Understanding and Using Patterns of Food Labeling Systems and their Determinants by Medical Students of Tabriz University of Medical Sciences, Iran

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ABSTRACT

Background and Objectives: Increased public knowledge concerning roles of nutrition in prevention of non-communicable diseases have urged people to select healthy foods. The aim of this study was to investigate levels of understanding and use of food labeling systems and their determinants by medical students of Tabriz University of Medical Sciences, Tabriz, Iran.

Materials and Methods: In a cross-sectional study on medical students of Tabriz University of Medical Sciences, 2018, 240 medical students were participated using stratified random sampling method. During the study, participants were asked about their use of nutritional value panel, ingredient list and serving size information of the food labels. To assess understanding levels of the food labeling, subjective and objective methods were used.

Results: Based on the findings, 41.2% of the participants always/most often read food labels when purchasing foods, while 34.2% of them read food labels occasionally. The most common reason for non-using food labels included lack of time to read the food labels (40.8%). A relative majority of the participants (42.5%) occasionally used food labels for diet planning. A majority of the participants (74.6%) reported that they somewhat were aware of food label information. Moreover, 70 to 90.4% of the participants chose the right label as the healthiest from three pairs of labels. Understanding and use of food labels were higher in females than males (p = 0.046 and p = 0.038, respectively).

Conclusions: Less than half of the medical students always/most often used food label information when buying food products. Further studies on other populations are needed to suggest recommendations for an effectual food labelling.

Keywords: Medical student; Understanding; Using; Food label

Introduction

The fast growing trend of non-communicable Diseases (NCDs) has urged public health officials and international organizations to take urgent actions for the prevention of these diseases (1). Nowadays, increasing knowledge and awareness, concerning roles of appropriate nutrition in prevention and management of NCDs, have increased attention of the general public to appropriate food selections and essential information about nutritional values of the food products (2). Decreased home-made foods and increased ready-to-eat foods have led to a greater dependence of people on food labels containing key facts about the ingredients of the products (3). Food labeling, as a population-based strategy, can potentially change individual behaviors and consequently improve population health. This effect depends on the consumers’ ability to appropriate understand and use of nutrition labels (4). Appropriate selection and consumption of foods can solve the problem of excessive eating and nutritional imbalances and are good approaches to control global metabolic epidemics by involving people in maintaining their health statutes (5). The current World Health Organization (WHO) approach is to decrease the risk of death from NCDs up to 25% by 2025 (5). In Iran, national documents for the prevention and control of NCDs have several goals for decreasing rates of these diseases between 1394 and 1404, including 30% decreases in average salt intake, zero trans fatty acid contents in edible oils and food products replacing with monounsaturated fats (MUFAs) and prevention of diabetes and obesity spreads (6).

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Various factors affect personal food choices, including economic considerations, social and demographic factors, lifestyle and concerns about health and food safety (7). In several societies, nutrition labeling containing essential nutritional information is currently one of the essential requirements for marketable food products. Studies have been carried out on knowledge and attitude of various populations about food labeling in various regions of the world. In a cross-sectional study by Jackey et al. (8), less than half of 60-year-old adults and those older in Delaware, USA, were able to interpret food label information correctly. Viola et al. (9) assessed knowledge and understanding of food labels in young adults mostly with higher education levels through an on-line survey and showed that they were generally able to identify healthier food products based on nutritional label information. Based on the finding by Haghhighian et al. (10), knowledge insufficiency of interpreting colors of traffic light labels on packages, small sizes of the labels and no exchanges of food products with red-color traffic light signs were the major challenges of consumers using these labels. To the best of the authors’ knowledge, no studies have assessed understanding and using patterns of food labels and their determinants by medical students of Tabriz University of Medical Sciences. Considering undeniable roles of physicians of the health systems in encouraging healthy nutritional choices, this study has been carried out.

