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Food Labeling: The Role of Claims and Statements in Community Health

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HIGHLIGHTS

- Deceptive statements on food labels can increase Non-Communicable Diseases
- Use of deceptive words can lead to increase consumer's desire to purchase unhealthy food.
- The major purpose of using phrases such as "traditional" for dairies is assuring consumers that they're chemicals free.

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Acronyms and abbreviations
FDA=Food and Drug Administration
NCD=Non-Communicable Diseases

ABSTRACT

Background: Food labels are typically significant to the costumers. It is crucial to ensure that labels are accurate as they provide essential information about products. Therefore, the major objective of this study was to assess the current printing information.

Methods: In this descriptive analytical study, 120 food products were selected in January 2020 and divided into eight food categories. Ten requirements of the food labels and the levels of compliance with the criteria developed by the Food and Drug Administration were evaluated. The data were subsequently analyzed using chi-square test and SPSS Software.

Results: The results revealed that 82.7% of the product labels contained food labeling requirements in line with the regulations developed in Iran. Among the non-compliant labels, the highest rate (62%) was associated with the use of deceptive words and the lowest rate (0.8%) was linked to inclusion of the company's name. The highest non-compliance rate was observed in the groups of prepared and semi-prepared foods, snacks, cereals and flours, as well as confectioneries.

Conclusions: In order to prevent consumer confusion and decrease non-communicable diseases, it is necessary to develop coherent plans and unify all food labels, regarding the acceptable compliance of labeling requirements with the country's regulations and the compatibility of the existing developed criteria with the regulations and standards of other Islamic and leading countries.

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Introduction

Food and nutrition are essential to human life. Nowadays, food is no longer known as a source of pleasure. Dietary deficiencies increasingly cause public concerns due to the potential consequences on human health(Ridder et al., 2017). Poor diets, as risk factors of obesity and Non-Communicable Diseases (NCDs), are the main causes for endangering individual's health worldwide (Shangguan et al., 2019). One of the country's policies to diminish NCDs includes the use of food labels. Food labels are effective tools for presenting important information to the consumers (Asafari et al., 2020a; Madilo et al., 2020). Information on food labels should be conveyed in a way which attracts consumer attention and hence allows consumers to differentiate between the products using the available information (Asafari et al., 2020b, 2021; Madilo et al., 2020). Food labels, if effectively designed, can be utilized as beneficial tools to select healthier foods and control food allergies (Asafari et al., 2020a; Madilo et al., 2020). Consumer demand for health-promoting information through food labels increases the community awareness of food safety and health as well as nutritional information. This improved awareness is advantageous for the development of public health and the prevention of NCDs (Madilo et al., 2020). In regulations and criteria related to global food labeling, information is divided into two categories of mandatory and optional information, which vary according to the criteria of each country (Asafari et al., 2020a; Mehdizadeh et al., 2011). Based on the labeling from the Food and Drug Administration (FDA) and the Codex Commission (Codex Alimentarius, 2007), the mandatory information, referred to as the "Ten Requirements" involves the product's name, brand, weight, license, date of manufacture, date of expiration, ingredients as well as the name and address of the manufacturer, batch number, storage conditions, preparation instructions, consumption instructions and health requirements, and recommendations (Asafari et al., 2020a).

