

“Knowledge, Attitude and Practice Regarding Food Labeling in Patients with Chronic Diseases in Gilan Province, North of Iran

Samira Rabiei ¹ , Asieh Ashouri ², Marjan Mahdavi-Roshan ^{*3,4}

1. Department of Nutrition Researches, National Nutrition and Food Technology Research Institute and Faculty of Nutrition and Food Technology Sciences, Shahid Beheshti University of Medical Sciences and Health Services, Tehran, Iran
2. School of Health, Guilan University of Medical Sciences, Rasht, Iran
3. Cardiovascular Diseases Research Center, Department of Cardiology, Heshmat Hospital, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran
4. Department of Community Medicine, Faculty of Medicine, Guilan University of Medical Sciences, Rasht, Iran

ARTICLE INFO

Original Article

Received: 20 March 2022

Accepted: 1 June 2022



Corresponding Author:

Marjan Mahdavi-Roshan

Marjanmahdavi60@gmail.com

ABSTRACT

Introduction: Food labels can be beneficial instruments for patients with chronic diseases to take care of the health. The study aimed to assess knowledge, attitude and practice of patients with chronic diseases about food labeling and effects of sociodemographic factors on it.

Methods: A cross-sectional study was conducted during 2018-2019 on 800 patients with chronic diseases who referred to clinics of Heshmat and Razi hospitals in Gilan, Iran, through convenience sampling. Anthropometric measurements and sociodemographic information were assessed. Status of knowledge, attitude and practice toward food labeling were assessed through a self-reported questionnaire. Mann-whitney U-test and Kruskal-Wallis test was used for statistical analysis in SPSS software version 23. P-value<0.05 was considered as significant.

Results: The mean age of participants was 55.6±14. The median± IQR of knowledge score was 8.47± 1.22. Almost 70% of the patients believed that written date on food package insures that the product is fresh. 68% of them believed that reading nutritional information on food labels is helpful to choose a product with high nutritional value. In the field of practice, 99% of participants paid attention to food labels when purchasing, however, the majority of them read these labels to find out the produce and expiry date and price. Only 11% of the participants read food labels when purchasing to get nutritional information.

Conclusion: Patients with chronic diseases have good knowledge but poor practice about food labeling. Regarding the importance of food choices in prevention of chronic diseases, educating people about the importance of food labels seems necessary.

Keywords: Food Labeling, Knowledge, Attitude, Practice, Chronic Disease.

How to cite this paper:

Rabiei S, Ashouri A, Mahdavi-Roshan M. “Knowledge, Attitude and Practice Regarding Food Labeling in Patients with Chronic Diseases in Gilan Province. J Community Health Research 2022; 11(2): 107-116.

Copyright: ©2022 The Author(s); Published by Shahid Sadoughi University of Medical Sciences. This is an open-access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Introduction

Association between dietary habits and the development of chronic diseases have been revealed in several studies (1-6). Food labels are important instruments to help people become aware of their nutrients intake. These labels provide some information about nutritional values and ingredient contents of the food products. A recent update on nutrition labels proposed by the US Food and Drug Administration (FDA) has reflected several associations between chronic diseases and nutritional status (7). According to a study which used data from the US National Health and Nutrition Examination Survey (NHANES), researchers found that the probability of reading food labels in patients with chronic diseases receiving nutritional education was 50% more than those who did not receive these educations. The results of that study showed that consumption of calories, saturated fatty acids, carbohydrates and sugar is less and intake of fiber is more in patients who read food labels than those who did not (8). Attention to food labels may be useful for making a balance in nutrients intake. It is especially important for management of chronic diseases. Therefore, it is necessary to make an improvement in food labeling systems, both for healthy population and patients with chronic diseases (9). The relation between nutrition labels and health status has been investigated in several studies with varying results (10-15). For example, results of a study conducted by Elfassy et al. showed that food labeling had an inverse relationship with intake of total fat, cholesterol and SFA. They suggested more nutrition knowledge leads to more attention to food labels (10). Furthermore, a study conducted on patients receiving care in medical clinics indicated that the consumption of fat in people, who had read food labels in the last year, was lower than others. This was despite the fact that it was higher for fruits and vegetables (11, 14, 16). According to a population-based study conducted on African Americans population, the authors found that reading nutrition labels had a negative association with obesity and a positive association with healthy eating choices (15).