Materials and Methods

Study design and participants: This study was a cross-sectional study on medical students of Tabriz University of Medical Sciences, Tabriz, Iran, 2018. Trained statisticians listed students in various departments of the medical school and chose the study participants using stratified random sampling method. Study objectives were explained to the participants and informed consents were signed by them. Then, demographic questionnaires, concerning age, sex, education level, marital status and monthly household incomes, were completed by the participants. The monthly household incomes were categorized as less than 30, 30–50, 50–100 and more than 100 million Iranian Rials per month.

Sample size: Based on the findings of Mirghotbi et al. (11), 0.25 and 0.06 were considered as estimates of the ratio and effect size, respectively. Using significance level of 0.05, power of 0.8 and two-sided test, the sample size was computed as 200. With a 20% probability of falling, the final sample size was estimated as 240 individuals. Inclusion criteria included being 18 years old and older and being a medical student in Tabriz University of Medical Sciences. Exclusion criteria included unwillingness to participate in the study, incomplete information and guest students from other medical universities.

Variables and measurements

During the study, food label samples were shown to the participants and asked them about their use of the nutritional value panel, ingredient list and serving size information when buying food products. Responses included “always”, “most of the time”, “sometimes”, “rarely,” “never” and “I’ve never seen it” (12). In each group, participants were asked about the reason for reading or non-reading using multiple-choice questions (13). Users were asked about the most important part of the nutritional data in food labels. To assess understanding levels of food labeling, subjective (asking the question “Do you have information on food labels?” and weighing it on a Likert scale as 1 = poor, 2 = somewhat and 3= largely) and objective (providing three pairs of hypothetical food labels and asking participants to choose the healthiest food label and expressing the cause of choice) methods were used (14). The questionnaire content validity data were achieved based on Delphi expert enquiry method. Ten nutritionists reviewed the questionnaires concerning the writing and grammar errors and the questionnaire appropriateness. Then, content validity index (CVI) and content validity ratio (CVR) were computed (15). The smallest admissible value of CVI to acknowledge each item in the questionnaires was considered as 0.78 (16) and because of the number of experts (n = 10), the lowest satisfactory value of CVR was considered as 0.62.

Statistical analysis: Data were presented as mean ±SD (standard deviation) and frequency (%) for quantitative and qualitative variables, respectively. Data analysis was carried out using SPSS software v.17 (IBM Analytics, USA). Chi-square test was used to show relationships between the categorical variables. The p-values less than 0.05 were considered as significant.

Table 1. Descriptive characteristics of the study participants

| Variables          | Category       | Frequency | Percent (%) |
|--------------------|----------------|-----------|-------------|
| Age                | <20            | 23        | 9.6         |
|                    | 20-22          | 101       | 42.1        |
|                    | 23-25          | 66        | 27.5        |
|                    | >25            | 50        | 20.8        |
| Sex                | Male           | 126       | 52.5        |
|                    | Female         | 114       | 47.5        |
| Educational year   | 1st            | 44        | 18.3        |
|                    | 2nd            | 49        | 20.4        |
|                    | 3rd            | 39        | 16.3        |
|                    | 4th            | 36        | 15.0        |
|                    | 5th            | 34        | 14.2        |
|                    | 6th            | 38        | 15.8        |
| Marital status     | Single         | 196       | 81.7        |
|                    | Married        | 36        | 15.0        |
|                    | Divorce        | 8         | 3.3         |
| Household income   | <30            | 29        | 12.1        |
| (million Rial/month)| 30-50         | 120       | 50.0        |
|                    | 50-100         | 72        | 30.0        |
|                    | >100           | 19        | 7.9         |
Table 2. Use of food labels by the participants