In Australia, Canada, Japan, Malaysia, South Africa, the EU, NZ, the UAE, and the UK, the required details on labels are mostly identical to slight variations in disclosing food ingredients, languages, transgenics, and allergies. The optional information include nutritional information, traffic light labels, allergens, HALAL logos, Genetically Modified Organism (GMO) information, organic, and health claims and specific foods such as probiotics. Each country typically set specific regulations and criteria (Asafari et al., 2020a). Although food labels are required to provide information to consumers in accordance with established criteria, various forms of labels are designed. With regard to an online survey in Japan, USA, Germany, China, and Thailand on the labels of four food products, attention to labels varied between countries. In general, labels with specialized and complex information included the lowest score; however, respondents acknowledged that specialized and intricately designed labels were the most reliable and trustworthy sources of information (Rupprecht et al., 2020). Although food labels contain complete and useful information, researches have highlighted that these labels present extensive information and therefore, consumers encounter problems to comprehend this information (Jacobs et al., 2011). Due to the large quantity of information, the lack of sufficient time to search for information at the time of purchase (Prinsloo et al., 2012) and the illegibility of the information (Mirghotbi et al., 2012), customers typically fail to peruse the label information and select the products based on their experience and the product apparent attributes. Consumers expect to assure that foods are safe and information on the food packages is accurate. At present, it is difficult to trust food labels and the information. Food manipulations and commercial abuses have reduced public trusts in food suppliers (Charlebois et al., 2016; Rupprecht et al., 2020). As the significance of food labels for consumer health, efforts should be deployed to decrease these concerns and clarify food quality and safety. By the approval of novel regulations and guidelines, the FDA defines general conditions for the consumption of healthy and useful foods and the prevention of contaminated and unhealthy foods (Mayne and Spungen, 2017). One of these criteria contains food labeling, which is regulated for the purpose of food safety including the avoidance of foodborne diseases and assurance of appropriate nutrition (Mayne and Spungen, 2017). Therefore, the main aim of the present study was to assess the current effectiveness of the food labels as consumers were increasingly aware of the important role of nutrition in health and the selection of healthy food products. This study can assist consumers to choose healthy foods as well as offer specific guidance on convenient food labeling.

Materials and methods

Sampling

This descriptive-analytical survey was conducted on 120 food product samples (Mfueni et al., 2018) collected from markets in four geographical regions of Tehran, Iran, in January 2020. To assess food labeling requirements, 120 samples were randomly selected. Samples were divided into eight major categories of foods, including cereal and flours, confectioneries, sauces, and seasonings, dairies, oils,

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beverages, prepared and semi-prepared foods and snacks. In general, 15 samples from each group were evaluated (Table 1). The food labels were compared to those of the checklist prepared in accordance with the labeling criteria by Iran FDA. The evaluation of the labels has been twofold. First, all the labeling requirements and the mandatory items that need to be included on the labels were assessed using the checklist with three options of "compliance", "non-compliance", and "not including". Subsequently, the required details of the labels were surveyed separately. Samples lacked the required items according to the labeling rules on the packaging were identified as non-compliance. In general, the samples included the product name, brand, license, production, and expiration date, batch number, traffic light label, ingredients, storage conditions, preparation instructions, health requirements, manufacturer address, term of "made in Iran", descriptive, warning, and special statements, general, nutritional and health claims, legibility, misleading phrases, and images, traditional and fresh words.

Table 1: Categories of the food groups

Group	Definition
Cereals and its products	Cereals and products made from flours, crackers, biscuits, cakes, and cookies
Confectionery products	Types of sugar products such as candies, chocolates, cocoas, chocolate dragees, jelly products, pastilles, Tahini, and various sweetening powders
Sauces and seasonings	All types of mayonnaises, tomatoes, mustards, spices, vinegars, lemon juices, verjuice, pickles, olives, and fermented cucumbers
Dairy products	Types of dairy products such as milks, cheeses, butters, ice creams, yogurts, and buttermilks
Oils	Types of liquids and frying oils
Beverages	Types of nectars and juices, mineral waters, essences, rosewaters, coffee powders and hot chocolates
Prepared and semi-prepared foods	Canned foods, olive salads, grilled chickens, pasta sauces, chicken fillets, and schnitzels, noodles, cutlet powders, and soups
Snacks	All types of chips, snacks, nuts, dried fruits, dates, fruit skins, and plums

Data analysis

Data analysis was performed using SPSS software v.21 (IBM Analytics, Chicago, USA). Descriptive statistics were computed for all items, and data normality was confirmed with the Shapiro-Wilk test. Next, data were analyzed using descriptive indices of mean and standard deviations as well as means of parametric tests such as ANOVA, Pearson correlation coefficient and Chi-square test at statistically significant levels of $p<0.05$. Additionally, Duncan post-hoc test was utilized to demonstrate relationships among various sections of the labels and the levels of compliance.

Results

According to the findings, 82.75% of the 120 samples included the criteria; however, validity check of this information was essential. The levels of non-compliance with food labeling requirements were ranked in descending order as follows: deceiving terms at 61.7%, legibility at 54.2%, nutritional claims at 44.2%, traffic light labels at 20%, special foods at 19.2%, health requirements and recommendations at 16.7%, general claims at 18.3%, descriptive statements at 13.3%, warning statements at 10.8%, health claims at 10%, preparation instructions at 7.5%, Iran FDA logos at 5%, ingredients at 5%, batch numbers at 2.5%, terms of made in Iran at 2.5%, addresses at 1.7% and company names at 0.8%. Results of compliance and non-compliance with food labeling requirements are displayed in Table 2.

