase packaged food 2 or 3 times a week. 28.8% of people purchase packaged food every week (Figure 2). Out of 500 participants, 49.4% found FOPL in front of packaged food, 28% thought it was situated on the back of packaged food, and 46.2% people read food labels sometimes. More than half of the participants did not check labels while purchasing packaged food of specific brands, 25% did not check labels because they had no time, and 18% could not understand the label. Only 15.4% of people knew about the front of the package labels, and only 12.2% knew about different types of FOPL (Table 2).

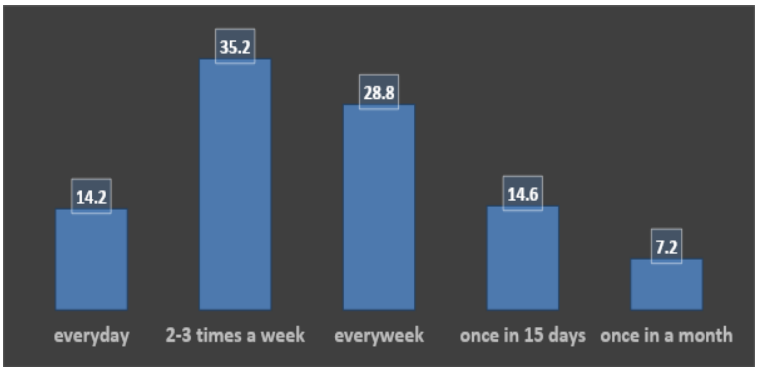

Figure 2. Frequency of purchasing packaged food products

Table 2. Sociodemographic details of the participants

Knowledge of Participants	Frequency (%)
Do you read food labels	
Never	105 (21%)
Sometimes	231 (46.2%)
Often	106 (21.2%)
Always	58 (11.6%)
Knowledge about Front of package label (FOPL)	
Yes	7(15.4%)

Knowledge of Participants	Frequency (%)
No.	423 (84.6%)
Where to find FOPL on packaged food	
Correct knowledge	247 (49.4%)
Incorrect knowledge	186 (37.2)
Do not know	67 (13.4%)
Information available on the Front of the package label	
Correct knowledge	254 (50.8%)
Incorrect knowledge	246 (49.2%)
Awareness of different types of front-of-package labels	
Yes	61 (12.2%)
No.	439 (87.8%)

Most people (69.4%) buy packaged food from supermarkets, 27.2% from retail stores, and only 3.4% buy packaged food online. Participants buy packaged foods for various reasons, like easily available (79.4%), ready to eat (76.4%), find them tasty (61%), and find them easy to store/preserve (30.2%). Manufacture date and expiry date (88.2%), price (86.4%), and nutritional label (33.8%) were the things that most participants mentioned as things noticed while purchasing packaged food. Of the amount, 59.4% of people thought that FOPL helped them to choose a healthier food, while 4% thought that labels were not helpful (Table 3). Among 500 participants, 55.6% people found the MTL food label as quick to understand, 49.2% people found the Nutri-score as difficult to understand, 65% people found MTL as easy to identify, 54.4% people found the Guideline daily amount difficult to identify, and 58.2% people would like to see MTL on food packages (Table 4).

Table 3. Sociodemographic details of the participants

Practice of Participants Regarding Packaged Food	Frequency (%)
Preferably from where they buy packaged food frequently	
Supermarket	347 (69.4%)
Online shopping	17 (3.4%)
Nearby retail shops	136 (27.2%)
Things noticed while purchasing packaged food.	**(n-1381) ***
Manufacture date and expiry date	441 (88.2%)
Price	432 (86.4%)
Color and design of the package	133 (26.6%)
Nutritional label	169 (33.8%)
FSSAI logo	104 (20.8%)
The time required for cooking	120 (24%)
Attitude of Participants regarding FOPL	**Frequency (%)**
Perception towards front of package label (FOPL) on food product	
Quickly understandable	81 (16.2%)
Difficult to understand	22 (4.4%)
Please help me to choose a healthier food	297 (59.4%)
Labels are not helpful	20 (4%)
Labels are helpful	67 (13.4%)
Other	13 (2.6%)
The front of the package label is mandatory.	
Yes	366 (73.2%)
No.	23 (4.6%)