| Variables | Frequency | Percent(%) |
|-----------|-----------|------------|
| Reading the food label when buying foodstuff | | |
| Always | 25 | 10.4 |
| Most of the times | 74 | 30.8 |
| Sometimes | 82 | 34.2 |
| Rarely | 46 | 19.2 |
| Never | 10 | 4.2 |
| I've never seen it | 3 | 1.2 |
| Why non-reading the food label | | |
| I'm not interested in it | 58 | 24.2 |
| I don't have enough time for this | 98 | 40.8 |
| I can't read it | 4 | 1.7 |
| I don't understand it | 18 | 3.3 |
| Others | 19 | 7.9 |
| Reasons for considering food labels from the perspective of the participants | | |
| Learn about the production and expiry dates | 228 | 95.3 |
| Learn about the license number from Ministry of Health | 18 | 7.6 |
| Learn about the product type | 53 | 22.5 |
| Learn about price | 38 | 16.1 |
| Learn about the product weight | 24 | 10.2 |
| Learn about the constituents of the food | 86 | 36.5 |
| Learn about the nutritional information | 39 | 16.5 |
| Having allergies / intolerance to some foods | 12 | 5.1 |
| Suffering from other medical problems | 1 | 0.4 |
| Learn about additives and artificial colors | 18 | 7.6 |
| I do this to choose a healthier food | 25 | 10.4 |
| Understanding the meaning of food labels | | |
| Entirely | 41 | 17.1 |
| Somewhat | 186 | 77.5 |
| Not at all | 4 | 1.7 |
| No idea | 9 | 3.8 |
| The part of nutritional data with the most attention | | |
| Additives | 61 | 25.7 |
| Calories per serving | 122 | 51.4 |
| Total fat | 104 | 43.8 |
| Saturated fat | 60 | 25.3 |
| Sugar | 61 | 25.7 |
| Carbohydrate | 34 | 14.3 |
| Protein | 59 | 24.8 |
| Vitamin/Mineral | 63 | 26.5 |
| Fibre | 19 | 8.0 |
| Salt | 35 | 14.7 |
| Other | 4 | 1.7 |
| Using nutrition label information for diet planning | | |
| Always | 5 | 2.1 |
| Most of the times | 29 | 12.1 |
| Sometimes | 102 | 42.5 |
| Never | 86 | 35.8 |
| No idea | 18 | 7.5 |
| Participants' opinion about food information provided in food labels | | |
| Legibility of production and expiration dates | | |
| Yes | 183 | 76.2 |
| No | 45 | 18.8 |
| No idea | 12 | 5.0 |
| The suitability of the location of production and expiry date | | |
| Yes | 140 | 58.3 |
| No | 94 | 39.2 |
| No idea | 6 | 2.5 |
| Nutrition information readability | | |
| Yes | 191 | 79.6 |
| No | 27 | 11.2 |
| No idea | 22 | 9.2 |
| Understandable nutrition information | | |
| Yes | 180 | 75.0 |
| No | 26 | 10.8 |
| No idea | 34 | 14.2 |
| The suitability of the location of nutrition information | | |
| Yes | 180 | 75.0 |
| No | 39 | 16.2 |
| No idea | 21 | 8.8 |
Results

In this cross-sectional study, 240 medical students with the mean age of 22.4 ± 2.2 years were studied, 2018. Demographic information of the participants are shown in Table 1. The average CVI of using and understanding questionnaires were respectively 0.791 and 0.855 and CVR were respectively 0.725 and 0.814. Data of using and understanding food labels are shown in Tables 2 and 3. Reading food labels when buying foods and using nutrition label information for diet planning were significantly higher in female students than male students (p = 0.046 and p = 0.038, respectively). No significant relationships were shown for other demographic variables (p-values > 0.05) (Tables 4, 5 and 6).

Table 3. Understanding of food labels by the participants

| Variables                              | Frequency | Percent (%) |
|----------------------------------------|-----------|-------------|
| Self-declaration                        | Poor      | 21          | 8.8        |
| awareness of data presented in food labels | Somewhat  | 179         | 74.6       |
| Largely                                |           | 40          | 16.7       |
| Choosing the right healthy label       | First pair| 217         | 90.4       |
|                                        | Second pair| 168         | 70.0       |
|                                        | Third pair | 183         | 76.2       |
| Reason for selection                   | Unknown   | 3           | 1.2        |
|                                        | Protein   | 108         | 45.0       |
|                                        | Vitamins  | 8           | 3.3        |
|                                        | Others    | 44          | 18.3       |
|                                        | Fat       | 229         | 95.4       |
|                                        | Fiber     | 102         | 42.5       |
|                                        | Energy    | 94          | 39.1       |
|                                        | Calcium   | 1           | 0.4        |
|                                        | Cholesterol | 70         | 29.1       |
|                                        | Carbohydrate | 83         | 34.5       |

