Research Article

Factors Behind Fruit and Vegetable Consumption Among the Elderly with Functional Constipation: A Study Based on the Health Belief Model

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Abstract

Background and Aim: Functional constipation is one of the most common health problems in older adults. Its development greatly depends on nutritional status in that a high fiber diet including fruits and vegetables can prevent or manage it. The present study aimed at assessing vegetable and fruit consumption among the elderly with functional constipation, based on the health belief model.

Methods: This was a cross-sectional study conducted on 163 elderly people aged 60 and older, who referred to retirement houses located in Isfahan, Iran, in 2013. The Rome III diagnostic criteria were used for functional constipation screening. Moreover, a demographic questionnaire, a researcher-made questionnaire developed based on the constructs of the health belief model, and a researcher-made 24-hour fruit and vegetable consumption checklist were used for data collection. Data analysis was done using SPSS Software (V, 20.0) and by running independent sample t test, Pearson correlation analysis, one-way analysis of variance, and multiple linear regression analysis at a significance level of less than 0.05.

Results: The mean of participants' age was 70.04 ± 6.41, while the means of their fruit consumption and vegetable consumption were 1.61 ± 0.73 and 1.31 ± 0.87 servings daily, respectively. Almost 44.2% of the participants consumed less than 2 servings of fruits and 55.8% consumed less than 2 servings of vegetables daily. Fruit and vegetable consumption was directly correlated with perceived susceptibility, perceived severity, perceived self-efficacy, perceived benefits, and knowledge and was inversely correlated with perceived barriers ($P < 0.001$). Moreover, perceived severity, perceived self-efficacy, perceived benefits, and knowledge explained 58% of the total variance of fruit consumption, while perceived self-efficacy, and perceived benefits, and knowledge explained 65.7% of the total variance of vegetable consumption. The most important cues to fruit and vegetable consumption were television (57.7%) and family and relatives (46%).

Conclusions: This study revealed that the elderly with functional constipation consume inadequate amount of fruits and vegetables and the health belief model is a significant predictor of fruit and vegetable consumption among the elderly. Educational interventions based on the health belief model can be helpful in promoting the consumption of fruit and vegetable consumption in the elderly.

Keywords: Health Belief Model, Fruit and Vegetable Consumption, Functional Constipation, Elderly People

1. Background

The results of 2011 population census in Iran revealed that people above 60 years constituted 8.3% (ie, more than 6 million) of the total of 75 million population of Iran (1). Elderly population in Iran is estimated to reach 10 million (ie, around 10% of the total population) by the next 20 years (2).

Nutrition is a key component of the elderly's health and quality of life, healthy aging, and disease prevention (3-5). Yet, little attention is paid to their nutritional status in developing countries (3). A study in Iran showed that 47.22% of the elderly had poor nutritional status (6). Another study also revealed that only 50.5% of them had good nutritional status (7). These findings highlight the necessity of assessing and improving their nutritional status (8).

One of the most common nutrition-related health problems among the elderly is bowel dysfunction, which can result in functional constipation (9). The prevalence of functional constipation among the elderly in Asia and Iran

was reported to be 10.8% ([10](#)) and 21.3% ([2](#)), respectively. A study in Isfahan, Iran, showed that the prevalence of functional constipation increased with age and that 27.7% of people aged 50 or more suffered from the disorder ([11](#)). Another study in Kerman, Iran, also found that the prevalence of functional constipation among the elderly aged 65 or more was 36.9% ([12](#)).

Over time, constipation can cause different complications such as hemorrhoid, anal fissure, and rectal prolapse. Moreover, it negatively affects life, activities of daily living, and quality of life, and imposes considerable costs on patients. Therefore, it is considered as a significant health problem ([13](#), [14](#)).

A high fiber diet, which includes fruits and vegetables, has a significant role in preventing and managing constipation among the elderly. In other words, fruit and vegetable consumption is a key component of healthy eating, chronic illness prevention, and functional constipation management ([15](#), [16](#)). Studies show that about 1.7 million (or 2.5%) of all deaths in the world are related to inadequate fruit and vegetable consumption ([17](#), [18](#)). The world health organization (WHO) recommends that each person should consume at least 400 grams (or five servings) of fruits and vegetables per day ([15](#), [19](#)). Yet, a study in Iran showed that only 29% of the elderly had good dietary behaviors and that 70.5% of female and 76.6% of male elderly consumed inadequate level of fruits ([8](#)).