Investigations on behavioral interventions to improve nutritional status demonstrated successful outcomes, especially in patients or people who are at risk of chronic diseases (17, 18). Although different researches have investigated food labeling from different aspects including socio-demographic, psychosocial, attention of patients with chronic diseases (e.g., hypertension, hypercholesterolemia, heart disease, overweight or diabetes) to food labels is virtually unknown. There are few investigations in the field of knowledge, attitude and practice regarding food labeling in Iran (19, 20). None of them, however, have been conducted on patients with chronic diseases. There is a lack of sufficient information on the status of knowledge, attitude and practice of Iranian patients with chronic diseases regarding food labels. The researchers aimed to assess knowledge, attitude and practice toward food labeling and the effects of sociodemographic factors on these items in patients with chronic diseases such as hypertension, diabetes and cardiovascular disease who referred to Gilan's hospitals.

Methods

In this cross-sectional study, 800 patients participated through the convenience method sampling during 2018-2019. They were aged between 14-83, had chronic diseases, and referred to outpatient clinics in Heshmat and Razi hospitals in Gilan, Iran.

In terms of inclusion criteria, Patients with diabetes, hypertension and cardiovascular disease who were literate entered the study. Patients who did not volunteer to participate in this study were not included. Participants signed a written consent form before beginning the study.

The sample size of this study was determined based on Mirghotbi et.al's study results (21). According to the same study, a sample size with 95% of confidence, absolute deviation of 5%, $\alpha= 0.05$, $d= 0.04$, $p= 0.6$ and considering compensating the missed data, the authors evaluated a total of 800 patients.

$$n = \frac{Z_{1-\frac{\alpha}{2}}^2 p(1-p)}{d^2}$$

Trained health care providers measured anthropometric data, including weight and height. Before weight measurement, the researchers performed calibration of weighing scales with 5-kg weights. Moreover, the removal of excess clothes and shoes was recommended to assure accurate measurements. BMI was calculated as weight (in kilogram) divided by height squared (in m²). A BMI 18.5-24.9 kg/m² was defined as normal, BMI 25 or more as overweight, while a BMI 30 or more was characterized as obese.

A trained dietitian collected all questionnaires about demographic information and status of knowledge, attitude, and practice (KAP) regarding food labeling in the mentioned clinics. KAP questionnaire was used in previous study by Mirghotbi, et al. to assess status of knowledge and practice about food labeling in 2013 in Iran (20). Chronic diseases were diagnosed through asking questions from patients and assessing their consumed drugs.

KAP questionnaire

This questionnaire consisted of 3 sections for assessing knowledge, attitude and practice. There were 3 questions related to knowledge. Patients received one point for correct answer to the first question. The second question had 7 options to choose from, all of which were correct. This question asked about some important topics usually written on food labels. They included the name of product, price, production and expiration date, weight, food consistency, nutritional value, food additives and artificial colors. Patients received 1 to 7 points according to the number of chosen items. Third question was about the kind of nutritional compositions written on food labels. Participants received one point if they choose at least one correct item. The total score for knowledge section was nine. The higher score in knowledge section means better knowledge.

Next section of the questionnaire was about

attitude to food labeling. This section consisted of 3 questions. Participants chose one out of five options. They included completely agree, agree, no idea, disagree, and completely disagree. The results were reported in percentage. Finally, for the last section, practice, there were 4 questions whose results were reported based on percentage. One question was about attention to food labels when purchasing. The patients who answered “No” had to answer the next question which asked about their reasons. This is while those who answered “Yes”, had to answer the next question about the purpose of their attention. The last question was about attention to the word of “diet” when purchasing. At the end of the questionnaire, there was a section in the form of a survey to assess patients’ idea about characteristics of food labels.

Statistical analysis

The Kolmogorov-Smirnov test was used to determine if variables showed a normal distribution. variables distribution in two levels were compared with Mann-Whitney U test. To compare those variables with more than two categories, Kruskal-Wallis test with Bonferroni correction were used. Spearman Correlation coefficient was used to determine the correlation between variables. SPSS version 23 was used for statistical analysis. P-value<0.05 was considered the significant level.