Practice of Participants Regarding Packaged Food	Frequency (%)
May be	110 (22%)
Other	1 (0.2%)

*As multiple responses were recorded

Table 4. Understanding and preference of FOPL type

Type of FOPL	Quickly understand	Difficult to understand	Easy to identify	Difficult to identify	Like to see on food packages
A (Multiple traffic light (MTL)	278 (55.6 %)	28 (5.6%)	325 (65%)	39 (7.8%)	291(58.2%)
B (Nutri-score)	16 (3.2%)	246 (49.2%)	25 (5.6%)	70 (14%)	24 (4.8%)
C (Health star rating)	68 (13.6%)	45 (9%)	44 (8.8%)	30 (6%)	74 (14.8%)
D (Warning labels)	25 (5%)	77 (15.4%)	42 (8.4%)	73(14.6%)	27 (5.4%)
E (Guideline daily amount)	100 (20%)	83 (16.6%)	53(10.6%)	272(54.4%)	73 (14.6%)
F (None)	13 (2.6%)	21 (4.2%)	8 (1.6%)	16 (3.2%)	11 (2.2%)

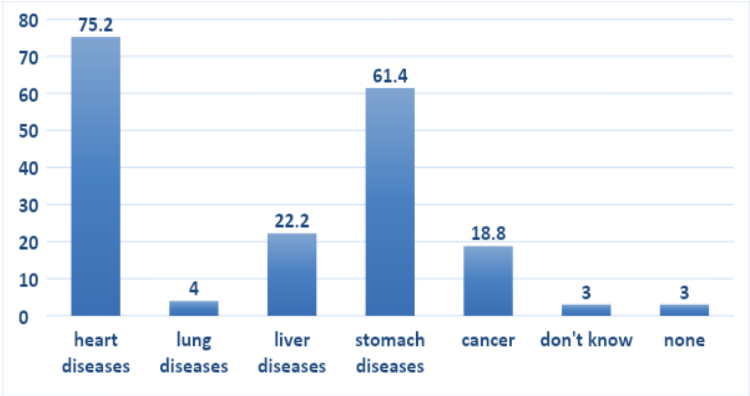

Figure 3. Diseases that are caused by packaged foods that are high in salt, sugar, and fat

Out of 500 participants, 75.2% thought that heart diseases were caused by foods high in salt, sugar, and fat, and c61.4% thought that consuming packaged food causes stomach disease (Figure 3). Level Education is significantly related to knowledge and information available on the front of the package label (FOPL) (P = 0.0001) (Table 5).

Table 5. Understanding and preference of FOPL type

Variables	Knowledge About Front of Package Label (FOPL)		Information Available on Front of Package Label	
	No	Yes	Correct knowledge	Incorrect knowledge
Illiterate	4(0.8%)	0(0%)	1(0.2%)	3(0.6%)
Secondary	4(0.8%)	4(0.8%)	6(1.2%)	2(0.4%)
Higher Secondary	71(14.2%)	11(2.2%)	22(4.4%)	60(12%)
Graduate	306(61.2%)	42(8.2%)	195(39%)	153(30.6%)
Post Graduate or Professional	38(7.6%)	20(4%)	30(6%)	28(5.6%)
Total (N=500)	423(84.6%)	77(15.4%)	254(50.8%)	246(49.2%)
	X^2 = 22.57*, P = 0.0001, df = 4		X^2=22.82*, P=0.0001, df = 4	

*Yates' correction applied

3.2.Discussion

Females predominate in this study population (55%). The majority of food purchasing studies have focused on women because they are the ones who buy and prepare the majority of the household's food (Carlson et al., 2018; Flagg et al., 2014).