Dietary behaviors are usually assessed through health education and promotion models ([8](#)), such as the health belief model (HBM). HBM is used to assess health-related behaviors ([20](#)) including dietary behaviors ([21](#)). It comprises 5 main constructs, namely, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action. Perceived susceptibility is one's opinion about the possibility of developing a given health problem, while perceived severity is one's opinion about the seriousness of the problem and its complications, such as death, disability, or negative social outcomes related to employment, daily life, or social relationships. Moreover, perceived benefit is the opinion about the usefulness of a recommended behavior in minimizing the risk or the severity of the problem; and perceived barrier is the opinion about the actual and psychological costs of the recommended behavior. Cues to action include both internal and external cues ([22](#)). The present study aimed at assessing vegetable and fruit consumption of the elderly with functional constipation based on HBM.

2. Methods

This cross-sectional study was done on 163 elderly people aged 60 or more, who referred to retirement houses located in Isfahan, Iran, in 2013. Sampling was performed purposively. Accordingly, all elderly people in the study setting were screened for functional constipation, and then, 163 cases with the disorder were recruited.

The screening tool was the 6-item Rome III diagnostic criteria. Elderly people who reported experiencing at least 2 out of the 6 symptoms of the criteria in the last 3 months were diagnosed with functional constipation ([14](#), [23](#)). These criteria were personally completed by participants through a self-report method. Besides, a demographic questionnaire and a researcher-made HBM-related questionnaire were used for data collection. The items of the demographic questionnaire included age, gender, marital, educational, employment, and financial status, and living type (either alone or with family members). The data on financial status were collected through a self-report method (poor, average, good).The researcher-made HBM-related questionnaire contained 46 items in 7 subscales, namely, knowledge (8 items), perceived susceptibility (6 items), perceived severity (6 items), perceived self-efficacy (8 items), perceived benefits (6 items), perceived barriers (6 items), and cues to action (6 items). The items of the knowledge subscale were multiple-choice questions with 4 choices. Wrong and right answers to knowledge items were scored 0 and 1, respectively. Moreover, the items of the other subscales were scored on a 5-point Likert-type scale from 1 ("I'm not sure at all") to 5 ("I'm completely sure"). All subscale scores were ranged from 0 to 100 scores. The questionnaire was developed based on the existing articles, books, and questionnaires ([15](#), [24](#), [25](#)). Then, its content validity was assessed by 7 experts in health education and nutrition. Their comments were used to revise the questionnaire. Reliability assessment was done via test-retest method, in which 25 persons completed the questionnaire for 2 times with a 15-day interval. The correlation coefficient between the 2 measurements was 0.78. Finally, 24-hour fruit and vegetable consumption was assessed using a checklist. All participants were asked to complete the questionnaires and the checklist.

This study was approved by Isfahan University of Medical Sciences, Isfahan, Iran (with the approval code of 392469).The aims of the study were explained to participants and their informed consent were obtained. Moreover, their questionnaires were anonymized.

Data were analyzed using SPSS software (V. 20.0). The measures of descriptive statistics were employed for data description, while inferential statistics methods, such as independent sample t test, Pearson correlation analysis, one-way analysis of variance, and multiple linear regression analysis, were used for data analysis. Significance level was set at less than 0.05.

3. Results

Study participants were 85 female (52.1%) and 78 male (47.9%) elderly people with an age range of 60 to 86 and a mean age of 70.04 ± 6.49. They were mostly married (53.4%) and 31% of them lived alone.

The means of fruit, vegetable, and fruit and vegetable consumption among participants were 1.61 ± 0.73, 1.31 ± 0.87, and 2.92 servings per day, respectively. About 4.3% and 19.6% of participants did not consume fruits and vegetables, respectively. Moreover, 44.2% consumed less than 2 servings of fruits and 55.8% consumed less than 2 servings of vegetables per day. Around 10.4% consumed 3 servings or more of fruits and 6.1% consumed 3 servings or more of vegetables daily. Fruit and vegetable consumption was significantly correlated with income level, educational status, age, and living type (Table 1).

The results of Pearson correlation analysis revealed that fruit and vegetable consumption had significant positive correlations with perceived susceptibility, perceived severity, perceived self-efficacy, perceived benefits, and knowledge, and a significant negative correlation with perceived barriers (P < 0.001; Table 2).