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Table 2: Proportions of compliance with labeling requirements in food products

Variable	No. (%)	Variable	No. (%)
Name and brand		**Health recommendation**	
Compliance	120 (100%)	Compliance	46 (38.3%)
Non-compliance	0	Non-compliance	20 (16.7%)
Not included	0	Not included	54 (45%)
License code		**Term of made in Iran**	
Compliance	120 (100%)	Compliance	117 (97.5%)
Non-compliance	0	Non-compliance	3 (2.5%)
Manufacturer name		**Descriptive statements**	
Compliance	119 (99.2%)	Compliance	49 (40.8%)
Non-compliance	1 (0.8%)	Non-compliance	16 (13.3%)
Not included	0	Not included	52 (43.3%)
Address		**Warning statements**	
Compliance	118 (98.3%)	Compliance	55 (45.8%)
Non-compliance	2 (1.7%)	Non-compliance	13 (10.8%)
Not included	0	Not included	52 (43.3%)
Iran FDA logo		**Special food statements**	
Compliance	114 (95%)	Compliance	55 (45.8%)
Non-compliance	6 (5%)	Non-compliance	23 (19.2%)
Not included	0	Not included	42 (35%)
Production and expiration date		**Public claims**	
Compliance	120 (100%)	Compliance	61 (50.8%)
Non-compliance	0	Non-compliance	53 (44.2%)
Not included	0	Not included	6 (5%)
Batch number		**Nutrition claims**	
Compliance	117 (97.5%)	Compliance	61 (50.8%)
Non-compliance	3 (2.5%)	Non-compliance	53 (44.2%)
Not included	0	Not included	6 (5%)
Traffic light labels		**Health claims**	
Compliance	90 (75%)	Compliance	53 (44.2%)
Non-compliance	24 (20%)	Non-compliance	12 (10%)
Not included	6 (5%)	Not included	55 (45.8%)
Ingredient on lable		**Legibility**	
Compliance	114 (95%)	Compliance	55 (45.8%)
Non-compliance	6 (5%)	Non-compliance	65 (54.2%)
Store conditions		**Printing real images**	
Compliance	120 (100%)	Compliance	55 (45.8%)
Non-compliance	0	Non-compliance	65 (54.2%)
Preparation instructions		**Deceiving term**	
Compliance	15 (12.5%)	Compliance	46 (38.3%)
Non-compliance	9 (7.5%)	Non-compliance	74 (61.7%)
Not included	96 (80%)	Not included	0

FDA=Food and Drug Administration

Furthermore, ANOVA test was utilized to demonstrate the statuses of non-compliance in each food groups. Results indicated that the highest non-compliance rate belonged to the traffic light labels in groups of snacks, prepared foods, beverages, cereals and flours and confectioneries, respectively. According to the findings in Table 3, health requirements and recommendations included the highest rates of non-compliance with statistical significances in groups of oils, snacks, and prepared foods; descriptive statements in groups of snacks and prepared foods, cereals and flours, beverages and confectioneries; warning statements in groups of confectioneries, snacks, and prepared foods; special food statements in groups of dairies, prepared foods and snacks; general claims in groups of snacks, prepared foods, oils, beverages, and cereals and flours; nutritional claims in groups of confectioneries, dairies, sauces, and seasonings, beverages, snacks, prepared foods, oils, and cereals and flours; health claims in groups of snacks, prepared foods, dairies and sauces and seasonings; printing real pictures in groups of beverages, snacks and prepared foods; preparing instructions in groups of prepared foods and snacks; deceiving terms in groups of beverages, snacks, prepared foods, sauces, and seasonings, oils, cereals, and flours and confectioneries; and HALAL logos in cereals and flours, beverages, sauces, and seasonings, dairies, confectioneries, and prepared foods.