With the large and increasing growth of the modern worldwide food retail sector, consuming packaged and processed foods has become common globally (Law et al., 2019). We found that 78.2% of participants consumed packaged food, and most (90.2%) consumed namkeen as packaged food, followed by cookies, biscuits, chocolate, breakfast cereals, cakes, and aerated beverages. About 35.2% of people purchase packaged food 2 or 3 times a week, followed by every week (28.8%). The majority of people (69.4%) buy packaged food from supermarkets. Participants buy packaged foods for various reasons, like being easily available (79.4%), ready to eat (76.4%), and finding them tasty (61%), followed by being easy to store or preserve (30.2%). Processed food consumption has risen this century, and current public health policies focus on it because of health concerns. Their effects, such as beverages, snacks, and ready meals, are often high in sugar, fat content, and salt content, and their excess consumption is identified as a risk factor for obesity and many other non-communicable diseases (Fiolet et al., 2018; Lane et al., 2021; Pagliai et al., 2021; Poti et al., 2017).

The majority of participants in this study read food labels. However, only 15.4% of people knew the front of the package label. According to Goyal & Deshmukh (2018), although consumers read labels, they may not always know what they read. Chopera et al. (2014) reported that most respondents (77.2%) read labels, with 51% partially understanding them. Most participants requested some instruction (80.6%) and label simplification (80.3%) since they were unfamiliar with the terms and language used.

Reading food labels was more common among people with higher education. The result of this study shows that education level is significantly related to knowledge and information available on the front of the package label (FOPL) ($P = 0.0001$). A higher level of education was significantly associated with a higher level of knowledge about the front of the packaged label and information in FOPL. Perception of front-of-pack labels varies considerably across population subgroups. Acceptability, understanding, and ensuing use are lower among men, the elderly, persons with low socio-economic status, and those with little nutritional knowledge (Bhattacharya et al., 2022).

Most participants in this study (75.2%) believed that packaged foods high in salt, sugar, and fat are a risk factor for heart disease. Meta-analyses provide compelling evidence that certain highly processed foods (processed meats, sugary drinks) and nutrients in highly processed foods (trans fats, sodium) increase the risk of cardiovascular disease (CVD) (Micha et al., 2017). According to epidemiological research, several cardiovascular disease risk factors, including obesity, metabolic syndrome, and hypertension, are also linked to consuming a lot of processed food (Elizabeth et al., 2020; Juul et al., 2018).

The study reports that participants had poor awareness regarding different types of FOPL. Only a few knew different types of FOPL. As reported in a study by Bhattacharya et al. (2022), a higher level of education was significantly associated with a higher level of awareness regarding food labels. There are two main approaches to improving people's diets: encouraging people to choose healthier foods through education, promotion, and implementing various health policies, which favor the development of healthy foods with the correct nutritional composition (Hafner & Pravst, 2023).

Among study participants, the majority, 88.2%, people notice the manufacture and expiry date of packaged food, followed by price (86.4%) and nutritional label (33.8%). The results of a previous study conducted in Indore, Madhya Pradesh, indicated that almost 72% of consumers stated that they did not use shopping lists, and 61.8% stated that they did not base their purchasing decisions on nutritional information. Only 9.3% of consumers used nutritional information while shopping (Goyal & Deshmukh, 2018).

In this study, more than half of the participants (55.6%) found MTL food labels easy to understand and identify, and 58.2% would like to see MTL on food packages. Meanwhile, nearly half of the participants (49.2%) found the nutri-score difficult to understand, and 54.4% found the daily guideline amount difficult to identify. This result is similar to several previous studies where the MTL food label was preferable among consumers (De la Cruz-Góngora et al., 2017; Jáuregui et al., 2020). The MTL is more informative and easy to identify, while GDA is less attractive because it is too complicated and difficult to understand (Ducrot et al., 2015; Vargas-Meza et al., 2019). In addition, compared to GDA, MTL doubles the probability of consumers correctly identifying products with the lowest nutritional quality (Vargas-Meza et al., 2019).

The FOPLs were strongly related to a rise in customers' accuracy in product classification. Half of the participants (49.4%) found FOPL on the front of packaged food, and 59.4% thought that FOPL helped them choose healthier food. The ability to recognize healthier items was higher among women, younger people, non-smokers, highly educated people, and people with children (all $P \leq 0.05$) (Bhattacharya et al., 2022).