Results

The mean age of patients was 55.6±14.36. 36.1% (n=289) of the participants were women, and 63.9% (n=511) were men. The mean of body mass index (BMI) indicated that patients were close to the maximum upper range of normal BMI (25.97±3.97kg/m²). 93.5% (n=749) of participants were with or without high school diploma. 6.5% (n= 52) had higher education degrees.

The results showed, on average, the number of chronic diseases in each participant was 2. The majority of patients (81.9%, n=655) had cardiovascular disease and about half of them (42%, n= 336) had hypertension. The results indicated that 14% (n= 112) of patients had hypertension in addition to cardiovascular disease. Comorbidity of hypertension, diabetes, hyperlipidemia and

cardiovascular disease was 9.6% (n= 76). The percentage of patients with cardiovascular and hyperlipidemia was 6.5% (n=52). It was 3.4% (n=27) for cardiovascular and diabetes. Comorbidity of diabetes, hyperlipidemia and hyperlipidemia was 1.8% (n=14). Furthermore, 1.3% (n=10) of patients had both diabetes and hypertension. Other comorbidities were less than 1% (n=8) in participants.

Table 1 shows the median and interquartile range (IQR) of knowledge score and percentage of answers to the sections of attitude and practice by sex. The minimum and maximum scores of

knowledge were 1 and 9, respectively. In the field of attitude, the results showed that 74% (n=592) of patients believed that written date on food package assured that the product was fresh. More than half of the participants believed that reading nutritional information on food labels was helpful for choosing a product with high nutritional value. Close to half of the participants believed that writing the word of “diet” on food labels gave them confidence that the food was really a dietary product. In the field of practice, 99% (n=792) of the participants mentioned that they read food labels when purchasing.

Table 1. Distribution of Participants’ Responses to Knowledge, Attitude and Practice Section of KAP Questionnaire by Sex

| | | | | | P-value |
|---|--------------------|------------|------------|------------|-----------|
| | | Total | Wom en | Men | |
| Knowledge*, Median±IQR | | 8.46±1.24 | 8.48±1.25 | 8.42±1.24 | 0.50* |
| Attitude | | | | | |
| Date written on food labels assures us that the product is fresh | Completelyagree | 38 (4.8) | 31 (3.9) | 7 (0.9) | 0.08** |
| | Agree | 553 (69.1) | 355 (44.4) | 198 (24.8) | |
| | Noidea | 207 (25.9) | 124 (15.5) | 83 (10.4) | |
| | Disagree | 2 (0.3) | 1 0(0.1) | 1 (0.1) | |
| | CompletelyDisagree | 0 | 0 | 0 | |
| Nutritionalinformationonfoodlabels,helpustochoo seavaluableproduct. | Completelyagree | 99 (12.4) | 69 (8.6) | 30 (3.8) | 0.1* * |
| | Agree | 451 (56.4) | 295 (36.9) | 156 (19.5) | |
| | Noidea | 249 (31.1) | 146 (18.3) | 103 (12.9) | |
| | Disagree | 1 (0.1) | 1 (0.1) | 0 | |
| | CompletelyDisagree | 0 | 0 | 0 | |
| Writingtheword“Diet”onfoodlabelsassuresusthatit isreallyadietaryproduct | Completelyagree | 30 (3.8) | 23 (2.9) | 7 (0.9) | 0.02** |
| | Agree | 355 (44.4) | 222 (27.8) | 133 (16.6) | |
| | Noidea | 411 (51.4) | 266 (33.3) | 145 (18.1) | |
| | Disagree | 4 (0.5) | 0 | 4 (1.4) | |
| | CompletelyDisagree | 0 | 0 | 0 | |
| Practice | | | | | |
| Doyoupayattentiontofoodlabelswhenpurchasing? | Yes,always | 149 (18.6) | 97 (12.1) | 52 (6.5) | 0.2* * |
| | Yes,often | 162 (20.3) | 99 (12.4) | 63 (7.9) | |
| | Yes,sometimes | 487 (60.9) | 315 (39.4) | 172 (21.5) | |