Table 4. Relationship between demographic characteristics with choosing the right healthy label (n=240)

| Characteristics | First pair |         | False |         | p-value | Second pair |         | False |         | p-value | Third pair |         | False |         | p-value |
|-----------------|------------|---------|-------|---------|---------|------------|---------|-------|---------|---------|------------|---------|-------|---------|---------|
| Age             | True n=217 | 16(7.3%)|       | 7(30.5%)| 0.090   | True n=168 | 8(4.8%)|       | 15(20.8%)| 0.123  | True n=183 | 17(9.2%)|       | 6(10.5%)| 0.634   |
|                 | False n=23 | 7(30.5%)|       | 6(26.1%)|         | False n=172| 5(7.0%)|       | 25(33.8%)|         | False n=57 | 6(10.5%)|       | 2(3.3%)|         |
|                 |            |         |       | 2(50.0%)|         |            | 9(12.5%)|       | 2(14.7%)|         |            | 11(19.4%)|       | 0(0.0%)|         |
|                 |            |         |       | 2(50.0%)|         |            | 9(12.5%)|       | 2(14.7%)|         |            | 11(19.4%)|       | 0(0.0%)|         |
|                 |            |         |       | 0(0.0%) |         |            | 0(0.0%) |       | 0(0.0%) |         |            | 0(0.0%) |       | 0(0.0%)|         |
|                 |            |         |       | 0(0.0%) |         |            | 0(0.0%) |       | 0(0.0%) |         |            | 0(0.0%) |       | 0(0.0%)|         |
| Age             | True n=25  | 17(68.0%)|       | 5(20.0%)| 0.031   | True n=49  | 20(51.3%)|       | 17(44.7%)| 0.046  | True n=42  | 17(40.5%)|       | 8(19.0%)| 0.072   |
|                 | False n=54 | 5(20.0%)|       | 12(46.4%)|         | False n=72| 7(10.0%)|       | 6(8.5%) |         | False n=71| 10(24.0%)|       | 5(11.0%)|         |
|                 |            |         |       | 1(4.0%) |         |            | 0(0.0%) |       | 1(2.2%) |         |            | 2(4.8%)  |       | 0(0.0%)|         |
|                 |            |         |       | 0(0.0%) |         |            | 0(0.0%) |       | 0(0.0%) |         |            | 0(0.0%) |       | 0(0.0%)|         |
|                 |            |         |       | 0(0.0%) |         |            | 0(0.0%) |       | 0(0.0%) |         |            | 0(0.0%) |       | 0(0.0%)|         |
|                 |            |         |       | 0(0.0%) |         |            | 0(0.0%) |       | 0(0.0%) |         |            | 0(0.0%) |       | 0(0.0%)|         |
| Age             | True n=25  | 17(68.0%)|       | 5(20.0%)| 0.031   | True n=49  | 20(51.3%)|       | 17(44.7%)| 0.046  | True n=42  | 17(40.5%)|       | 8(19.0%)| 0.072   |
|                 | False n=54 | 5(20.0%)|       | 12(46.4%)|         | False n=72| 7(10.0%)|       | 6(8.5%) |         | False n=71| 10(24.0%)|       | 5(11.0%)|         |
|                 |            |         |       | 1(4.0%) |         |            | 0(0.0%) |       | 1(2.2%) |         |            | 2(4.8%)  |       | 0(0.0%)|         |
|                 |            |         |       | 0(0.0%) |         |            | 0(0.0%) |       | 0(0.0%) |         |            | 0(0.0%) |       | 0(0.0%)|         |
|                 |            |         |       | 0(0.0%) |         |            | 0(0.0%) |       | 0(0.0%) |         |            | 0(0.0%) |       | 0(0.0%)|         |
|                 |            |         |       | 0(0.0%) |         |            | 0(0.0%) |       | 0(0.0%) |         |            | 0(0.0%) |       | 0(0.0%)|         |