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Table 3: Comparisons of labeling requirements in various food groups

Variable	Category	Group of food								X^2	Cramer's V	*p*-value
		Dairy	Seasoning	Oil	Cereal	Confectionery	Beverage	Prepared food	Snack			
Name and brand	Compliance	15	15	15	15	15	15	15	15			
	Non-compliance	0	0	0	0	0	0	0	0			
License code	Compliance	15	15	15	15	15	15	15	15			
	Non-compliance	0	0	0	0	0	0	0	0			
Manufacturer name	Compliance	15	15	15	15	15	15	14	15	7.05	-	0.42
	Non-compliance	0	1	0	0	0	0	0	0			
Address	Compliance	15	15	15	15	15	15	14	14	6.10	-	0.52
	Non-compliance	0	1	0	0	0	0	1	1			
*IFDA logo	Compliance	15	15	13	14	15	13	15	14	7.71	-	0.35
	Non-compliance	0	0	2	1	0	2	0	1			
Production and expiration dates	Compliance	15	15	15	15	15	15	15	15			
	Non-compliance	0	0	0	0	0	0	0	0			
Batch number	Compliance	15	15	15	15	13	15	14	15	10.59	-	0.15
	Non-compliance	0	0	0	0	2	0	1	0			
Traffic light label	Compliance	12	12	15	9	12	11	10	9	31.11	0.36	0.05
	Non-compliance	3	0	0	3	3	4	5	6			
	Not including	0	3	0	3	0	0	0	0			
Ingredient	Compliance	15	15	13	14	15	13	15	14	7.71	-	0.35
	Non-compliance	0	0	0	1	0	2	0	1			
Store condition	Compliance	15	15	15	15	15	15	15	15			
	Non-compliance	0	0	0	0	0	0	0	0			
Health requirement and recommendation	Compliance	15	15	9	6	15	15	10	6	85.55	0.59	<0.001
	Non-compliance	0	0	6	0	0	0	5	9			
	Not included	0	0	0	9	0	0	0	0			
Term of made in Iran	Compliance	15	15	15	15	15	15	13	15	5.12	-	0.64
	Non-compliance	0	0	0	0	0	0	1	0			
Descriptive statement	Compliance	0	2	15	5	0	8	9	9	97.71	0.63	<0.001
	Non-compliance	0	0	0	3	1	1	6	6			
	Not included	15	13	0	7	14	6	0	0			
Warning statement	Compliance	2	2	15	6	13	9	10	10	82.60	0.58	<0.001
	Non-compliance	2	0	0	0	1	0	5	5			
	Not included	11	13	0	9	1	6	0	0			
Special food statement	Compliance	2	2	15	6	13	9	10	10	128.12	0.73	<0.001
	Non-compliance	13	0	0	0	0	0	5	5			
	Not included	0	13	0	9	14	6	0	0			
Public claim	Compliance	13	4	11	6	14	10	10	8	66.23	0.52	<0.001
	Non-compliance	1	0	4	2	0	3	5	7			
	Not included	1	11	0	7	1	2	0	0			
Nutritional claim	Compliance	5	3	11	8	4	9	11	10	40.94	0.41	<0.001
	Non-compliance	10	10	4	3	11	6	4	5			
	Not included	0	2	0	4	0	0	0	0			

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	Compliance	2	1	14	6	1	9	10	10			
Health claim	Non-compliance	0	1	1	0	0	0	5	5	87.69	0.60	<0.001
	Not included	13	13	0	9	14	6	0	0			
Legibility	Compliance	11	0	14	14	15	15	4	14	12.85	-	0.07
	Non-compliance	4	15	1	1	0	0	1	1			
	Compliance	3	2	15	6	1	8	10	10			
Printing real picture	Non-compliance	0	0	0	0	0	7	5	5	103.32	0.65	<0.001
	Not included	12	13	0	9	14	0	0	0			
	Compliance	15	15	15	2	5	15	8	0			
Preparation instruction	Non-compliance	0	0	0	0	0	0	7	2	88.21	0.60	<0.001
	Not included	0	0	0	13	10	0	0	13			
	Compliance	14	2	13	6	1	7	10	7			
Term of deceiving	Non-compliance	1	3	2	1	1	8	5	8	104.88	0.66	<0.001
	Not including	0	10	0	8	13	0	0	0			
	Compliance	11	6	10	5	14	6	14	10			
HALAL logo	Non-compliance	4	9	5	10	1	9	1	5	25.26	0.45	0.001