4. Conclusion

There is a strong need for public awareness among the general population about the importance of nutrition labeling, as only half of the participants knew the information described in FOPL. Education level is significantly related to the knowledge and information available on the front of the package label (FOPL) ($P = 0.0001$). Consumers most commonly selected multiple traffic lights (MTL) as the type of FOPL that is easy to understand and identify. Education programmes about nutrition labeling and how to read nutrition labels properly must be done to increase consumers' awareness, knowledge, and understanding of the importance of nutrition labeling information. It can be an effective means of helping consumers make healthier food choices and prevent NCDs. Further research on the effectiveness of this educational program should be conducted.

References

Arrúa, A., Curutchet, M. R., Rey, N., Barreto, P., Golovchenko, N., Sellanes, A., Velazco, G., Winokur, M., Giménez, A., & Ares, G. (2017). Impact of front-of-pack nutrition information and label design on children's choice of two snack foods: Comparison of warnings and the traffic-light system. *Appetite*, *116*, 139–146. https://doi.org/10.1016/j.appet.2017.04.012

Bablani, L., Mhurchu, C. N., Neal, B., Skeels, C. L., Staub, K. E., & Blakely, T. (2020). The impact of voluntary front-of-pack nutrition labeling on packaged food reformulation: A difference-in-differences analysis of the Australasian Health Star Rating scheme. *PLOS Medicine*, *17*(11), e1003427. https://doi.org/10.1371/journal.pmed.1003427

Becker, M. W., Bello, N. M., Sundar, R. P., Peltier, C., & Bix, L. (2015). Front-of-pack labels enhance attention to nutrition information in novel and commercial brands. *Food Policy*, *56*, 76–86. https://doi.org/10.1016/j.foodpol.2015.08.001

Bennett, J. E., Stevens, G. A., Mathers, C. D., Bonita, R., Rehm, J., Kruk, M. E., Riley, L. M., Dain, K., Kengne, A. P., Chalkidou, K., Beagley, J., Kishore, S. P., Chen, W., Saxena, S., Bettcher, D. W., Grove, J. T., Beaglehole, R., & Ezzati, M. (2018). NCD Countdown 2030: Worldwide trends in non-communicable disease mortality and progress towards Sustainable Development Goal target 3.4. *The Lancet*, *392*(10152), 1072–1088. https://doi.org/10.1016/S0140-6736(18)31992-5

Bhattacharya, S., Bera, O. P., & Shah, V. (2022). Consumers' Perception About Front of Package Food Labels (FOPL) in India: A Survey of 14 States. *Frontiers in Public Health*, *10*. https://www.frontiersin.org/articles/10.3389/fpubh.2022.936802

Campos-Nonato, I., Cervantes-Armenta, M. A., Pacheco-Miranda, S., Quezada-Sánchez, A. D., Contreras-Manzano, A., Barquera, S., & Vargas-Meza, J. (2022). Perception and Understanding of Guideline Daily Amount and Warning Labeling among Mexican Adults during the Law Modification Period. *Nutrients*, *14*(16), 3403. https://doi.org/10.3390/nu14163403

Carlson, D. L., Miller, A. J., & Sassler, S. (2018). Stalled for Whom? Change in the Division of Particular Housework Tasks and Their Consequences for Middle- to Low-Income Couples. *Socius*, *4*, 2378023118765867. https://doi.org/10.1177/2378023118765867

CDC. (2022, September 20). *Food Labels*. Centers for Disease Control and Prevention. https://www.cdc.gov/diabetes/managing/eat-well/food-labels.html

Champagne, B., Arora, M., ElSayed, A., Løgstrup, S., Naidoo, P., Shilton, T., Vaca McGhie, D., Armstrong-Walenczak, K., Berteletti, F., Ganesan, S., & Popkin, B. (2020). World Heart Federation Policy Brief: Front-Of-Pack Labeling: Unhealthy Changes in the Global Food System. *Global Heart*, *15*(1), 70. https://doi.org/10.5334/gh.935

Chopera, P., Chagwena, D., & Mushonga, N. (2014). Food label reading and understanding in parts of rural and urban Zimbabwe. *African Health Sciences*, *14*(3), 576–584. https://doi.org/10.4314/ahs.v14i3.12