Table 5. Relationship between demographic characteristics with using of food labels (N=240)

| Characteristics | Always n=25 | Most of the times n=54 | Sometimes n=82 | Rarely n=46 | Never n=10 | I’ve never seen it n=3 | p-value | Entirely n=41 | Somewhat n=186 | Not at all n=4 | No idea n=9 | p-value |
|-----------------|-------------|-------------------------|----------------|-------------|------------|-----------------------|---------|--------------|----------------|---------------|-------------|---------|
| Age             | True n=25  | 5(12.0%)                | 68(83.8%)      | 8(9.9%)     | 4(8.8%)    | 2(20.0%)               | 0(0.0%) | 3(7.3%)      | 19(10.5%)      | 0(0.0%)       | 1(11.1%)   | 0.083   |
|                 | False n=23 | 4(17.4%)                | 66(60.9%)      | 12(10.2%)   | 2(17.2%)   | 15(20.8%)              | 0(0.0%) | 6(14.7%)     | 22(25.6%)      | 1(11.1%)      | 2(11.1%)   | 0.038   |
|                 |            |                        |               |             |            | True n=25             | False n=23 | 3(13.0%)  | 2(8.5%) | 1(4.0%) | 0(0.0%) | 0(0.0%) | 0.038   |
|                 |            |                        |               |             |            | False n=23            | True n=25  | 3(13.0%)  | 2(8.5%) | 1(4.0%) | 0(0.0%) | 0(0.0%) | 0.038   |
|                 |            |                        |               |             |            | True n=25             | False n=23 | 3(13.0%)  | 2(8.5%) | 1(4.0%) | 0(0.0%) | 0(0.0%) | 0.038   |
|                 |            |                        |               |             |            | False n=23            | True n=25  | 3(13.0%)  | 2(8.5%) | 1(4.0%) | 0(0.0%) | 0(0.0%) | 0.038   |
|                 |            |                        |               |             |            | True n=25             | False n=23 | 3(13.0%)  | 2(8.5%) | 1(4.0%) | 0(0.0%) | 0(0.0%) | 0.038   |

Neda Dolatkhah, et al: Understanding and using of food labels
According to the findings of this study, 41.2% of the participants always/most often read the food labels when buying foods, while 34.2% of the participants occasionally read the food labels. Reasons for reading food labels in

95.3% of the participants included production and expiry dates, while only 36.5% of them focused on food ingredients. In addition, 42.5% of the participants admitted that they only occasionally used nutritional label information for diet planning. In a study by Malekmahdavi et al. (23) on assessing knowledge, attitude and practice of 332 Iranian medical and non-medical students in five various study majors including nutrition, health, health services management, paramedical and engineering, 47.6% of the students reported that they often/always used food label information when buying food products. Of these students, only 32.3% used nutrition label information to modify their daily food intakes. Expiry date and storage condition were reported as the most important items in food labels. In the study of Ghanbari Ghozikali et al. (24), more than 75% of the people in Bostanabad, East Azarbajian Province of Iran, paid attention to food labels when shopping. Similar to the results of the present study, most of these people were motivated to view production and expiry dates. 

A small percentage of the participants read the food labels for nutritional facts, product weight monitoring, additives and artificial colors. In a cross-sectional study on 542 adolescents in Sri Lanka, Talagala et al. (14) found that a majority of the participants (74.5%) always/often read the food labels. Of these participants, 75% focused on the brand names, 85% on the product prices and 81% on the nutritional facts.