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Duncan post-hoc test was utilized to identify distinctions among the groups. The test results indicated that the traffic light labels included significant differences in groups of snacks and sauces and seasonings; preparation instructions in all groups except confectioneries, cereals and flours and snacks; health requirements in all groups except cereals and flours, confectioneries, and beverages, descriptive statements in all groups except oils, beverages, and cereals and flours; warning statements in all groups except beverages, dairies and cereals and flours; nutritional claims in confectioneries and cereals and flours; health claims in all groups except cereals and flours and beverages; legibility of products in group of dairies; deceiving terms in groups of sauces and seasonings, cereals and flours and confectioneries; and HALAL logos in cereals and flours, confectioneries and prepared foods. Moreover, labeling elements including health requirements and recommendations, descriptive statements, warning statements, special food statements, public claims, health claims, real picture illustrations, preparation instructions, and terms that could mislead consumers are all strongly associated. However, elements such as traffic light labels, nutritional claims, and the HALAL logo exhibit a moderate connection. This suggests that the initial set of elements has a more significant influence or relationship with the aspect under evaluation, whereas the second set has a discernible but smaller impact. The use of "strongly" and "moderately" associated corresponds to higher and lower Cramer's V values, respectively.

Discussion

According to the food labeling information of various food groups and items, this research proposes several practical and appropriate nutrition policies to decrease NCD in Iran. It is the initial study to prioritize the nutrition policy options with regard to their significance for NCD prevention. The results of this work revealed that 82.75% of the products contained labeling requirements. Most of the non-compliances were observed in categories of cereals and flours, confectioneries, prepared and semi-prepared foods and snacks. Based on the studies on food labeling worldwide, food labeling is designed to inform customers on various aspects of the food products. Therefore, it is crucial to comprehend which food labeling design includes the most and the least significance for the consumers (Genannt Bonsmann et al., 2010). A review study reported that food labeling led to a 6.6% reduction in energy consumption, 10.6% decrease in total fat intake, and other by 13.0% drop in unhealthy dietary options, while vegetable consumption increased by 13.5%, and industry reactions resulted in a reduction of sodium content by 8.9% and artificial trans fats by 64.3%. Yet, the greatest lack of adherence was documented in categories involving misleading language (61.7%), readability (54.2%), and nutritional statements (44.2%). The current study demonstrated that information was not appropriately transmitted to consumers, which could lead to increase NCDs, especially obesity, Cardiovascular Diseases (CVDs) and diabetes. Based on other studies, enabling informed food selections and reinforcing healthy dietary intakes can assist medical specialists prevent NCDs and support population health (Benajiba et al., 2020; Cetthakrikul et al., 2019; Zargaraan et al., 2017). In the current investigation, significant inconsistencies were reported. Education and food labeling can have an important impact on increasing the awareness of students and the general public. Furthermore, by expanding these training sessions, individuals can make the appropriate decision in choosing their food product (Meijer et al., 2021).

The non-compliance in groups of prepared foods and oils for health requirements and recommendations is perilous as it can lead to food poisoning or decrease nutritional values of these products (Moslemi et al., 2020).

It is important to have warning requirements for prepared foods, snacks, and confectioneries, as the presence of allergens in foods can pose a danger.

Nutritional claims, especially those linked to cholesterols and fats, are important in dairies, snacks and prepared foods for individuals with underlying health problems (Zargaraan et al., 2017). Furthermore, the assertions regarding fiber, sugar, salt, and calories hold significance in dairy products, snacks, prepared foods, beverages, seasonings, and spices, oils, confectioneries and flours in individuals following special diets (Moslemi et al., 2020). By reviewing 111 articles, Shangguan et al. (2019) reported that food labels decreased consumption of energy (6.6%), fats (10.6%), and other unhealthy foods (13%) but increased vegetable consumption by 13.5%. Moreover, implementation of labeling requirements decreased contents of sodium by 8.9% and trans fats by 64.3% in food industries. In a study on effects of food labeling on consumer behaviors in Chile, Araya et al. (2022) manifested that warning labels reduced purchase of breakfast cereals with no effects on chocolates and cookies. Additionally, the behavior of food producers was impacted by food labeling, leading them to modify their products to prevent the inclusion of warning labels. The authors percieved that the sugar content of labeled products decreased by 5.4% and the sodium content reduced by 9.7% after the law. Based on the results of chi-square test in the

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present study, warning statements and snack labels were consistent and food labeling is an effective policy tool to promote consumer and producer behavior, and to prevent obesity and related diseases.