Cui, J., Yan, R., Astell-Burt, T., Gong, E., Zheng, L., Li, X., Zhang, J., Xiang, L., Ye, L., Hu, Y., Tang, Y., Gao, C., Xiao, L., Jiang, Y., Shao, R., Feng, X., Zhang, J., & Yang, Y. (2022). Types and Aspects of Front-of-Package Labeling Preferred by Parents: Insights for Policy Making in China. *Nutrients*, *14*(4), Article 4. https://doi.org/10.3390/nu14040800

De la Cruz-Góngora, V., Torres, P., Contreras-Manzano, A., Jáuregui de la Mota, A., Mundo-Rosas, V., Villalpando, S., & Rodríguez-Oliveros, G. (2017). Understanding and acceptability by Hispanic consumers of four front-of-pack food labels. *The International Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 28. https://doi.org/10.1186/s12966-017-0482-2

Ducrot, P., Méjean, C., Julia, C., Kesse-Guyot, E., Touvier, M., Fezeu, L., Hercberg, S., & Péneau, S. (2015). Effectiveness of Front-Of-Pack Nutrition Labels in French Adults: Results from the NutriNet-Santé Cohort Study. *PloS One*, *10*(10), e0140898. https://doi.org/10.1371/journal.pone.0140898

Egnell, M., Ducrot, P., Touvier, M., Allès, B., Hercberg, S., Kesse-Guyot, E., & Julia, C. (2018). Objective understanding of Nutri-Score Front-Of-Package nutrition label according to individual characteristics of subjects: Comparisons with other format labels. *PLOS ONE*, *13*(8), e0202095. https://doi.org/10.1371/journal.pone.0202095

Elizabeth, L., Machado, P., Zinöcker, M., Baker, P., & Lawrence, M. (2020). Ultra-Processed Foods and Health Outcomes: A Narrative Review. *Nutrients*, *12*(7), 1955. https://doi.org/10.3390/nu12071955

Fiolet, T., Srour, B., Sellem, L., Kesse-Guyot, E., Allès, B., Méjean, C., Deschasaux, M., Fassier, P., Latino-Martel, P., Beslay, M., Hercberg, S., Lavalette, C., Monteiro, C. A., Julia, C., & Touvier, M. (2018). Consumption of ultra-processed foods and cancer risk: Results from NutriNet-Santé prospective cohort. *BMJ*, *360*, k322. https://doi.org/10.1136/bmj.k322

Flagg, L. A., Sen, B., Kilgore, M., & Locher, J. L. (2014). The influence of gender, age, education, and household size on meal preparation and food shopping responsibilities. *Public Health Nutrition*, *17*(9), 2061–2070. https://doi.org/10.1017/S1368980013002267

GBD 2017 Diet Collaborators. (2019). Health effects of dietary risks in 195 countries, 1990-2017: A systematic analysis for the Global Burden of Disease Study 2017. *Lancet (London, England)*, *393*(10184), 1958–1972. https://doi.org/10.1016/S0140-6736(19)30041-8

Goyal, R., & Deshmukh, N. (2018). Food label reading: Read before you eat. *Journal of Education and Health Promotion*, *7*, 56. https://doi.org/10.4103/jehp.jehp_35_17

Hafner, E., & Pravst, I. (2023). Comparison of Nutri-Score and Health Star Rating Nutrient Profiling Models Using Large Branded Foods Composition Database and Sales Data. *International Journal of Environmental Research and Public Health*, *20*(5), Article 5. https://doi.org/10.3390/ijerph20053980

Hamlin, R., & McNeill, L. (2018). The Impact of the Australasian 'Health Star Rating', Front-of-Pack Nutritional Label, on Consumer Choice: A Longitudinal Study. *Nutrients*, *10*(7), 906. https://doi.org/10.3390/nu10070906

Jáuregui, A., Vargas-Meza, J., Nieto, C., Contreras-Manzano, A., Alejandro, N. Z., Tolentino-Mayo, L., Hall, M. G., & Barquera, S. (2020). Impact of front-of-pack nutrition labels on consumer purchasing intentions: A randomized experiment in low- and middle-income Mexican adults. *BMC Public Health*, *20*(1), 463. https://doi.org/10.1186/s12889-020-08549-0