| | | | | | |
|--|---|---------------|---------------|---------------|------------|
| | No | 2 (0.3) | 0 | 2 (0.3) | |
| If the answer is “Yes”, what is your aim for paying attention? | Attention to type of product | 274 (34.3) | 180 (22.5) | 94 (11.8) | 0.2 |
| | Attention to production and expiration date | 689 (86.1) | 438 (54.8) | 251 (31.4) | 0.3 |
| | Attention to price of product | 574 (71.8) | 360 (45) | 214 (26.8) | 0.1 |
| | Attention to weight of product | 19 (2.4) | 13 (1.6) | 6 (0.8) | 0.4 |
| | Attention to food ingredients | 21 (2.6) | 14 (1.8) | 7 (0.9) | 0.4 |
| | Attention to nutritional information | 20 (2.5) | 10 (1.3) | 10 (1.3) | 0.1 |
| | Attention to food additives and artificial colors | 47 (5.9) | 28 (3.5) | 19 (2.4) | 0.3 |
| Do you pay attention to the word of “Diet” when purchasing? | Yes, always | 2 (0.3) | 2 (0.3) | 0 | 0.01 ** |
| | Yes, often | 19 (2.4) | 6 (0.8) | 13 (1.6) | |
| | Yes, sometimes | 89 (11.1) | 56 (7) | 33 (4.1) | |
| | No | 690 (86.3) | 447 (55.9) | 243 (30.4) | |

* Mann-Whitney U test

** Chi-square test

Figure 1 shows distribution of participants' responses according to the survey section of the study. The items of "Production and expiration

dates were easy to read." and "Nutrition information on food labels were legible." had the highest and lowest percentage of responses, respectively.

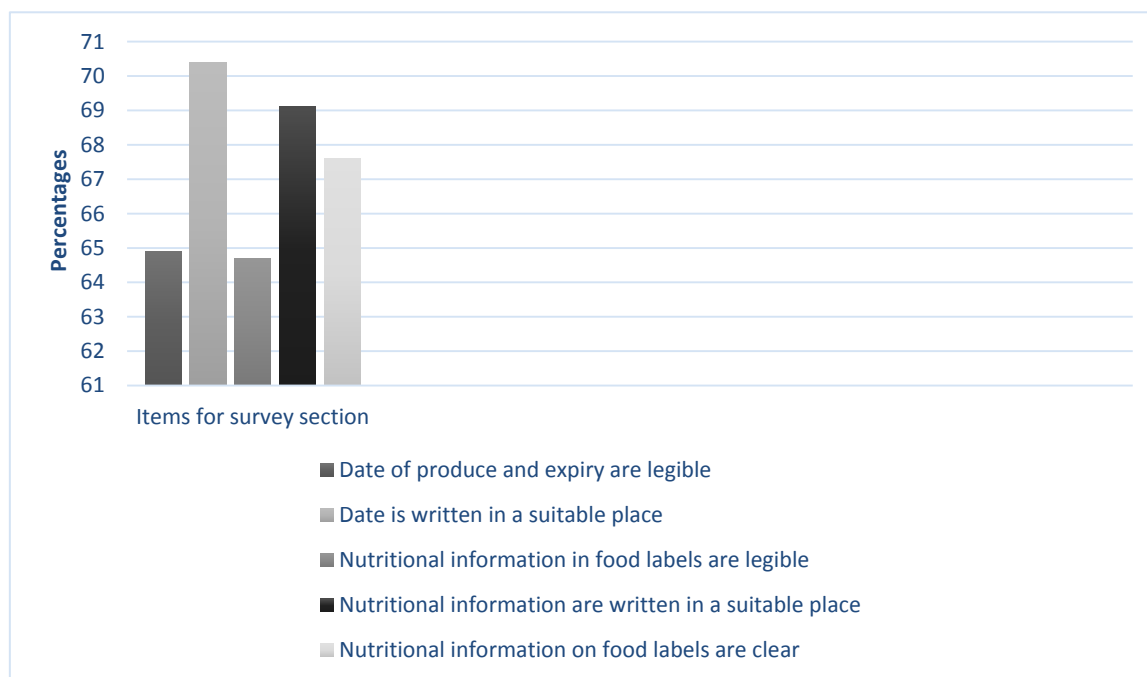


Figure 1. Distribution of Participants According to the Survey Section

Demographic variables and knowledge score

According to table 1, with respect to Mann-Whitney U test, there was no significant difference between men and women ($p=0.50$). Also, there was no significant difference between married and single participants regarding knowledge score.