Preparation instructions in the group of prepared foods (especially in canned foods) and health requirements in groups of dairies, prepared foods, and oils have played important roles in general consumer health. Additionally, significant relationships between descriptive statements in dairies (especially word use of “traditional” and “fresh”), beverages (words of “fresh” and “natural”), and snacks (use of “the best” term) have indicated consumer desires for fresh, high quality, and organic products with no preservatives. Fernan et al. (2018) demonstrated that product title increased the overall perceptions of product healthfulness and effects mediated by increased perceptions of the additional healthy phrases. Readability of dairies was typically due to their concise information, in comparison with other products. The utilization of deceptive words in various sauces and seasonings, cereals and flours and confectioneries could uncover competitions of the producers using dishonest advertising and enticing words because of the poor nutritional values of these food categories. Sandvik et al. (2018) examined the labeling of various industrial and commercial breads and concluded that the implementation of specific words on the labels of fiber-containing products and other claims led to greater selections of those products, introducing these products as healthy products to consumers and possibly misleading the consumers, which was more common in individuals with limited education. The importance of HALAL logos in prepared foods and confectioneries, especially meat products and gelatin contained pastilles, is due to their significance for the Muslims. Based on several studies, HALAL logos include significantly positive effects on consumer purchasing behaviors. The presence of logos are important factors affecting consumer purchasing behaviors since those with higher positive and greater reliance on food ingredients and nutrients appear to have greater intentions to purchase goods or products with such labels (Abdul Latiff et al., 2013; Muflih and Juliana, 2020; Ruslan et al., 2018). Indeed, health claims in dairies are essential due to the probiotics; nutritional claims in confectioneries and cereals and flours are significant for individuals on special diets (coeliac disease); and warning statements in confectioneries, sauces, and seasonings and snacks are substantial in spite of allergenic raw materials (Zargaraan et al., 2017). Marra et al. (2017) reported that labeling was the primary method for reducing allergen exposure in risk management. Studies have demonstrated that the current labeling system is insufficient in preventing exposure to allergens (Brown et al., 2015; Marra et al., 2017; Ontiveros et al., 2020; Surojanametakul et al., 2021). Ontiveros et al. (2020) analyzed a total of 10,254 packaged food products and proved that a majority of products containing allergens in their ingredients were inadequately labeled. Therefore, this case must particularly be considered by the officials to ensure that consumers are not misled into identifying healthier products as developing food labeling regulations. In a different research, Nugzar (2018) examined the impact of food labeling on Georgian consumers’ choices. Based on the arguments of the consumers, the major condition of labeling was the clearance of information.

According to the worldwide approved regulations, essential information must be provided in the main part (PDP) and in front of the packages, which can be observed by the buyers (Yeganeh, 2019). This allows consumers to immediately identify desired products in terms of their nature. Additional appendices to EU regulations nos. 2006/192 and 2006/1925, and guidelines nos. 90/496/EEC, 87/250/EEC, 10/1999/EC, 13/2000/EC, 67/2002/EC, /2008/EC, and 608/2004 (EC) are criteria and requirements for including and displaying information on food packages, as well as the minimum and the maximum selected pen sizes based on the largest food packages (Yeganeh, 2019). With regard to the EU regulations, details on food labels must be easy to understand and clear in a specific place, in such a way that be easily visible, obvious, and legible and not be obscured by other contents and images (Todo and Sato, 2002). Due to the necessity of inserting several information and its prevalence in a certain area of the packaging, presentation, and insertion of information should be presented to attract attentions visually (Todo and Sato, 2002). Additionally, countries support the inclusion of the information in their official languages to comprehend information of the labels (Codex Alimentarius, 1985). Based on the high compliance of the current products with formulated regulations of the country and 90% overlap of the regulations with guidelines of other countries, the society has not achieved its health goals through the food labels. With regard to the reviews of a study, over 50% of consumers complained about the illegibility and inappropriateness of the location of manufacture name and expiration date on food packages (Mirghotbi et al., 2012). As regards that they have not achieved their exact goals it is necessary to effectively review the instructions. Terms such as "non-transgenic" and "cholesterol-free" are widely used for vegetable oils, and "zero-calorie", "sugar-free", and "preservative-free" are

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widely applied for beverages. These words are meant to motivate more customers to make purchases. Governments must provide training for individuals to comprehend and utilize these words correctly, in an honest and accurate manner (Franco-Arellano et al., 2017, 2020; Viola et al., 2016).