Jones, A., Neal, B., Reeve, B., Mhurchu, C. N., & Thow, A. M. (2019). Front-of-pack nutrition labeling to promote healthier diets: Current practice and opportunities to strengthen regulation worldwide. *BMJ Global Health*, *4*(6), e001882. https://doi.org/10.1136/bmjgh-2019-001882

Juul, F., Martinez-Steele, E., Parekh, N., Monteiro, C. A., & Chang, V. W. (2018). Ultra-processed food consumption and excess weight among US adults. *The British Journal of Nutrition*, *120*(1), 90–100. https://doi.org/10.1017/S0007114518001046

Kaur, S., & Singh, D. A. (2020). Assessment Of Knowledge, Attitude And Practice (Kap) Vis-A-Vis Food Labels. *PUSA Journal of Hospitality and Applied Sciences*, *6*, 58–71.

Khandpur, N., Mais, L. A., de Morais Sato, P., Martins, A. P. B., Spinillo, C. G., Rojas, C. F. U., Garcia, M. T., & Jaime, P. C. (2019). Choosing a front-of-package warning label for Brazil: A randomized, controlled comparison of three different label designs. *Food Research International (Ottawa, Ont.)*, *121*, 854–861. https://doi.org/10.1016/j.foodres.2019.01.008

Khandpur, N., Sato, P. de M., Mais, L. A., Martins, A. P. B., Spinillo, C. G., Garcia, M. T., Rojas, C. F. U., & Jaime, P. C. (2018). Are Front-of-Package Warning Labels More Effective at Communicating Nutrition Information than Traffic-Light Labels? A Randomized Controlled Experiment in a Brazilian Sample. *Nutrients*, *10*(6), 688. https://doi.org/10.3390/nu10060688

Lane, M. M., Davis, J. A., Beattie, S., Gómez-Donoso, C., Loughman, A., O'Neil, A., Jacka, F., Berk, M., Page, R., Marx, W., & Rocks, T. (2021). Ultraprocessed food and chronic noncommunicable diseases: A systematic review and meta-analysis of 43 observational studies. *Obesity Reviews*, *22*(3), e13146. https://doi.org/10.1111/obr.13146

Law, C., Green, R., Kadiyala, S., Shankar, B., Knai, C., Brown, K. A., Dangour, A. D., & Cornelsen, L. (2019). Purchase trends of processed foods and beverages in urban India. *Global Food Security*, *23*, 191–204. https://doi.org/10.1016/j.gfs.2019.05.007

Menon, G. R., Singh, L., Sharma, P., Yadav, P., Sharma, S., Kalaskar, S., Singh, H., Adinarayanan, S., Joshua, V., Kulothungan, V., Yadav, J., Watson, L. K., Fadel, S. A., Suraweera, W., Rao, M. V. V., Dhaliwal, R. S., Begum, R., Sati, P., Jamison, D. T., & Jha, P. (2019). National Burden Estimates of healthy life lost in India, 2017: An analysis using direct mortality data and indirect disability data. *The Lancet Global Health*, *7*(12), e1675–e1684. https://doi.org/10.1016/S2214-109X(19)30451-6

Micha, R., Shulkin, M. L., Peñalvo, J. L., Khatibzadeh, S., Singh, G. M., Rao, M., Fahimi, S., Powles, J., & Mozaffarian, D. (2017). Etiologic effects and optimal intakes of foods and nutrients for risk of cardiovascular diseases and diabetes: Systematic reviews and meta-analyses from the Nutrition and Chronic Diseases Expert Group (NutriCoDE). *PloS One*, *12*(4), e0175149. https://doi.org/10.1371/journal.pone.0175149

Ministry of Health and Family Welfare. (2022, February 8). *Status of Non-Communicable Diseases (NCDs) in India*. https://pib.gov.in/pib.gov.in/Pressreleaseshare.aspx?PRID=1796435