The results of Spearman test also showed that there was no significant correlation between knowledge score and demographic variables, such as household size ($r=0.006$, $P=0.87$) and income level ($r=0.04$, $p=0.14$). But, there was a very weak positive and significant correlation between knowledge score and education level ($r=0.08$, $p=0.02$). However, age and knowledge score had a weak negative, significant correlation ($r=-0.18$, $p=0.001$).

Demographic variables and attitude score

The attitude score regarding the products and their freshness in women was significantly lower than men (2.19 vs 2.27 , $p=0.039$). Furthermore, the score was significantly higher in participants with monthly income of 3-6 millionRials (187-375

) than those with an income of lower than 3 millionRials (2.36 ± 0.5 vs 2.2 ± 0.5 , $p=0.011$). It showed the people with lower income had more positive attitude towards the date of production than others. There was no significant difference between other demographic variables and the score of attitude on the date of production ($p>0.05$).

According to Mann-Whitney U test, median of the score of attitude about the importance of nutritional information for choosing high value products, was lower in women compared with men (2.15 ± 0.5 versus 2.25 ± 0.2 , $p=0.032$).

Demographic variables and practice score

The score of practice, in the field of "attention to food labels when purchasing", was not different between both sexes and between married and single participants, according to Mann-Whitney U test. There was not als any significant correlation between the mentioned item and age, household size and education levels based on the Spearman test.

In the field of "attention to the word of "diet" when purchasing", there were not any differences

between both sexes, married and single patients, age groups, different education level and different household size ($p>0.05$). The median of the score of patients with just hypertension, was lower than patients with other chronic diseases in addition to hypertension (3.49 ± 0.4 versus 3.85 ± 0.4 , $P<0.001$). The results of Spearman correlation coefficient showed that there was not any significant correlation between the mentioned item and age ($p=0.93$), education level ($p=0.58$), monthly income ($p=0.92$), BMI ($p=0.03$), household size ($p=0.08$) and the amount of comorbid chronic disease ($p=0.08$).

Correlation between knowledge and attitude, and practice

Table 2 shows the correlation between the score of knowledge and attitude, and the score of practice. The results of Spearman test indicated

that there was a significant, positive correlation between “attention to the word of “diet” when purchasing” and knowledge score. Also, there was a significant and positive correlation between “attention to the word of “diet” when purchasing” and the second and the third items in the attitude section (i.e., “nutritional information on food labels helps us to choose a valuable product” and “Writing the word “Diet” on food labels assures us that it is really a dietary product”). These findings revealed that more positive attitude leads to more attention to the word of “diet” when purchasing. Furthermore, the item of “attention to food labels when purchasing”, had a significant, positive correlation with the second item of attitude section (i.e. “nutritional information on food labels helps us to choose a valuable product”).

Table 2. Correlation of Knowledge and Attitude with Practice in participants

| | Practice | | | |
|---|--|--------|---|--------|
| | Attention to food labels when purchasing | | Attention to the word of “diet” when purchasing | |
| | r | P | r | P |
| Knowledge | -0.023 | 0.510 | 0.185 ^a | <0.001 |
| Attitude1: Date written on food labels assures us that the product is fresh | 0.061 | 0.086 | -0.035 | 0.317 |
| Attitude2: Nutritional information on food labels, helps us to choose a valuable product | 0.124 ^a | <0.001 | 0.103 ^a | <0.003 |
| Attitude 3: Writing the word “Diet” on food labels assures us that it is really a dietary product | 0.048 | 0.173 | 0.178 ^a | <0.001 |

^a significant difference in $p < 0.001$

Discussion

The current study assessed knowledge, attitude and practice of patients with chronic diseases regarding food labeling and the related effective factors in Gilan, Iran. Findings showed that knowledge score in this population was high. The median score of patients’ knowledge about information on food labels was 8.45. (Its range was 1-9). The score of knowledge was higher in patients with cardiovascular disease than those with other chronic diseases. It may be because of the effect of higher mental pressure of cardiovascular disease compared with other chronic diseases. Consequently, patients attempted

to have a high quality of life and a healthy diet to prevent early death. On the other hand, it was shown in some studies that the knowledge about food labeling had a positive correlation with education level (21-23). The findings were consistent with them. They indicated that patients with higher education level had more knowledge regarding food labeling than patients with lower education level. There was no consensus about the correlation between education level and knowledge respecting food labeling. For example, a study conducted by Rotaman et al. showed that although the poor understanding of food labeling had a correlation with lower education level. Some

people with high education level faced this problem, too. So, knowledge about food labeling was not associated with education level (24).