Additional research has indicated absence of awareness and willingness of consumers to read labels on food packages due to illegibility of information, inadequate literacy or illiteracy, low resolution of labels, insertion of small information on food packages and lack of belief, interest, motivation, time, and non-evident and understandable contents (Mirghotbi et al., 2012, Vandevijvere and Swinburn, 2014). Decisions have been made to introduce a novel model for labeling of all products. Moreover, it instills a habit in consumers to engage with this information, promotes healthier eating habits, and offers appropriate diets to mitigate the impact of improper nutrition in society. These tendencies arise from education and increasing public awareness.

In a research on the effects of food labeling on food choices by the mothers, Seyedhamzeh et al. (2020a) demonstrated that the focus of labels was mostly on energy intake, potentially promoting individuals to choose low-calorie foods. The authors agreed to modify the product labels by presenting novel models by the policy makers. Identical studies indicated the necessity of changes in policies of the current food labels by presenting novel labels that included a combination of physical activity, traffic light labels, and warning labels (Dorosty et al., 2020; Seyedhamzeh et al., 2020b). Moslemi et al. (2020) demonstrated that labeling of color nutritional traffic labels increased the public awareness. In addition to behavioral modifications by the consumers to change diets to decrease risks of NCDs, it is necessary to reconsider food regulations and encourage food industries to modify formulations of their food products. Moreover, the present investigation has introduced a three-part model consisting of statements and claims, main page, and information page. This model can be adapted to all products with various volumes, sizes, and display levels. One of the advantages of this model is that the model regulates and categorizes claimed information, avoiding confusion of consumers to search for their desired information. According to this model, each of the labeling elements needs to be printed in a designated location. This feature facilitates the consumer selection and eliminates the necessity of searching all sections of the packages for health information. Since illegibility and lack of prevent consumers from paying sufficient attentions to these labels, this feature can easily encourage consumers to read necessary health information by creating a principled order in inserting the information.

Conclusion

Despite regulations mandating that food industries contain all necessary details on labels, it appears that a notable portion of label content seems to be inaccurate. Consequently consumers who value label information and depend on it for their purchases may potentially be at risk for certain non-communicable diseases. In conclusion, use of terms such as “non-GMO” and “cholesterol-free” for vegetable oils and “zero calorie”, “sugar-free” and “preservative-free” for beverages, flours and confectioneries is deceptive. These phrases are typically utilized for marketing purposes and customer attractions with no considerations of the product nature. For instance, use of “free-cholesterol” phrase for vegetable oils with no animal origins is for the advertisements on high-cholesterol levels and their associations with CVDs. Furthermore, labeling dairies as “traditional” aims to reassure consumers that the product used in industries is free of chemicals. In fact, this phrase use deceives consumers to believe that the manufacturing procedures of two food products are identical, encouraging the consumers to select the highlighted product. In snacks, use of words such as “natural colors” and “rich in vitamins” misleads the consumers. Use of these words is an example of marketing if the product’s origin and nutritional and functional values have not been studied. In other words, label is a billboard that can deceptively boost consumer’s desire to purchase specific food products. Therefore, use of these phrases must carefully be monitored by the authorities. Labeling is a dynamic and evolving policy; through which, food industries can regularly improve nutritional values of their products. The current study has suggested a novel design of food labels for coordinating between the food labels to attract consumer attention.

Authors' contributions

M.A. designed and conceived the topic, analyzed, and interpreted of data, wrote the main manuscript and text; H.S. collected the data and contributed to the preparation of the survey; M.H. and H.H. revised the manuscript for important intellectual content and supervised the study; R.M.N.F. and H.H. assisted with translate, review, and editing; All authors read and approved the final manuscript and they also contributed effectively in the preparation and revision of the final submission.

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Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Ethical consideration

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