Multiple linear regression analysis indicated that knowledge, perceived severity, perceived benefits, and perceived self-efficacy explained 58% of the total variance of fruit consumption, while knowledge, perceived benefits, and perceived self-efficacy explained 65.7% of the total variance of vegetable consumption (Table 3). The most important external cues to action from the perspectives of participants were television (57.7%) and family and relatives (46%). Moreover, the most important internal cue to action was abdominal distention (51.5%). Participants noted that these factors motivated them to consume fruit and vegetable.

4. Discussion

This study was done based on HBM to evaluate fruit and vegetable consumption among elderly people with functional constipation. Findings revealed that fruit and vegetable consumption among the elderly was lower than the recommended levels. Hazavehei et al. (8) and Yang et al. (26) also reported the same finding. Viebig et al. also conducted a study in Brazil and found that 39% of their participating elderly people did not consume fruits and vegetables on a daily basis and only 19% consumed 5 servings of fruits and vegetables per day (27). The results of another study in Isfahan, Iran, also illustrated that the means of fruit and vegetable consumption among elderly males and females were 1.31 ± 4.5 and 1.28 ± 4.65 servings per day (28). In line with our findings, all these findings have indicated that the mean of fruit and vegetable consumption among Iranian elderly people is less that the recommended levels.

The findings of this study presented perceived self-efficacy and perceived benefits as the most significant predictors of fruit and vegetable consumption, which is in agreement with the findings of studies made by Najimi et al. on students (29) and Salehi et al. on the elderly (30, 31). Hazavehei et al. found that elderly people's attitudes were significantly correlated with their nutritional status (8). Self-efficacy has been reported in different studies as one of the most important factors contributing to fruit and vegetable consumption (32-35). By definition, self-efficacy is one's belief in his/her ability to accurately perform a given behavior (36).

Study findings also revealed that the level of participants' knowledge was positively correlated with their fruit and vegetable consumption. Salehi et al. reported the same finding (31). Knowledge is a predisposing factor of engagement in healthy behaviors. Another finding of this study was the significant correlations of fruit and vegetable consumption with educational status and monthly income in that those elderly people who had higher educational status and income consumed larger amounts of fruits and vegetables. Previous studies also reported the same finding (27, 28, 37-39).

In line with the findings of previous studies (16, 30, 39), our findings also indicated financial factors, fruit and vegetable prices, and inadequate family support as the most significant barriers to fruit and vegetable consumption by the elderly. Moreover, findings revealed that the most important external cues to fruit and vegetable consumption were television and family and relatives. These findings are in line with the findings reported by Sharifirad et al. (40). Media coverage of health-related issues has turned media into the most significant source of health-related information for homebound elderly people.

Furthermore, we found that the mean scores of knowledge and self-efficacy among participating elderly people were low, while the mean scores of perceived susceptibility and severity were in the moderate range. These findings denote that most elderly people have limited information about or are inattentive to the importance of nutrition for functional constipation management, their susceptibility to functional constipation, and the severity of the complications of inadequate fruit and vegetable consumption. Moreover, these findings imply that not only the elderly do not pay attention to the benefits of fruit and vegetable consumption, but also there are many barriers to fruit and vegetable consumption.

Table 1. The Meanscores of Fruit and Vegetable Consumption Based on Participants' Demographic Characteristics

Characteristics	No. (%)	Mean of Fruit Consumption	P Value	Mean of Vegetable Consumption	P Value
Age, y			0.001		< 0.001[a]
60 - 69	87 (53.4)	1.83 (0.67)		1.61 (0.7)	
70 - 79	58 (35.6)	1.4 (0.66)		1.07 (0.81)	
80 and more	18 (11)	1.22 (0.8)[b]		0.67 (0.81)[b]	
Gender			0.25		0.25[c]
Female	85 (52.1)	1.68 (0.75)		1.45 (0.90)	
Male	78 (47.9)	1.55 (0.69)		1.15 (0.80)	
Marital status			< 0.001		< 0.001[c]
Married	87 (53.4)	1.82 (0.6)		1.57 (0.7)	
Single	76 (46.6)	1.39 (0.7)		1.01 (0.9)	
Educational status			< 0.001		< 0.001[a]
Illiterate	17 (10.4)	1.11 (0.60)[b]		0.58 (0.61)[b]	
Primary	50 (30.7)	1.28 (0.70)[b]		0.86 (0.8)[b]	
Diploma	53 (32.5)	1.77 (0.66)		1.02 (0.77)	
Associate	26 (16.0)	2.03 (0.59)		1.80 (0.63)	
Bachelor's	17 (10.4)	2 (0.61)		1.94 (0.74)	
Living type			0.003		< 0.001[a]
Alone	52 (31.9)	1.38 (0.77)[b]		1.03 (0.92)[b]	
With spouse	33 (20.2)	1.84 (0.71)		1.45 (0.79)	
With spouse and children	56 (34.4)	1.78 (0.59)		1.62 (0.72)	
With children	22 (13.5)	1.40 (0.79)[b]		0.95 (0.89)[b]	
Income level			< 0.001		< 0.001[a]
Low	47 (28.9)	1.2 (0.73)[b]		0.78 (0.90)[b]	
Moderate	84 (51.5)	1.7 (0.72)		1.42 (0.81)	
High	32 (19.6)	1.9 (0.53)		1.78 (0.55)	

