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Food Security Status and Its Related Factors in the Elderly in Yazd

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ABSTRACT

Background: Increasing population aging is a global challenge and has occurred very rapidly in all parts of the world. The elderly population is more at risk of diseases, and their improper condition may impair their ability to live and cook at home. Food insecurity endangers public health as well as nutritional status, especially in the elderly. The present study aims to investigate the food security status and its associated factors in adults aged over 60 years. **Methods**: This cross-sectional study was conducted on 200 elderly (88 men and 112 women) referring to health centers in Yazd. A researcher-made questionnaire was used to record demographic information. The standardized FaCPS-FSSM (Farsi Current Population Survey-Food Security Survey Module) questionnaire was used to assess the food security of the elderly. The participants' food security and their relationship with the studied variables were evaluated by chi-square and ANOVA statistical tests using SPSS software version 20. **Results**: The findings indicate 44% complete food security, 12.5% mild insecurity, 8.5% moderate insecurity, and 35% severe food insecurity in the elderly participated in the study. Moreover, a significant relationship was observed between education level (P = 0.01), marital status (P = 0.01), income (P = 0.001), and some chronic diseases, such as cardiovascular (P = 0.02), gastrointestinal disorders (P = 0.03), and hyperlipidemia (P = 0.01) with food insecurity (P < 0.05). **Conclusion**: The present study shows a significant prevalence of food insecurity (56%) in the elderly. A significant relationship was also observed between some chronic diseases and food insecurity. Therefore, it is recommended to perform educational programs, intervention studies, and cohort studies to improve food insecurity, especially in the elderly with the mentioned chronic diseases.

Keywords: *Food security; Elderly; Chronic diseases; Body weight*

Introduction

Food and nutrition are among the basic needs of human societies and providing adequate and suitable food for all people lies in the category of food security (Bickel *et al.*, 2000). As defined by the United States Department of Agriculture, food security means that all people, at all times, have

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access to adequate food to maintain a healthy and active lifestyle (Coleman-Jensen *et al.*, 2014). It includes providing healthy and adequate food in terms of nutrition, ability, and ensuring that acceptable foods are obtained through acceptable means (Thomas, 2006).

Recent studies have focused on aspects of safe and nutritious food, timely availability, and social and cultural acceptance (Cheng *et al.*, 2016). Some other studies have reported important factors affecting food security, such as social, economic, and ecological factors, including household size, home-ownership, acquiring educational skills, savings and access to insurance health services, and independent household income (Modirwa and Oladele, 2012). A study conducted in China also stressed the impact of experiences during social life and economic status on eating and nutritional behaviors (Browning *et al.*, 2019). Food insecurity disproportionately affects vulnerable populations, including the elderly, those who have low incomes, and those with chronic diseases or disabilities worldwide (Hessol *et al.*, 2017). Food security is one of the essential prerequisites for the elderly health. Food security has also been identified as an important issue for the quality of life of the elderly and aging in place (Browning *et al.*, 2019). The elderly population is more at risk of diseases, and their improper condition may impair their ability to live and cook at home. Food insecurity endangers public health as well as nutritional status, especially in the aged people (Khodadad-Kashi and Heydari, 2004). Moreover, it may exacerbate the existing health conditions of the elderly, leading to poorer disease management, subsequent health care needs, and worse overall health (Leung *et al.*, 2020). Given the young structure of the population of Iran in recent years, so far there was little need for studies on food safety in the elderly.

On the other hand, given many countries are facing population aging, according to Iran National Organization for Civil Registration, the population growth rate for people aged over 60 years in 2011-2050 is predicted to be more than 26% and it is expected that by the year 2050 about 33% of the population will be over 60 years (Owlia *et al.*, 2019). Due to the demographic structure of Iran, the aging problems have not been seriously shown (Hosseini *et al.*, 2008). Food insecurity is caused by many factors, one of which is an aging population (Oldewage-Theron and Egal, 2021). Despite the dramatic increase in population age, a small number of low- and middle-income countries have addressed the nutritional problems of the elderly population, and government strategies often ignore the synergistic risk of food insecurity and nutrition on the nutritional status and health of the elderly (Aboderin and Beard, 2015, Altman *et al.*, 2009). In some studies, the prevalence of food insecurity in the elderly population has been reported 30% in South Africa (Grobler and Dunga, 2019), 62% in Tehran (Mohammadi *et al.*, 2008), and 45.8% in Chinese (Cheng *et al.*, 2016). Bahrami *et al.* conducted a study on the elderly in Yazd. They showed that only 1.2% of individuals used more than two servings of dairy products. Furthermore, the number of fruits and vegetable consumption is very low. Moreover, low fruits, vegetables, and dairy consumption among the elderly might affect their health and lead to several chronic diseases, including obesity, type 2 diabetes, and cardiovascular diseases (Bahrami *et al.*, 2016). Health problems lead to food insecurity in the elderly. For instance, limiting access to sufficient food and the practical use of food, increasing the need for special nutrients and meal patterns, increasing medical expenses; and the loss of appetite (Hall and Brown, 2005, Park *et al.*, 2019, Wolfe *et al.*, 1996).

Due to the increasing population of the elderly and the importance of food security in this group, several studies have only validated the appropriate tools for measuring food security and selecting the best tool (Milani-Bonab A *et al.*, 2012, Quine and Morrell, 2006, Wolfe *et al.*, 2003, Wolfe *et al.*, 1998). Many researchers believe that common tools for measuring food security in different groups are not necessarily reliable tools for measuring food security in the elderly population (Duerr, 2007, Frongillo *et al.*, 2003, بناب *et al.*, 2012). Wolfe et al. in 2003 suggested 14 new questions to complete and validate the FSSM food

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safety questionnaire. Then, Duerr in 2006 used a tool called CPS-FSSM that included 18 questions, including 8 items (from questions suggested by Wolfe et al. in 2003) to more accurately assess the food security situation of the elderly. The results of his study also indicated greater accuracy and sensitivity than the questions suggested by Wolf et al. (Duerr, 2007, Milani-Bonab *et al.*, 2012). The elderly population in Iran is growing. Food security is undeniably important for having successful aging and choosing aging in place. On the other hand, the health status of the elderly has been deteriorated due to the existing financial challenges, poorer disease management, subsequent health care needs, and worse overall health. Therefore, given that limited studies have been conducted in this regard, the present study aims to determine the elderly food security status and its associated factors in Yazd.

Materials and Methods

Study population: This analytical cross-sectional study was conducted on the elderly population referring to health centers in Yazd. In this study, participants with a minimum age of 60 years were included in the study. Ten out of twenty health centers in Yazd were randomly selected based on the urban regional classification. The access to the elderly was as follows: by referring to the health center of Yazd city and preparing statistics of health centers, 10 health centers were selected from 24 health centers of Yazd city based on urban classification, so that different social classes of a health center were included in the sampling from all areas. The present study was performed by explaining the study process, goals, disadvantages, advantages, limitations, and obtaining written informed consent by the researcher.

The inclusion and exclusion criteria: The inclusion criteria were age over 60 years, having informed and free consent, being covered by health centers, living at home, ability to understand the Persian language clearly. The participation of the elderly population was voluntary. The exclusion criteria included lack of understanding of research questions and study objectives. Using the formula $n = \frac{Z1-\alpha/2p(1-p)}{d2}$ considering the prevalence of 61% (Fallah Tafti *et al.*, 2016a) with a 95% confidence level and a maximum error of 0.05, the sample size required for this study was determined to be 200 elderly people. The participants were randomly selected from 10 health centers in Yazd based on the computer lists of each center and were participated in the study.

Anthropometric measurements: First, the height and weight of the participants were measured according to the standards (wearing light clothes, without shoes, through a digital scale with an accuracy of 100 grams and a tape measure with an accuracy of one centimeter, standing next to the wall with the shoulders in normal condition). Body mass index (BMI) was measured by dividing weight in kilograms by height in meters squared.

Weight status based on BMI was determined according to the National Institutes of Health (NIH) (<18.5 underweight, 18.5-24.9 normal weight, 25-29.9 overweight, 30-34.9 first degree obesity, 35-39.9 second degree obesity, and equal to or more than 40 severe obesity).

Food security assessment: Then, the standardized 8-item FaCPS-FSSM (Farsi Current Population Survey-Food Security Survey Module) in Iran was completed by interviews conducted by trained experts. This questionnaire is a suitable tool for measuring food insecurity in the Iranian elderly. This questionnaire has a good reputation in terms of content validity and internal reliability. For internal reliability, Cronbach's alpha was 0.85% in the study by Milani *et al.* (Milani-Bonab *et al.*, 2012). The questionnaire itself included yes or no questions and expressions, such as often, sometimes, and never. Answers of "often, sometimes, and yes" scored 1, and answers of "never and no" scored zero. Using guidelines and information obtained from the studies by Bickel *et al.*, and Nnkawe and Milani *et al.*, food insecurity degrees were classified and determined in the FaCPS-FSSM questionnaire (Bickel *et al.*, 2000, Milani-Bonab *et al.*, 2012, Nnakwe, 2003). Accordingly, a score of 0 to 2 indicated complete food security, 3 to 4 mild insecurity, 5 to 6

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moderate insecurity, and a score of 7 to 8 severe food insecurity.

Assessment of socioeconomic and demographic status: Socioeconomic and demographic variables were recorded, including education level, occupation, marital status, gender, household size, number of breadwinners, area of residence, type of property, household income, place of residence, floor area, and number of rooms. Health status (having chronic diseases common in the elderly, including cardiovascular disease (yes, no), hypertension (yes, no), joint (yes, no), etc.) was also measured and recorded according to the high prevalence of these diseases among the elderly. The researcher-made questionnaire was used to record demographic information and chronic diseases. The data were based on the elderly statements.

Ethical consideration: This study was confirmed in the ethics committee of Shahid Sadoughi University of Medical Sciences of Yazd with the ethics code: IR.SSU.SPH.REC.1397.040.

Data analysis: To evaluate food security and its relationship with the studied variables, chi-square and ANOVA tests were used. The data were analyzed using SPSS software version 20. P< (0.05) was considered satirically significant.

Results

In this study, the food security status of 200 elderly people (88 men and 112 women) with a minimum age of 60 years was examined. More than half of the participants were women (56%).

Moreover, 85% of the elderly lived with their spouses (**Table 1**). Among the study population, 44% experienced complete food security, 12.5% mild insecurity, 8.5% moderate insecurity, and 35% severe food insecurity. **Table 2** reveals the distribution of some of the studied variables according to food security status. As can be seen in this table, 43 subjects were illiterate, 22 (51.2%) of whom had food insecurity, 51 had a diploma or higher degree, 8 (15.7%) of whom had food insecurity. Therefore, there was a significant relationship between education levels with food security (P = 0.014). Moreover, complete food security in the elderly living with their spouse was in a better status and the rate of severe food insecurity in the elderly living alone was 50%, which was higher than the others (P = 0.01). However, no significant relationship was observed between gender and food security (P > 0.05). **Table 2** reveals the health status and chronic diseases of the elderly and their relationship with food security. There was a significant relationship between diseases of cardiovascular, gastrointestinal, and hyperlipidemia with food insecurity in the elderly (P < 0.05).

Table 3 shows the mean age, household size, number of children, and some economic factors based on food security status. A significant relationship was found between household income and food security (P = 0.001). However, no significant relationship was found between age, household size, floor area, and the number of children with food security (P > 0.05). Table 4 indicates the relationship between food security status and weight status of the elderly, and no significant difference was observed between different weight groups with food security.

Table 1. Demographic variables.

Variables	
Age (year)	65.10 ± 5.57[a]
Body mass index (kg/m^2)	28.35 ± 4.53
Gender	N (%)
Male	88 (44.0)
Female	112 (56.0)
Education	
Illiterate	43 (21.5)
Primary school	94 (47.0)
Junior high school	12 (6.0)
Diploma and higher	51 (25.5)
Marital status	
Living with spouse	170 (85.0)
Living alone	30 (15.0)
Smoking	
Yes	13 (6.5)
No	187 (93.5)

[a]: Mean ± SD

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Table 2. Frequency distribution of food security status according to some studied variables in the elderly.

Variables	Severe insecurity	Moderate insecurity	Mild insecurity	Secure	P-value[b]
Food security status	70 (35.0) [a]	17 (8.5)	25(12.5)	88 (44.0)	
Education level					
Illiterate	22 (51.2)	3 (7.0)	3 (7.0)	15 (34.9)	0.01
Primary school	36 (38.3)	9 (9.6)	15 (16.0)	34 (36.2)	
Junior high school	4 (33.3)	2 (16.7)	1 (8.3)	5 (41.7)	
Diploma and higher	8 (15.7)	3 (5.9)	6 (11.8)	34 (66.7)	
Marital status					
Living with spouse	55 (32.4)	12 (17.1)	25 (14.7)	78 (45.9)	0.01
Living alone	15 (50.0)	5 (16.7)	0 (0)	10 (33.3)	
Gender					
Male	26 (29.5)	5 (5.7)	14 (15.9)	43 (48.9)	0.16
Female	44 (39.3)	12 (12.7)	11 (9.8)	45 (40.2)	
Cardiovascular					
Yes	16 (30.0)	8 (19.0)	3 (7.1)	15 (35.7)	0.02
No	54 (34.2)	9 (5.7)	22 (13.9)	73 (46.2)	
Hypertension					
Yes	42 (39.3)	9 (8.4)	13 (12.1)	43 (40.2)	0.57
No	28 (30.1)	8 (8.6)	12 (12.9)	45 (84.4)	
Gastrointestinal					
Yes	17 (53.1)	0 (0)	5 (15.6)	10 (31.3)	0.03
No	53 (31.5)	17 (10.1)	20 (11.9)	78 (46.4)	
Joint					
Yes	32 (46.4)	4 (5.8)	5 (7.2)	28 (40.6)	0.06
No	38 (29.0)	13 (9.9)	20 (15.3)	60 (45.8)	
Hyperlipidemia					
Yes	41 (51.2)	7 (8.8)	9 (11.3)	23 (28.7)	0.01
No	29 (24.2)	10 (8.3)	16 (13.3)	65 (54.2)	
Diabetes					
Yes	35 (42.2)	8 (9.6)	11 (13.3)	29 (34.9)	0.17
No	35 (29.9)	9 (7.7)	14 (12.0)	59 (50.4)	

[a]: Number (%); [b]: Chi-square *test*

Table 3. Mean age, household size, number of children, and some economic factors based on the food security status of the elderly in Yazd.

Variables	Severe insecurity	Moderate insecurity	Mild insecurity	Secure	P-value [a]
Age (year)	64.95 ± 5.25	65.11 ±4.90	64.96 ± 4.73	65.25 ± 6.21	0.98
Household size	3.07 ± 1.63	2.41 ± 0.79	2.84 ± 1.28	2.95 ± 1.55	0.43
Number of children	4.72 ± 1.84	4.00 ± 1.62	5.00 ± 2.08	4.26 ± 1.78	0.13
Income (Million)	1.51 ± 0.59	1.34 ± 0.67	1.28 ± 0.40	2.09 ± 0.99	0.001
Number of rooms	2.35 ± 0.81	2.52 ± 0.79	2.56 ± 1.22	2.63 ± 1.23	0.35
Floor area (m^2)	262.28 ± 156.13	279.64 ± 88.10	255.40 ± 146.40	277.61 ± 136.61	0.84

[a]: ANOVA *test.*

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Table 4. Frequency distribution of weight status of the elderly based on the food security status.

Weight status	Total	Severe insecurity	Moderate insecurity	Mild insecurity	Secure	P-value[a]
Normal	45	18 (25.7)[b]	1 (5.9)	4 (16.0)	22 (25.0)	0.54
Overweight	88	30 (42.9)	9 (52.9)	10 (40.0)	93 (44.3)	
Obesity	67	22 (31.4)	7 (41.2)	11 (44.0)	27 (30.7)	
Total	200	70	17	25	88	

[a]: Chi-square *test;* [b]*: number (%)*

Discussion

The results of this study show that the prevalence of food insecurity among the elderly population of Yazd was 56%. Moreover, a significant relationship was observed between education level, marital status, income, and some diseases, such as cardiovascular, gastrointestinal disorders, and hyperlipidemia with food insecurity ($P < 0.05$).

The prevalence of food insecurity in this study is similar to the studies by Milani et al. in Tehran and Fallah Tafti *et al.* in Arak that reported the prevalence of food insecurity were 59.3% and 60.7%, respectively (Fallah Tafti *et al.*, 2016b, Milani-Bonab *et al.*, 2012). Mohammadi Nasrabadi *et al.* in their study on the prevalence of food insecurity in Tehran reported that the prevalence of food insecurity was 43.7% (Mohammadi *et al.*, 2008). Eghrari *et al.* reported that 24.1% of the elderly in Tehran had mild food insecurity, 22.7% moderate food insecurity, and 15.2% had severe food insecurity (Eghrari *et al.*, 2020). A study conducted on the Mexican elderly reported that the prevalence of mild, moderate, and severe food insecurity was 40.3%, 20.5%, and 12.5%, respectively (Pérez-Zepeda *et al.*, 2016). Food insecurity in the Chinese elderly was reported 45.8 (Cheng *et al.*, 2016), in the homeless elderly in Auckland 55.4% (Tong *et al.*, 2019), and in the elderly in Torres Strait Islanders was 21% (Temple and Russell, 2018). A comparison of studies conducted on the elderly in different countries indicates that the prevalence of food insecurity in the elderly is almost high. The differences observed in the results can be attributed to differences in the characteristics of participants (socioeconomic factors and specific demographic groups) (Temple and Russell, 2018), homelessness of the elderly (Tong *et al.*, 2019), and food insecurity measurement tools (Pérez-Zepeda *et al.*, 2016). On the other hand, the existence of such differences in the prevalence of food insecurity between the present study and other studies may indicate that the prevalence of food insecurity in the elderly is higher for reasons, such as inability to prepare food, disease, and physical disabilities.

In this study, gender had no significant relationship with food security status; while Eghrari *et al.* stated that men are more prone to food insecurity (Eghrari *et al.*, 2020). However, Nkechi Ene-Obong *et al.* and Fernandes *et al.* in the study of the epidemiology of chronic diseases showed a higher prevalence of insecurity in women (Fernandes *et al.*, 2018). In this present study, the marital status of the head of the household and the participants living alone had more insecurity than those living with their spouse. These findings are consistent with the study by Milani *et al*, which showed a significant relationship between these variables and food security status (Milani-Bonab *et al.*, 2012). However, in the study of Seivwright *et al.*, food security did not show a significant difference in terms of marital status (Seivwright *et al.*, 2020). In this study, the elderly population with better economic status and higher income had better food security. A significant association was also seen between education level and food insecurity, so that by increasing education level, food insecurity level decreased. The results of the study by Wolfe et al. indicated a direct relationship between low income and low financial resources with food insecurity in the elderly (Wolfe *et al.*, 2003). The results of the

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study by Shariff *et al.* (Shariff and Khor, 2005), Chang *et al.* (Chang and Hickman, 2018), and Eghrari *et al.* (Eghrari *et al.*, 2020) showed that there was a negative relationship between income and education levels with food insecurity. There was an inverse relationship between food insecurity and education level, since increasing the education level leads to increasing and improving knowledge, performance, and attitude of people about nutritional status. Furthermore, a higher level of education can lead to better employment opportunities, followed by greater economic status and purchasing power, and ultimately access to high-quality food. The results of the present study show that there is a significant relationship between gastrointestinal, cardiovascular, and hyperlipidemia diseases with food insecurity. These results were in line with the results of the study by Milani *et al.* which reported a significant relationship between cardiovascular diseases and food insecurity (Milani-Bonab *et al.*, 2012). The study by Fallah Tafti *et al.* also stated that cardiovascular and gastrointestinal diseases were significantly associated with food insecurity. Unlike the present study, Tafti *et al.* also reported a significant relationship between joint, diabetes, and eye diseases with food insecurity (Fallah Tafti *et al.*, 2016b). Consistent with the present study, the results of a study by Seligman et al. in the United States indicated that there was a significant difference between food insecurity and hyperlipidemia (Seligman and Schillinger, 2010). The difference in the findings of this study and other studies was due to the difference in the number of samples participating in the study, the individual characteristics of the participants, as well as ethnic and racial minorities.

The results showed that there is no significant relationship between different weight groups with food security. A prospective study by Witaker *et al.* showed that changes in food security status were not correlated with weight changes (Mohammadi *et al.*, 2008, Whitaker and Sarin, 2007). However, many other studies on food insecurity and weight have reported results, which are not in line with the present study (Larson and Story, 2011, Moradi *et al.*, 2019, Wilde and Peterman, 2006, تفتی *et al.*, 2016, فاطمه *et al.*). Studies have shown that there is a significant relationship between food insecurity and weight. The difference in the observed result can be due to the number of participants (Fallah Tafti *et al.*, 2016a), different measurement tools, and demographic characteristics (Mohammadi *et al.*, 2008).

The strength of this study is that the result of this study can be the basis for conducting in a wider population of the elderly. On the other hand, the results of this study can help the government institutions, such as the University of Medical Sciences and Welfare office to plan food security for the elderly population.

It was a cross-sectional study and could not precisely explain a causal relationship. On the other hand, given that the elderly suffer from many chronic diseases and due to their disabilities, reaching the target population was difficult. The sample size in some groups is too small to clarify any significant differences between the groups. Finally, it is recommended to use this tool in the National Elderly Health Program. Given that Iran is composed of different cultures and ethnicities, this tool can be used in other parts of the country along with other food intake questionnaires. On the other hand, the present study is descriptive and it is better to conduct cohort studies to confirm the results.

Conclusion

The present study showed a significant prevalence (56%) of food insecurity in the elderly in Yazd, Iran. A significant relationship was observed between education level, marital status, income, and some diseases, such as cardiovascular, gastrointestinal disorders, and hyperlipidemia with food insecurity. Finally, it is recommended that due to the increasing population of the elderly, food insecurity prevention programs should be seriously designed and implemented for the elderly population, especially those with chronic diseases.

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Authors' contribution

Mozaffari-khosravi H, Zimorovat A, Anbari Z designed, performed and conducted theory of the study. Anbari Z, Gheflati A, Entezari M collected the data. Anbari Z and Zimorovat A supported in statistical analysis. Mozaffari-khosravi, Zimorovat A, Anbari Z, Gheflati A, Entezari M wrote the manuscript. All authors read and approved the final manuscript.

Conflict of interest

The authors of this article state that there is no conflict of interest.

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