Based on the results of the present study, the major reasons for non-using label information by the participants
included lack of time in 40.8% and lack of interest in 24.2% of the participants. Similar to the present study, Schupp et al. (25) showed that lack of time, lack of interest and motivation and prior knowledge of the food were the major reasons for not paying attention to food labels in Louisiana Americans. A 1997 study by Shine et al. (7) showed that lack of interest (22%), lack of time (13%) and inability to understand information (9%) were the major reasons for non-using food labels. Relatively, small text sizes were reported as the major reasons by older Irish people. In a study in USA, color-coded labels were reported more impressive than traditional food labels in attracting users’ attentions (26). Color-coded labels are reported as the most impressive labels for helping consumers rank food items based on healthiness (27). In a UK study, consumers less consumed red labeled nutrients (28). Ability of 5-color food labels in helping consumers assess nutritional qualities of the breakfast cereals has been shown in French markets (29). Traffic Light labels are effective under time limitation as less time is needed to understand these labels, compared to guideline daily amount (GDA) labels (30). In addition, front-of-package (FOP) warning food labels with graphical design such as black & white stop signs are other choices to help users decide simpler and more understandable (31).

Regarding nutritional facts, 51.4% of the participants wanted to learn about the calories per serving, 43.8% noticed the total fat and 26.5% noticed the vitamin/minerals. Other items such as sugars and saturated fats were ranked lower. Additionally, satisfaction with readability and appropriateness of location of the manufacturing and expiry dates, readability of nutritional facts, providing with understandable information and appropriateness of nutritional facts label locations included 76.2, 58.3, 79.6, 75 and 75%, respectively. In a study by Mirghothi et al. (11) in Tehran, Iran, more than half of the surveyed individuals stated unreadability, inappropriate label location and incomprehensible nutritional information. These differences were seemingly linked to a research community involved in a recent study of ordinary customers in malls in Tehran. Based on the findings, 74.6% of the participants were somewhat aware of food label information. Correct choices of healthy food labels for the first, second and third label pairs included 90.4, 70.0 and 76.2%, respectively. Reasons for choosing healthier labels in 95.4, 65.0 and 45.0% of the respondents were based on the product fat, sodium and protein contents, respectively. However, other health items were ranked lower. In the study of Esfandiar et al. (32), most of the students (81.7%) from Isfahan University of Medical Sciences, Iran, had a sufficient knowledge about the choice of appropriate food products based on the nutritional color markers (guide light) of the food packages. This further increased by training. Levy and Fein showed that most American consumers (78%) correctly compared two food products and recognized nutrient alterations between them; however, only 20% were qualified enough to estimate contributions of a particular food to the entire daily intake (33).

In this study, no significant relationships were seen between demographic variables with understanding and using food labels except for sex. Reading and using nutrition label information for diet planning were significantly higher in women than men. This finding is similar to findings from previous studies (34-38). This might occur because women were more expected to comply with the efficiency of nutrition data on food labels and generally had more concerns in health and nutrition topics in comparison to men (39). In contrast to findings from the current study, a study by Jackey et al. in Delaware, USA (8), showed that food label awareness was associated with monthly income. In another study by Miller et al. (40) in California, USA, 2013–2014, accuracy and attention to food labels decreased with increasing age. These differences could be due to the youngness of the participants in the present study. However, the present study included limitations that must be considered when interpreting results. These limitations included a relatively low sample size, self-reported questionnaire and observational nature of the study.

Conclusion

Findings of this study suggested that less than half of the medical students always/most often read the food labels when buying foods. In addition, less than half of the participants expressed that they occasionally used nutrition label information for diet planning, signifying that this labeling arrangement might not provide an extra guidance to users to choice healthier foods. The major reasons for non-using food labels by the participants included lack of time and interest. Color-coded labels, traffic light labels and FOP warning food labels with graphical design may practically help policy makers. Further studies on other populations are needed to provide recommendations for efficient labelling and verify accurate comprehension of the nutritional values.

Ethics approval

At the beginning of the study, goals and methods of the study were clearly explained in details to each participant. Participants were volunteers and informed consents were signed. Personal information of the participants were assumed private and secure. The project protocol was approved by the Ethics Committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1396.1284).

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