The executive instructions of food labeling criteria were revised by Iran food and drug administration (IFDA) in 2015. It says the content on food labels should involve valid information about the amount of nutrients in food products. They should not mislead consumers. Writing the amount of calorie, protein, total fat, saturated fatty acids, trans fatty acids, salt and sugar is necessary on food labels, while it is optional for vitamins and minerals (25).

In the study by Nurliayana et al. the knowledge of students about food labeling had a positive correlation with their attitude ($p = 0.028$)(26). In the current study, the researchers found that most of the participants, in the first place, had a positive attitude on products freshness and its quality based on the written date on labels. In the second place, they had a positive attitude on the word “diet” written on food labels. These positive attitudes were poorer among men than women and among the patients with a monthly income of more than 30 million rials (almost 187\$) than those with lower income. Men with chronic diseases had a more negative attitude than women towards choosing a valuable product based on food labels. Furthermore, the positive attitude of patients on the word “diet” regarding food labels did not have any correlation with their demographic variables. Overall, it was found that there was a misgiving about the content of food labels, especially in men. It may be due to patients’ uncertainty about efficient monitoring systems on food products and food labeling.

The current study demonstrated that the performance of patients with chronic diseases was poor regarding food labeling. Most of the patients read food labels; although, it was only for the information about production and expiration date and price. The number of people who read food labels to gain nutritional information was very few. This contradicts with the findings of Satia et al. that showed 78% of American people pay attention to food labels for gaining information on

nutritional value(15).Furthermore, Tessaro et al. showed a beneficial effect of food labeling on decrease of fat intake and increase of fruits and vegetables consumption(27). The findings of this study to some extent were consistent with the results of the study by Snehasree et al. They showed that many adolescents read labels only to find the date of production (79%), expiration (74%) or best expiration date (65%). Fewer adolescents read ingredients and nutritional information (20%). About 66% of participants believed that nutritional information on labels was too complex to be understood(25). The other study showed that the practice regard to nutritional information was significantly associated with reading food labels ($p < 0.05$). The most important aims of reading food labels during purchasing were finding out the expiration date (98.5%), taste (95.7%), price (92.4%) and nutrient content (90.5%) (26).

Regarding practice, Findings were consistent with Ogechi Ukegbu et al. They found that 97.7% of people paid attention to food labels when shopping. 45.7% of them paid attention to information on production and expiration date and 36.1% paid attention to nutritional information on labels(28). Furthermore, the findings of this study were in line with Mirghotbi’s study. It indicated that the majority of participants (82%) read food labels, while 66% of label readers looked at the labels only to find out production and expiration date(20). Although knowledge score in patients with chronic diseases was high, patients’ performance regarding food labeling was poor. It may be due to insufficient information about the effect of what is eaten for controlling the disease. Furthermore, the role of economic pressures on purchasing behaviors, especially regarding economical sanction in Iran cannot be ignored. Economic problems cause paying attention to the products’ price instead of nutritional composition. Therefore, people do not pay attention to nutritional information on food labels when purchasing, despite having good knowledge about them. In the current study, considering food labeling when purchasing did not have any

association with demographic variables. This factor only had a relationship with patients' attitude on choosing a product with high nutritional value. Patients' attention to the word of "diet" may be different depending on the type of disease. For example, patients with hypertension had better practice than patients with other diseases. However, there is need for more investigation with more patients in each disease subgroup. Tali et al. suggested that patients with hypertension or high sodium in their urine notice to food labels to find the amount of sodium in the product(10). This was inconsistent with the results of Sung woo hong's study. After investigating Korean food and health organization's data, they found that there was no difference between healthy people and patients with chronic diseases with regard to noticing food labeling(29).

In the current study, patients' attention to the word of "diet" when purchasing was poor. It was better in patients who had a positive attitude on "choosing a product of high nutritional value" and had trust on the word of "diet" on the labels. It suggested that the positive attitude may lead to better practice. Attention to the word "diet" when purchasing was better among men than women. It might be because, for men, brief and bold words might be more attractive and applicable than the small size food composition tables.

Strengths and limitation

Study on partly large sample size was one of the strengths of this study. Considering patients with chronic diseases was the other strength of this study, because of the importance of nutrients intake for these patients. If we collected

information on dietary intake of participants, the association between knowledge, attitude and practice with chronic diseases might be better clarified.

Conclusion

The findings of this study reveal good knowledge, but poor practice, regarding attention to food labeling in patients with chronic diseases. With respect to the important role of nutrition and food choices in prevention and control of these diseases, authorities should educate people concerning the importance of attention to what is written on food labels. Assigning more budget and time to educating people regarding healthy behavior when purchasing is recommended. It is done through attention to food labeling as a potential tool on prevention and control of chronic diseases.

Acknowledgment

Authors would like to thank for the collaboration of Gilan University of Medical Sciences. They also appreciate the cooperation of the participants in this study.

Ethics code:IR.GUMS.REC.1396.486

Conflict of interest

Authors declared no conflict of interest.

Authors' contributions

S.R analyzed the data and wrote the manuscript. A.A collected the data and provided consultation. M.M-R designed the study and analyzed the data. All authors read and approved the final manuscript.

References

- 1.Ellison DH, Welling P. Insights into salt handling and blood pressure. *New England Journal of Medicine*. 2021;385(21):1981-93.
- 2.Zare F, Ameri H, Madadzadeh F, Reza Aghaei M. Health-related quality of life and its associated factors in patients with type 2 diabetes mellitus. *SAGE Open Medicine*. 2020 Oct;8:2050312120965314.
- 3.Zhang Y, Zhang D-z. Associations of vegetable and fruit consumption with metabolic syndrome. A meta-analysis of observational studies. *Public health nutrition*. 2018;21(9):1693-703.
- 4.Setayeshgar S, Whiting SJ, Vatanparast H. Prevalence of 10-year risk of cardiovascular diseases and associated risks in canadian adults: the contribution of cardiometabolic risk assessment introduction. *Int J Hypertens*. 2013:276564.

5. Sacks FM, Svetkey LP, Vollmer WM, Appel LJ, Bray GA, Harsha D, et al. Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. DASH-Sodium Collaborative Research Group. *N Engl J Med*. 2001;344(1):3-10.
6. Esmailzadeh A, Kimiagar M, Mehrabi Y, Azadbakht L, Hu FB, Willett WC. Fruit and vegetable intakes, C-reactive protein, and the metabolic syndrome. *Am J Clin Nutr*. 2006;84(6):1489-97.
7. US Food and Drug Administration. FDA proposes updates to nutrition facts label on food packages. accessed on 10 March 2014.
8. Post RE, Mainous AG, 3rd, Diaz VA, Matheson EM, Everett CJ. Use of the nutrition facts label in chronic disease management: results from the National Health and Nutrition Examination Survey. *Journal of the American Dietetic Association*. 2010;110(4):628-32.
9. Hong S-w, Oh S-W, Lee C, Kwon H, Hyeon J-h, Gwak J-s. Association between nutrition label use and chronic disease in Korean adults: the Fourth Korea National Health and Nutrition Examination Survey 2008-2009. *J Korean Med Sci*. 2014;29(11):1457-63.
10. Elfassy T, Yi S, Eisenhower D, Lederer A, Curtis C. Use of sodium information on the nutrition facts label in New York City adults with hypertension *Journal of the Academy of Nutrition and Dietetics*. 2015;115(2):278- 83.
11. Madadzadeh, F., Vali, L., Khalilabad, T.H. and Asar, M.E., 2016. Work-related musculoskeletal disorders among administrative employees of Kerman university of medical sciences. *International Journal of Occupational Hygiene*, 8(2), pp.78-84.
12. Anastasiou K, Miller M, Dickinson K. The relationship between food label use and dietary intake in adults: A systematic review. *Appetite*. 2019;138:280-91.
13. Tian Y, Yoo JH, Zhou H. To read or not to read: An extension of the theory of planned behaviour to food label use. *Int J Consum Stud*. 2022;46(3):984-93.
14. Lewis J, Arheart K, LeBlanc W, Fleming L, Lee D, EP D, et al. Food label use and awareness of nutritional information and recommendations among persons with chronic diseases. *The American journal of clinical nutrition*. 2009;90(5):1351-7.
15. Satia J, Galanko J, Neuhauser M. Food nutrition label use is associated with demographic, behavioral, and psychosocial factors and dietary intake among African Americans in North Carolina. *J Am Diet Assoc*. 2005;105(3):392- 402.
16. Nasirzadeh M, Abdolkarimi M, Asadollahi Z, Hashemian M. Investigating Factors Effect on Fruit and Vegetable Consumption: Applying Social Cognitive Theory. *Journal of Community Health Research*. 2020;9(3):159-71.
17. Bull ER, McCleary N, Li X, Dombrowski SU, Dusseldorp E, Johnston M. Interventions to promote healthy eating, physical activity and smoking in low-income groups: a systematic review with meta-analysis of behavior change techniques and delivery/context. *Int J Behav Med*. 2018;25(6):605-16.
18. Khanjani N, Ahmadzadeh A, Bakhtiari B, Madadzadeh F. The role of season and climate in the incidence of congenital hypothyroidism in Kerman province, Southeastern Iran. *Journal of Pediatric Endocrinology and Metabolism*. 2017 Feb 1;30(2):149-57.
19. Malek Mahdavi A, Abdolahi P, Mahdavi R. Knowledge, Attitude and Practice between Medical and Non-Medical Sciences Students about Food Labeling. *Health Promot Perspect*. 2012;2(2):173-9.
20. Mirghotbi M, Bajan M, Z A. Knowledge and practice of consumers about food labeling. *Payesh*. 2012;11(4):505.
21. Najibi N, Dorosty Motlagh A, Sadrzadeh Yeganeh H, Eshraghian M, Daneshi M, Azizi S. Food insecurity status and some associated socioeconomic factors among newly diagnosed patients with type 2 diabetes in Shiraz. *Journal of Arak University of Medical Sciences*. 2013;16(1):98-106.
22. Han CY, Zheng X, Lee LF, Chan CG, Lee YQ, Zailani NA, et al. Development of a diabetes-related nutrition knowledge questionnaire for individuals with type 2 diabetes mellitus in Singapore. *Nutrition & Dietetics*. 2019;76(5):567-73.
23. Sohrabi renani MT, Nourafkan F, FathiMard F, Sadegheyan khashoei K, Mazarei r. Relationship between Self-efficacy and Mental Health with Health Literacy in Patients with Diabetes in Kazerun City, Shiraz, Iran. *Journal of Community Health Research*. 2020;9(4):256-64.
24. Rothman R, Housam R, Weiss H, Davis D, Gregory R, Gebretsadik T, et al. Patient understanding of food labels: the role of literacy and numeracy. *American journal of preventive medicine*. 2006;31(5):391-8.

25. Saha S, R. Vemula S, Mendu V, M. Gavaravarapu S. Knowledge and Practices of Using Food Label Information Among Adolescents Attending Schools in Kolkata, India. *Journal of Nutrition Education and Behavior*. 2013;45(6):773-9.
26. Nurliyana G, Norazmir MN, Anuar K. Knowledge, Attitude and Practices of University Students Regarding the Use of Nutritional Information and Food Labels. *Asian Journal of Clinical Nutrition*. 2011;3:79-91.
27. Tessaro I, Rye S, Parker L, Mangone C, McCrone S. Effectiveness of a Nutrition Intervention with Rural Low-income Women. *American Journal of Health Behavior*. 2007;31(1):35-43.
28. Ukegbu P. Consumers' knowledge, attitude, and use of food labels in an urban city in southeast Nigeria. Oxford University Press. 2016.
29. Hong S-w, Oh S-W, Lee C, Kwon H, Hyeon J-h, Gwak J-s. Association between nutrition label use and chronic disease in Korean adults: The Fourth Korea National Health and Nutrition Examination Survey 2008-2009. *J Korean Med Sci*. 2014;29(11):1457- 63.