[a] The one-way analysis of variance.
[b] The Tukey's test revealed that this category significantly differed from the other categories.
[c] The independent-sample t test.

Table 2. The Meanscores of HMB Constructs and Their Correlations with Fruit and Vegetable Consumption

HBM Constructs	Mean (SD)	Fruit Consumption		Vegetable Consumption	
		r	P Value	r	P Value
Perceived susceptibility	57.7 (23.06)	0.519	< 0.001	0.541	< 0.001
Perceived severity	53.06 (22.3)	0.406	< 0.001	0.460	< 0.001
Perceived self-efficacy	34.2 (22.7)	0.701	< 0.001	0.725	< 0.001
Perceived benefits	60.3 (25.8)	0.542	< 0.001	0.555	< 0.001
Perceived barriers	56.5 (22.1)	-0.311	< 0.001	-0.267	< 0.001
Knowledge	35.2 (29.5)	0.679	< 0.001	0.739	< 0.001

4.1. Conclusions

Study findings have revealed that fruit and vegetable consumption is lower among the elderly than the recommended levels. Moreover, some components of HBM including perceived severity, perceived self-efficacy, perceived benefits, and knowledge are significant predictors of fruit and vegetable consumption. Therefore, HBM-based educational interventions can be helpful in promoting the consumption of fruit and vegetable in the elderly.

Table 3. The Results of Multiple Linear Regression to Predict Fruit and Vegetable Consumption Based on HBM Constructs

HBM Constructs	Fruit Consumption[a]			Vegetable Consumption[b]		
	B	Beta	P Value	B	Beta	P Value
Knowledge	0.009	0.36	< 0.001	0.013	0.43	< 0.001
Perceived susceptibility	0.005	0.14	0.086	0.004	0.11	0.12
Perceived severity	-0.007	-0.12	0.01	-0.005	-0.11	1.32
Perceived self-efficacy	0.011	0.34	< 0.001	0.013	0.32	< 0.001
Perceived benefits	0.007	0.23	0.01	0.006	0.19	0.02
Perceived barriers	0.001	-0.06	0.91	0.002	0.05	0.29

[a]R = 0.77; R Square = 0.59; Adjusted R = 0.583; F = 38.70; P < 0.001.
[b]R = 0.81; R Square = 0.65; Adjusted R = 0.644; F = 49.80; P < 0.001.

References

1. Statistical Center of Iran. *Population and Housing Census in 2011*. 2012.
2. Hekmatpou D, Shamsi M, Zamani M. The effect of healthy lifestyle education programs on promotion of physical activity in elderly of Arak. *Daneshvar*. 2012;**19**(98):33–42.
3. Eshaghi SR, Babak A, Manzori L, Marasi MR. The nutritional status of the elderly and their associated factors in Isfahan. *Iran J Ageing*. 2007;**2**(3):340–5.
4. Maghsoudi M, Mohammadi Bavariani F, Salim S, Nejad Haghighi E, Arabi H. The association between health promoting behaviors and quality of life in the elderly people of Ewaz, 2014-2015. *J Navidno*. 2016;**18**(60):16–23.
5. Ghasemi S, Sharifi F, Maghsoodnia S, Dadkhah A. Nutrition Educational Program and health promotion in aged people in Iran. *ME-JAA*. 2009;**6**(4).
6. Namjoo A, Niknami M, Baghaee M, Sedghei SM, Atrkar RZ. Survey health behavior of elderly referring to retirement centers in Rasht city in 20. *J Holistic Nurs Midwifery*. 2010;**20**(1):40–8.
7. Jazayeri A, Ariaei M, Minaei M. Nutritional status of elderly people. *J School Public Health Inst Public Health Res*. 2014;**12**(2):59–68.
8. Hazavehei S, Faghih Solaimani P, Moeini B, Soltanian A. Factors Affecting Nutritional Behaviors of ageing population based on BASNEF Model: Sanandaj, Iran. *J Geriatric Nurs*. 2016;**2**(2):61–70.
9. Ashtari S, Sorouri M, Moghimi DB, Pourhoseingholi MA, Safaee A, Vahedi M, et al. Prevalence of Functional Bowel Disorders in Tehran Province: A Population-Based Study. *Knowledge Health*. 2011;**6**(3):31–9.
10. Jamshed N, Lee ZE, Olden KW. Diagnostic approach to chronic constipation in adults. *Am Fam Physician*. 2011;**84**(3):299–306. [PubMed: 21842777].
11. Hassanzadeh KA, Hashemi JMS, Dehestani B, Adibi P. Epidemiology of constipation and functional constipation and their risk factors in iranian population. *J Isfahan Med School*. 2016;**34**(404):1282–9.
12. Zahedi MJ, Moghadam SD, Abbasi MHB, Mirzaei SMS. The assessment prevalence of functional constipation and associated factors in adults: a community-based study from Kerman, Southeast, Iran (2011-2012). *Govaresh*. 2014;**19**(2):95–101.
13. Adibi P, Hadizadeh F. Treatment of Constipation in Adults: Primary Care Clinical Guidelines. *J Isfahan Med School*. 2012;**30**(200):1187–200.
14. Pourhoseingholi A, Moghimi-Dehkordi B, Pourhoseingholi MA, Kaboli SA, Safaee A, Vahedi M, et al. The relationship between Body Mass Index and constipation: a population-based study in Tehran province. *J Kermanshah Univ Med Sci*. 2012;**16**(4):317–22.
15. Dehdari T, Kharghani Moghadam M, Mansouri T, Saki A. Survey of daily fruit consumption status among girl students who are living in

16. dormitories and its predictors based on the theory of planned behavior constructs. *Razi J Med Sci*. 2013;**20**(106):10–9.
16. Salehi S, Naji SA, Sargazi M. A study of relationship between fruit and vegetable consumption and related factors in hospitalized elderly people in Zahedan hospitals (1389). *Salmand Iran J Ageing*. 2012;**6**(22):30–6.
17. Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJ. Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. *Lancet*. 2006;**367**(9524):1747–57. doi: 10.1016/S0140-6736(06)68770-9. [PubMed: 16731270].
18. Organization WH. *Global status report on noncommunicable diseases 2014*. World Health Organization; 2014.
19. Salehi L, Eftekhar H, Mohammad K, Jazayery A, Taghdisi M, Shojai Zadeh D. Facilitating and inhibiting factors healthy lifestyle in elderly. *Public Health School Public Health*. 2009;**6**(2):49–57.
20. Soltani R, Sharifirad GR. Use of helmets by motorcycle drivers based on Health Belief Model. *Health System Res*. 2012;**8**(4):688–94.
21. Hosseini Z, Gharlipour Z, Mohebi S, Sharifirad GR, Mohammadbeigi A, Kazazloo Z. Associated Factors of Milk Consumption among Students: Using Health Belief Model (HBM). *Int J Pediatr*. 2017;**5**(2):4439–48.
22. Glanz K, Rimer BK, Viswanath K. *Health behavior and health education: theory, research, and practice*. John Wiley & Sons; 2008.
23. Eliopoulos C. *Gerontological nursing*. Lippincott Williams & Wilkins; 2013.
24. Bazzano LA, Li TY, Joshipura KJ, Hu FB. Intake of fruit, vegetables, and fruit juices and risk of diabetes in women. *Diabetes Care*. 2008;**31**(7):1311–7. doi: 10.2337/dc08-0080. [PubMed: 18390796].
25. DiBello JR, Kraft P, McGarvey ST, Goldberg R, Campos H, Baylin A. Comparison of 3 methods for identifying dietary patterns associated with risk of disease. *Am J Epidemiol*. 2008;**168**(12):1433–43. doi: 10.1093/aje/kwn274. [PubMed: 18945692].
26. Li Y, Li D, Ma CY, Liu CY, Hui D, Wen ZM, et al. Consumption of, and factors influencing consumption of, fruit and vegetables among elderly Chinese people. *Nutrition*. 2012;**28**(5):504–8. doi: 10.1016/j.nut.2011.07.023. [PubMed: 22178002].
27. Viebig RF, Pastor-Valero M, Scazufca M, Menezes PR. Fruit and vegetable intake among low income elderly in the city of Sao Paulo, Southeastern Brazil. *Rev Saude Publica*. 2009;**43**(5):806–13. [PubMed: 19722005].
28. Sabzghabaee AM, Mirmoghtadaee P, Mohammadi M. Fruit and Vegetable Consumption among Community Dwelling Elderly in an Iranian Population. *Int J Prev Med*. 2010;**1**(2):98–102. [PubMed: 21566769].
29. Najimi A, Ghaffari M, Alidousti M. Social cognitive correlates of fruit and vegetables consumption among students: a cross-sectional research. *Pajoohandeh J*. 2012;**17**(2):81–6.
30. Salehi L, Eftekhar Ardebili H, Mohammad K, Shogaei Zadeh D. Some

Factors affecting consumption of Fruit and vegetable by elderly people in Tehran. *Iran J Ageing*. 2010;**4**(4):0.

31. Salehi L, Eftekhar H, Mohammad K, Tavafian SS, Jazayery A, Montazeri A. Consumption of fruit and vegetables among elderly people: a cross sectional study from Iran. *Nutr J*. 2010;**9**:2. doi: 10.1186/1475-2891-9-2. [PubMed: 20070890].

32. Guillaumie L, Godin G, Manderscheid JC, Spitz E, Muller L. Self-efficacy and implementation intentions-based interventions on fruit and vegetable intake among adults: impact at 12-month follow-up. *Glob Health Promot*. 2013;**20**(2 Suppl):83–7. doi: 10.1177/1757975913483336. [PubMed: 23678501].

33. Henry H, Reimer K, Smith C, Reicks M. Associations of decisional balance, processes of change, and self-efficacy with stages of change for increased fruit and vegetable intake among low-income, African-American mothers. *J Am Diet Assoc*. 2006;**106**(6):841–9. doi: 10.1016/j.jada.2006.03.012. [PubMed: 16720125].

34. Keihner AJ, Meigs R, Sugerman S, Backman D, Garbolino T, Mitchell P. The Power Play! Campaign's School Idea & Resource Kits improve determinants of fruit and vegetable intake and physical activity among fourth- and fifth-grade children. *J Nutr Educ Behav*. 2011;**43**(4 Suppl 2):S122–9. doi: 10.1016/j.jneb.2011.02.010. [PubMed: 21683281].

35. Richert J, Reuter T, Wiedemann AU, Lippke S, Ziegelmann J, Schwarzer R. Differential effects of planning and self-efficacy on fruit and vegetable consumption. *Appetite*. 2010;**54**(3):611–4. doi: 10.1016/j.appet.2010.03.006. [PubMed: 20227450].

36. Rafiei M, Rostami A, Tavakoli A, Ghiasi M. Principles of nutritional training and counseling for patients in group training sessions based on behavioral change theory. *Iran J Med Educ*. 2010;**10**(1):92–100.

37. Riediger ND, Shooshtari S, Moghadasian MH. The influence of sociodemographic factors on patterns of fruit and vegetable consumption in Canadian adolescents. *J Am Diet Assoc*. 2007;**107**(9):1511–8. doi: 10.1016/j.jada.2007.06.015. [PubMed: 17761228].

38. Tsai AC, Liou JC, Chang MC. Food patterns that correlate to health and nutrition status in elderly Taiwanese. *Nutr Res*. 2006;**26**(2):71–6. doi: 10.1016/j.nutres.2005.11.006.

39. Peltzer K, Phaswana-Mafuya N. Fruit and vegetable intake and associated factors in older adults in South Africa. *Glob Health Act*. 2012;**5**(1):18668. doi: 10.3402/gha.v5i0.18668.

40. Shrifirad GR, Mohebbi S, Motalebi M, Abbasi MH, Rejati F, Tal A. The prevalence and effective modifiable factors of self-medication based on the health belief model among elderly adults in gonabad in 2009. *Health System Res*. 2011;**7**(4):410–21.