Neal, B., Crino, M., Dunford, E., Gao, A., Greenland, R., Li, N., Ngai, J., Ni Mhurchu, C., Pettigrew, S., Sacks, G., Webster, J., & Wu, J. H. (2017). Effects of Different Types of Front-of-Pack Labeling Information on the Healthiness of Food Purchases-A Randomised Controlled Trial. *Nutrients*, *9*(12), 1284. https://doi.org/10.3390/nu9121284

Packer, J., Russell, S. J., Ridout, D., Hope, S., Conolly, A., Jessop, C., Robinson, O. J., Stoffel, S. T., Viner, R. M., & Croker, H. (2021). Assessing the Effectiveness of Front of Pack Labels: Findings from an Online Randomised-Controlled Experiment in a Representative British Sample. *Nutrients*, *13*(3), 900. https://doi.org/10.3390/nu13030900

Pagliai, G., Dinu, M., Madarena, M. P., Bonaccio, M., Iacoviello, L., & Sofi, F. (2021). Consumption of ultra-processed foods and health status: A systematic review and meta-analysis. *British Journal of Nutrition*, *125*(3), 308–318. https://doi.org/10.1017/S0007114520002688

Pettigrew, S., Jongenelis, M. I., Jones, A., Hercberg, S., & Julia, C. (2023). An 18-country analysis of the effectiveness of five front-of-pack nutrition labels. *Food Quality and Preference*, *104*, 104691. https://doi.org/10.1016/j.foodqual.2022.104691

Poti, J. M., Braga, B., & Qin, B. (2017). Ultra-processed Food Intake and Obesity: What Really Matters for Health—Processing or Nutrient Content? *Current Obesity Reports*, *6*(4), 420–431. https://doi.org/10.1007/s13679-017-0285-4

Roberto, C. A., Ng, S. W., Ganderats-Fuentes, M., Hammond, D., Barquera, S., Jauregui, A., & Taillie, L. S. (2021). The Influence of Front-of-Package Nutrition Labeling on Consumer Behavior and Product Reformulation. *Annual Review of Nutrition*, *41*, 529–550. https://doi.org/10.1146/annurev-nutr-111120-094932

Rønnow, H. N. (2020). The Effect of Front-of-Pack Nutritional Labels and Back-of-Pack Tables on Dietary Quality. *Nutrients*, *12*(6), 1704. https://doi.org/10.3390/nu12061704

Samant, S. S., & Seo, H.-S. (2016). Effects of label understanding level on consumers' visual attention toward sustainability and process-related label claims found on chicken meat products. *Food Quality and Preference*, *50*, 48–56. https://doi.org/10.1016/j.foodqual.2016.01.002

Singh, S. K., Taillie, L. S., Gupta, A., Bercholz, M., Popkin, B., & Murukutla, N. (2022). Front-of-Package Labels on Unhealthy Packaged Foods in India: Evidence from a Randomized Field Experiment. *Nutrients*, *14*(15), 3128. https://doi.org/10.3390/nu14153128

Soederberg Miller, L. M., & Cassady, D. L. (2015). The Effects of Nutrition Knowledge on Food Label Use: A Review of the Literature. *Appetite*, *92*, 207–216. https://doi.org/10.1016/j.appet.2015.05.029

Taillie, L. S., Hall, M. G., Popkin, B. M., Ng, S. W., & Murukutla, N. (2020). Experimental Studies of Front-of-Package Nutrient Warning Labels on Sugar-Sweetened Beverages and Ultra-Processed Foods: A Scoping Review. *Nutrients*, *12*(2), 569. https://doi.org/10.3390/nu12020569

Vargas-Meza, J., Jáuregui, A., Contreras-Manzano, A., Nieto, C., & Barquera, S. (2019). Acceptability and understanding of front-of-pack nutritional labels: An experimental study in Mexican consumers. *BMC Public Health*, *19*, 1751. https://doi.org/10.1186/s12889-019-8108-z

WHO. (2019, May 13). *Guiding principles and framework manual for front-of-pack labeling for promoting healthy diets*. https://www.who.int/publications/m/item/guidingprinciples-labeling-promoting-healthydiet

WHO. (2021, June 9). *Obesity and overweight*. https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight