RESEARCH ARTICLE

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Elderly's food security and its associated socioeconomic determinants in Tehran: A cross-sectional study

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Abstract

Introduction: The mechanism by which a suppressed immune system of a cancer patient makes them susceptible to COVID-19 is still unclear. Any delay or discontinuation of cancer care due to the pandemic is expected to have a detrimental impact on the outcome of cancer. A few studies have addressed the incidence of COVID-19 among cancer patients, but the small sample size of such studies makes it difficult to draw inference to the general population.

Methods: For our review, 'Pubmed' database and Google search engines were used for searching the relevant articles. The criterion used for review includes their relevance to the defined review question, which is the pathophysiological mechanism of COVID-19 among cancer patients and the relevant therapeutic interventions therewith. This review includes 20 studies and other relevant literature which address the determinants of COVID-19 among Cancer patients.

Results: Delay in cancer diagnosis will increase the stage progression of cancer patients and increased mortality in the future. A short delay in administering cancer related treatment to aid the odds of patient surviving the acute SARS-CoV-2 infection, should be at the discretion of the treating Physician. Oncologists dilemma in the current situation includes titrating the density of drug doses and intensity of treatment regimen, for the optimal management of metastatic and adjuvant cancer patients. Patients are thus subjected to suboptimal treatment and undetected disease recurrence, To circumvent the immunosuppressive effects of chemotherapy, Providers need to consider staggered regimen or alternate therapies such as biological/immunotherapy, targeted therapy, anti-angiogenic drugs, hormone therapy and/or antibody-based therapeutics.

Conclusion: This review provides insights on the pathogenesis of SARS-CoV-2, which could enable Physicians in formulating therapeutic strategies for the management of severe patients, more so in Oncology settings, thus reducing the mortality. The key is to balance the continuation of urgent cancer care, but rationing the elective treatment according to the circumstances.

KEYWORDS
elderly, food security, logistic regression, Tehran

1 | INTRODUCTION

Food and nutrition security take place when all people at all times receive adequate and high-quality food to meet the needs of their diet and have a healthy and active life combined with environmental health and sufficient health care.[1,2]

Today, food security has become a great concern for societies. Communities with a higher food security status have a higher developmental level, and individuals in these communities have higher mental, intellectual, and physical health.[3] In other words, food security is related to the economic, social, cultural, and health indicators of the community, and there is a two-way interaction.

The elderly with low-income and lack of receiving social assistance are more likely to experience food insecurity.[4] Elderly with a history of chronic disease are two times more likely to suffer from food insecurity. Also, different studies have indicated that age, the elderly's education level, economic status, unemployment, lack of permanent salary, and savings are all factors influencing food security status.[5,6]

Since access to adequate food is one of the most basic human rights, governments have to take serious actions to improve the nutritional status of people.[7] Given the role of people's productivity in economic, social, and political development processes at the national and international levels, the importance of food security and its influence on the economic development of the countries is obvious.[8,9] Therefore, ensuring food security requires government efforts to provide access to a minimal level of nutrition for all households, especially for vulnerable and elderly.[8]

Due to the increase in life expectancy of the individuals, an increasing number of elderly (people of 60 years and over) around the world especially in Iran, there is a need to pay more attention to the nutritional status of elderly for maintaining the quality of their lives, and health.[9] It is expected that the world's elderly population increases by about 223% by 2025.[10] According to the latest census of Iran (the year 2006), the population over 60 years old was 5 121 043, and it is expected to reach 10.3% of the total population by 2026.[11,12] Thus, an increase in the elderly population and a higher prevalence of chronic diseases call for more attention should be paid to the health and social needs of the elderly especially the nutritional requirements.[13,14] For the stated reasons, the food security status of the elderly as one of the foundations of physical and mental health is highly important. Knowledge of the nutritional security status of the elderly and its influential factors can be helpful for policymakers, development planners, and other community health agencies to take a positive step toward the development of communities. Therefore, the present study aimed to investigate the food security status of the elderly in the city of Tehran by focusing on economic and social factors by using a logistic regression model.

2 | METHOD

The present study is an applied and descriptive-analytical research conducted on a total of 1000 elderly in Tehran city. Required data obtained from a questionnaire developed in 2018. The study population consists of the elderly in Tehran, which has a population of about 1 423 224 people. Tehran city is capital of Iran and as the most populous city in Iran lies between 51.100 and 51.633 longitude east and 35.566 and 35.850 latitude north. According to the latest information in the year 2018, there were 1 423 224 people over the age of 60 years in Tehran. In this study, 1000 elderly participated as a sample. The elderly who did not provide data on food security and other socioeconomic and health information and those who were under the age of 60 years were excluded.

This study was conducted on 1000 eligible people ≥60. The number of samples required was calculated regarding the food security status of the elderly that were founded by Qomi et al study in Tehran.[15] Using the results of the Qomi et al study and by adding the power of 90%, the calculated sample size was 698, and with considering 20% of the sample drop out, the sample size was increased to 838; finally, to enhance the accuracy of the study, the sample size of 1000 was considered.

At first, the city of Tehran was divided into five geographical areas including the north, south, east, west, and center as the study strata. Two municipal regions were selected from each geographical area, randomly. Then, a public health center was randomly selected from each municipal region.

Finally, 100 households with elderly from each health center were selected by using the systematic sampling approach. All elderly in the selected households were invited to take part in the study. If the elderly refused to take part, the next household with an elderly person was invited.

TABLE 1 Independent variables of Logit model

Variable	Description
X_1	Monthly income (one for less than 10 million IRR, two for between 10 and 20 million IRR, three for between 20 and 30 million IRR, four for 30 million IRR and more)
X_2	Level of education (one for diploma and less, two for associate degrees, three for bachelor, four for master and above)
X_3	Employment status (one for employed, two for unemployed, three for retired)
X_4	Marital status (one for married, two for widow/widower, three for divorced, four for unmarried)
X_5	Home ownership status (one for tenant, two for private house, three for living with relatives)
X_6	Size and housing measure (one for less than 50-m square, two for between 50 and 100, three for more than 100-m square)
X_7	Gender (one for men, two for women)
X_8	Being under the coverage of a supporting insurance (one for having social security insurance, two for Iranian health insurance, three for other type of health insurance coverage, four for without insurance)
X_9	Chronic disease (one for having chronic disease, two for not having chronic disease)

TABLE 2 Characteristics of participants in the study (n = 1000)

Characteristics	Number	Percent (unweighted)	Percent (weighted)
Income (million IRR)			
Income <10	300	30	29.4
10 ≤ income <20	396	39.6	39.4
20 ≤ income <30	225	22.5	22.7
Income ≥30	79	7.9	8.5
Gender			
Men	517	51.7	51.8
Women	483	48.3	48.2
Marital status			
Married	649	64.9	64.2
Widow/widower	294	29.4	29.9
Divorced	48	4.8	4.9
Unmarried	9	0.09	0.19
Education level			
Diploma and less	541	54.1	53.2
College degree	240	24	23.5
Bachelor	136	14.6	14.7
MS and above	83	8.3	9.4
Employment status			
Employed	319	31.9	32.8
Unemployed	407	40.7	39.9
Retired	274	27.4	27.3
Home ownership status			
Tenant	61	6.1	5
Private house	372	37.2	38.4
Living with relatives	567	56.7	56.6
Size and housing measure (square meter)			
Less than 50	442	44.2	43.3
Between 50 and 100	479	47.9	48.2
100 and more	79	7.9	8.5
Insurance coverage			
Social security insurance	406	40.6	40.3
Iranian health insurance	376	37.6	37.8
Other insurances	160	16	16.2
Without insurance	58	5.8	5.7
Chronic disease			
Having chronic disease	345	34.5	33.3
Not having chronic disease	655	64.5	65.7

The elderly were free to participate in the study. The interviewers told to participants about the objectives of the study and assured that their information remains confidential. The elderly were free to participate in the study. The interviewers were told to participants about the objectives of the study and assured that their information remains confidential.

Required data were gathered by a questionnaire developed in 2018. The questionnaire was developed in two sections: the first section contains general information and socioeconomic characteristics that affect the elderly's food security status. In this section, there were some questions on age, gender, level of education, health and employment status, monthly income, homeownership status, health status, and being under the coverage of supporting insurance. In the second section, a six-item short questionnaire was used to measure food security status. Six-item short questionnaire contains items: (a) In the last 12 months did you or any other in your household ever had

Question		N	Percentages
1	In the last 12 months, did you or any other in your household ever had to cut the size of meals or skip meals entirely because of no enough money for food? (Yes, No)	392	39.2
2	How often did this happen (cutting the size of meals or skip meals entirely)? (Almost every month, some months but not every month, only 1 or 2 months)[a]	381	38.1
3	In the last 12 months, did you ever eat less than enough because there was no enough money to buy food? (Yes, No)	317	31.7
4	In the last 12 months, were you ever hungry but did not eat because you could not afford enough food? (Yes, No)	181	18.1
5	The food that I/we bought just did not last, and I/we did not have money to buy more. (often, sometimes, or never true for you in the last 12 months)[b]	211	21.1
6	I/we could not afford to eat balanced meals (often, sometimes, or never true for you in the last 12 months)[b]	234	23.4

[a]"Almost every month" and "some months but not every month" were considered positive response.
[b]"Often" and "sometimes" were considered positive response.

to cut the size of meals or skip meals entirely because of no enough money for food? (Yes, No); (b) How often did this happen (cutting the size of meals or skip meals entirely)? (Almost every month, some months but not every month, only 1 or 2 months); (c) In the last 12 months, did you ever eat less than enough because there was no enough money to buy food? (Yes, No); (d) In the last 12 months, were you ever hungry but did not eat because you could not afford enough food? (Yes, No); (e) The food that I/we bought just did not last, and I/we did not have money to buy more (Often, sometimes, or never true for you in the last 12 months); (f) I/we could not afford to eat balanced meals (Often, sometimes, or never true for you in the last 12 months).

The elderly were considered as food insecure if responded "yes" to two or more of the six items. This questionnaire was validated in Iran by Dastgiri et al (Cronbach's alpha = .93) and used in several studies to calculate food security status.[16-18] For gathering the data, questionnaires were filled out by trained interviewers; all participants in the study were informed that their responses would remain confidential.

Then, the relationship between food security status and socio-economic and health factors was examined by bivariate and multivariate logistic regression models by the Eviews 10 Software. In the first stage of the analysis, we used a bivariate logistic regression model. We entered the meaningful variables of the first model into the multivariate logistic regression model (second model). The multivariate logistic regression model structure in this study is as follows:

$$Z_i = \alpha + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \ldots + \beta_n X_{in} + u_i, \qquad (1)$$

where, Y_i (qualitative dependent variable) is the probability of food security ($Y_i = 1$), $Y_i = 0$ stands for food insecurity, α shows the model

intercept, n indicates the number of observations, u_i refers to the random intervening component, and $B_j = (j = 1, 2, 3 \ldots 10)$ represent the model unknown parameters that must be estimated.[19] In this equation, X_j stands for the model independent variables including a set of social, economic and health features affecting the food security status (Table 1).

Iran University of Medical Sciences' Ethics Committee approved this study (ethics code: 32037). The participants were informed of the objectives and method of study, and an informed written consent was obtained from all participants. Explanations about the confidentiality of information and freedom to withdraw from the study at any time were also given to the participants.

3 | RESULTS

The sample included 517 (51.75%) men and 483 (48.3%) women with an average age of 67 ± 6.21 years. Only 6.9% of the participants had an academic education and 20.5% of them were illiterate.

The majority of the elderly had under diploma education (40.01%) and 40.7% of them were unemployed (40.7%). A total of 73.5% of elders had a chronic disease. The demographic characteristics of the study participants are presented in Table 2.

Results of the second section in the questionnaire showed that 391 (39.1%) elders at least respond positive answers to two or more questions and were identified as food insecure. On the other hand, 609 (60.9%) elders answered negative to one or none of the questions and identified as food secure. Table 3 shows the percentage of positive answers to each question.

In this study elderly with income less than 10 million Iranian rial (IRR) and elderly with income 30 million IRR and more, had the lowest percentage of food security (3%) and had the highest percentage

TABLE 4 Bivariate analysis: food security status and independent variables

| | Food security | | | | |
| | n = 609 | n = 391 | | | |
Variables	Yes (%)	No (%)	Total	χ^2	P
Monthly income (million IRR[a])					
Income <10	9 (3)	291 (97)	300	57.2	<.0001
10 ≤ income <20	332 (83)	64 (16)	396		
20 ≤ income <30	198 (88)	27 (12)	225		
Income ≥30	70 (88)	9 (11)	79		
Education level					
Diploma and less	211 (40)	330 (60)	541	103.11	<.0001
Associate degrees	200 (83)	40 (16)	240		
Bachelor	116 (85)	20 (14)	136		
Master and above	82 (98)	1 (1)	83		
Employment status					
Unemployed	97 (30)	222 (70)	319	71.25	<.0001
Employed	270 (66)	137 (33)	407		
Retired	242 (88)	32 (12)	274		
Marital status					
Married	408 (62)	241 (38)	649	28.3	.11
Widow/widower	181 (61)	113 (39)	294		
Divorced	16 (33)	31 (66)	48		
Unmarried	3 (33)	6 (66)	9		
Home ownership status					
Tenant	132 (35)	240 (65)	372	111.4	<.0001
Private house	464 (81)	103 (19)	567		
Living with relative	13 (21)	48 (79)	61		
Size and housing scale (square meter)					
Less than 50	180 (40)	262 (60)	442	2.72	.12
Between 50 and 100	359 (74)	120 (26)	479		
More than 100	70 (88)	9 (12)	79		
Gender					
Men	357 (69)	160 (31)	517	1.48	.1
Women	252 (52)	231 (48)	483		
Insurance coverage type					
Social security insurance	305 (75)	101 (25)	406	75.54	<.0001
Iranian health insurance	195 (51)	181 (49)	376		
Other	101 (63)	59 (37)	160		
Without insurance	8 (13)	50 (87)	58		
Health status					
Having chronic disease	205 (59)	140 (41)	345	122.09	<.001
Not having chronic disease	404 (61)	251 (39)	655		

[a]42 000.00 Iranian rial (IRR) = 1.00 United States Dollar (USD).

of food security (88%), respectively. The elderly with a diploma and less had the highest percentage of food insecurity (60%). Also, elderly that had not any insurance coverage and were unemployed had the highest percentage of food insecurity (87% and 70%) (Table 4).

3.1 | Logistic regression analysis

In the first step, we used the bivariate logistic regression model and applied the Rao-Scott chi-square test to determine statistically significant differences between groups. In this step, variables that were

TABLE 5 Multivariate model predicting food insecurity among elderly

Variables	OR[a] (95% CI)	OR[b] (95% CI)
Monthly income (million IRR)		
Income <10	3.01 (0.61-1.4)	3.19 (0.61-1.48)
10 ≤ income <20	2.5 (1.6-3.6)	2.4 (1.51-3.52)*
20 ≤ income <30	1.22 (0.5-2.1)	1.3 (0.54-2.36)
Income ≥30	1	1
Level of education		
Diploma and less	3.18 (1.5-3.72)	3.02 (1.4–3.72)*
Associate degrees	1.5 (1-3.2)	1.6 (1.05-3.24)*
Bachelor	1.33 (0.65-2.01)	1.2 (0.65-1.55)
Master and above	1	1
Employment status		
Unemployed	2.18 (1.01-4.11)	2.18 (1.01–4.09)*
Employed	1.02 (0.77-1.5)	1.2 (0.81–1.59)
Retired	1	1
Home ownership		
Tenant	3.1 (1.6-6.1)	2.94 (1.62–5.63)*
Living with relatives	1.4 (1–3.1)	1.7 (1.1-3.21)*
Private house	1	1
Insurance coverage type		
Social security insurance	0.5 (0.61-1.39)	0.7 (0.61-1.38)
Iranian health insurance	0.8 (0.6-1.33)	0.8 (0.6-1.38)
Others	0.5 (1.05-2.8)	0.23 (0.24-0.67)*
Without insurance		1
Chronic disease		
Yes	3.54 (1.94-6.5)	3.54 (1.94–6.62)*
No	1	1

[a]Crude odds ratio;
[b]Adjusted odds ratio.
*$P < .05$.

significant at the $P < .001$ level consider as independent variables in binary logistic regression, and were entered into the multivariate logistic regression model in the second step of the analysis. Table 4 shows the results of bivariate logistic regression in the first step of the analysis. Results of the bivariate model show that monthly income, education, employment, and homeownership status, insurance coverage type, and health status have significant effects on elderly's food security status. Marital status, size, housing scale, and gender have not significant effects on the elderly's food security status, so these variables did not enter into the multivariate logistic regression model.

The results of unadjusted and adjusted logistic regression (multivariate model) analyses of factors associated with food insecurity among participants showed in Table 5.

Results of the multivariate model predicting showed that elderly that had low-income (less than 10 million IRR), approximately three times more likely to be food insecure (OR = 3.19, 95% CI: 1.61-

4.48). In the elderly with diplomas and less, associate degrees, and bachelor education level the odds of food insecurity were 2.02, 1.6, and 1.2 times greater than elderly with master and above education level.

Also, results showed that in unemployed elderly, the odds of food insecurity were more than two times greater (OR = 2.18, 95% CI: 1.01-4.09), and the odds of food insecurity with employed status were 1.2 times greater (OR = 1.2, 95% CI: 0.81-1.59) compared to elderly in which were retired. Elderly in which living in tenant homes were approximately three times more likely to be food insecure compared to the elderly that had a private home (OR = 2.94, 95% CI: 1.62-5.63). On the other hand, results showed that the elderly covered by any insurance had fewer odds to face food insecurity (OR < 1). Participants that had chronic disease approximately 3.54 times more likely to be food insecure (OR = 3.54, 95% CI: 1.94-6.62) compared to the elderly without any chronic disease. Table 5 shows the results of the multivariate regression model.

4 | DISCUSSION

This study aimed to estimate the food security status and its related factors among the elderly living in the city of Tehran. In the present study, food security in the elderly investigated was 39.1%. This finding is consistent with the other studies. Fernandes showed that 23% of individuals ≥65 years old were food insecure in Portugal. Another study conducted by Dean et al in the United States, 18.6% of elders were food insecure.[20-22]

Goldberg results also showed that >9% of the elderly were food insecure.[23] The differences between our results and other studies might be due to differences in the data collection methods, methodological approaches, and other factors such as the elderly population. Also, differences in the level of development of different countries were other reasons for the difference between our findings and the results of studies in other countries.

Results of a systematic review conducted in Iran showed that the prevalence of food security was 35% in the elderly.[24] In another study conducted among the elderly in Tehran women, 53.3% of study subjects had food security that was almost similar to our finding.[25]

In the other study conducted among elderly women in Iran, results show that only 10.9% of the elderly have food security.[26] Differences in the level of development and welfare facilities between cities and rural areas are the reasons for these differences. Also, another main reason for the variation of food security in different studies is economic, social, and cultural differences between areas and populations.

The finding of the current study reflects the fact that despite advances in personal/public health measures, it seems that there is still not enough attention to the elderly's health status for improving food security. Also, neglected these are still a public health problem in developing countries such as Iran.

The present study findings revealed that the elderly with a high-income had fewer odds of food insecurity compared to the elderly that had low-income. The results of previous studies are consistent with this study.[27-30] A recent study of food security among the elderly explained that elderly with low incomes were more likely to be food insecure.[24]

Lee et al showed that elderlies who received lower-income faced four times higher odds of being food insecure compared with those who had sufficient income.[31] High-income people have more ability to buy food than low-income people. In general, the role of the economic status on food security can be explained due to increased purchasing power that leads to greater access to food.

The findings of the present study also revealed that the education level and employment status of the elders have a significant impact on food insecurity. The elderly with low education levels were more likely to be food insecure. Furthermore, as the education level of the elderly increases (from diploma to higher degrees), and as the elderly's employment status improves the likelihood of food insecurity decreases among them. These findings are compatible with the findings of previous studies.[28,29,32-34] Also, a study conducted by Goldberg among the elderly in the United States showed that odds of food insecurity in the elderly with <ninth grade and high school level were 3.28 and 1.68 times more compared with the elderly with college education.[23]

By increasing education level, people's knowledge, performance, and attitude toward nutrition will improve. Higher education can provide a better job and consequently provide a better economic situation and increased purchasing power; this will eventually lead to more access to high-quality food.

Furthermore, the elderly's health status and insurance coverage significantly were correlated with the food insecurity status. The odds of food insecurity are higher in elderly that had chronic disease and had not any insurance coverage. Chronic disease exerts added financial strain on the elderly' budgets, and the elderly face more to catastrophic health expenditure, and due to lack of insurance coverage, they force to decrease essential expenses (food expense).[22] A study conducted by Jih found that food insecurity odds in elderly with chronic disease were 2.12 and 3.64 in comparison with other elderly that had not chronic disease.[35,36] Goldberg et al found that people who ever received Assistance Program benefits (support programs) were more likely to be food insecure compared to those that had never received any support program benefits.[20] Also, Wicks et al concluded that the elderly suffering from certain diseases makes them more vulnerable to food insecurity than younger individuals.[37]

As a limitation, in this study, we did not classify food insecure elderly based on severity (mild, moderate, and severe). Therefore, future research should classify the elderly based on food insecurity severity, and additional research is needed to explore more socioeconomic factors identified in this study that predicted food insecurity among the elderly. Also, considering number and type of chronic disease in elderly as a factor that effect on food insecurity is recommended.

With regard to growing trend of aging in the country, special attention has to be paid to the health of the elderly. The findings from this study showed that some variables had a relation to food insecurity especially income. So, financial and welfare support for elderly such as creating employment opportunities and expanding insurance coverage for increasing elderly' income, reforming inappropriate food habit and increasing elderly' nutritional awareness can be effective in promoting food security.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

AUTHOR CONTRIBUTIONS

Conceptualization: Vahid Alipour, Mahboobeh Shali, Touraj Harati Khalilabad
Data curation: Mahboobeh Shali, Touraj Harati Khalilabad
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Writing - review and editing: Touraj Harati Khalilabad, Vahid Alipour

All authors have read and approved the final version of the manuscript.

Touraj Harati Khalilabad had full access to all of the data in this study and takes complete responsibility for the integrity of the data and the accuracy of the data analysis.

TRANSPARENCY STATEMENT

The lead author, Touraj Harati Khalilabad, affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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REFERENCES

1. Coleman-Jensen A, Gregory C, Singh A. Household food security in the United States in 2013. *USDA-ERS Economic Research Report* 2014;173.
2. Committee on World Food Security. Coming to terms with terminology: food security, nutrition security, food security and nutrition, food and nutrition security. *Proceedings of the 39th Session of the Committee on World Food Security [Internet].* Rome, Italy: FAO; 2012.

3. Fathi M. *Agriculture in the World Towards 2015-2030*. Tehran: Institute of Planning and Agricultural Economics Research; 2003 [in Persian].

4. Alaimo K, Briefel RR, Frongillo EA Jr, Olson CM. Food insufficiency exists in the United States: results from the third National Health and Nutrition Examination Survey (NHANES III). *Am J Public Health*. 1998; 88(3):419-426.

5. Zhang Z, Luo Y, Robinson D. Reducing food poverty and vulnerability among the rural elderly with chronic diseases: the role of the new rural pension scheme in China. *Int J Environ Res Public Health*. 2018; 15(6):1253.

6. Weimer JP. Many elderly at nutritional risk. *Food Review/National Food Review*. Vol 20(1482-2016-121448); 1997:42-48.

7. Derrickson JP, Sakai M, Anderson J. Interpretations of the "balanced meal" household food security indicator. *J Nutr Educ*. 2001;33(3): 155-160.

8. Torkamani A. Food security and its rate in Iran. *J Trade Stud*. 2000;14: 121-148.[in Persian].

9. McIntyre L. Food security: more than a determinant of health. *Policy Options Montreal* 2003; 24(3):46–51.

10. WHO. *Active Ageing: A Policy Framework*. Geneva, Switzerland: WHO; . 2002. www.who.int/hpr/ageing/ActiveAgeingPolicyFrame.pdf

11. Tavakoli Ghouchani H. *Active Aging*. Mashhad, Iran: Mashhad University of Medical Sciences 2003; 1(1): 12–32.[in Persian]

12. Ghomi MH, Mirmiran P, et al. The association of food security with dietary diversity in people over 40 years of age. *Iran J Endocrinol Metab*. 2012;14(4):360-367.

13. National Population & Household Census. *Tehran: President Deputy Strategic Planning and Control*. Tehran, Iran: Statistical Centre of Iran 2006; 3(2): 132–75.[in Persian]

14. Khoshbin S, Rahimi A, Navaeiyan N. *Population Forecasts of Iran*. 1st ed. Tehran, Iran: Ministry of Health and Medical Education Publication 2004; 2(3): 24–51.[in Persian]

15. Seligman HK, Laraia BA, Kushel MB. Food insecurity is associated with chronic disease among low-income NHANES participants. *J Nutr*. 2010;140(2):304-313.

16. Dastgiri S, Tutunchi H, Ostadrahimi A, Mahboob S. Sensitivity and specificity of a short questionnaire for food insecurity surveillance in Iran. *Food Nutr Bull*. 2007;28(1):55-58.

17. Gholami A, Foroozanfar Z. Household food security status in the northeast of Iran: a cross-sectional study. *Med J Islam Repub Iran*. 2015;29:227.

18. Blumberg SJ, Bialostosky K, Hamilton WL, Briefel RR. The effectiveness of a short form of the household food security scale. *Am J Public Health*. 1999;89(8):1231-1234.

19. Asteriou D, Hall SG. *Applied Econometrics*. New York, USA: Macmillan International Higher Education; 2015.

20. Fernandes SG, Rodrigues AM, Nunes C, et al. Food insecurity in older adults: results from the epidemiology of chronic diseases cohort study 3. *Front Med*. 2018;5:203.

21. Dean W, Sharkey J, Johnson C. Food insecurity is associated with social capital, perceived personal disparity, and partnership status among older and senior adults in a largely rural area of Central Texas. *J Nutr Gerontol Geriatr*. 2011;30(2):169-186. https://doi.org/10. 1080/21551197.2011.567955.

22. Valtorta NK, Hanratty B. Socioeconomic variation in the financial consequences of ill health for older people with chronic diseases: a systematic review. *Maturitas*. 2013;74(4):313, 23415927-333.

23. Goldberg SL, Mawn BE. Predictors of food insecurity among older adults in the United States. *Public Health Nurs*. 2015;32(5):397-407.

24. Behzadifar M, Behzadifar M, Abdi S, et al. Prevalence of food insecurity in Iran: a systematic review and meta-analysis. *Arch Iran Med*. 2016;19(4):288-294.

25. Tavakoli S, Dorosty-Motlagh AR, Hoshyarrad A, Eshraghian MR. Food insecurity and some associated risk factors among Iranian elderly women. *Int Res J Appl Basic Sci*. 2016;10(1):1-4.

26. Cheraghi M, Kazemi N. Food security and related economic factors in rural elderly women. *Koomesh*. 2018;20(2):203-209.

27. Tiwari S, Daidone S, Ruvalcaba MA, et al. Impact of cash transfer programs on food security and nutrition in Sub-Saharan Africa: a cross-country analysis. *Glob Food Sec*. 2016;11:72-83.

28. Rostami F, Shahmoradi M, Baghaei S. The effect of financial development on food security of rural household (case studied village Karnachi City Kermanshah). *Agri Econ Develop Res*. 2015;4(2):725-735.[in Persian].

29. Omotesho OA, Adewumi MO, Fadimula KS. Food security and poverty of the rural households in Kwara State: Nigeria. *Libyan Agri Res Cent J Int*. 2010;1(1):56-59.

30. Dastgiri S, Mahboob S, Tutunchi H, Ostadrahimi A. Determinants of food insecurity: a cross-sectional study in Tabriz. *J Ardabil Univ Med Sci*. 2006;6(3):233-239.

31. Lee JS, Frongillo EA. Factors associated with food insecurity among U.S. elderly persons: importance of functional impairments. *J Gerontol B Psychol Sci Soc Sci*. 2001;56(2):94-99.

32. Ziaee SM, Shirani Bidabadi F, Ashraghi F, Karamatzadeh A. Factors affecting choice coping strategies using less product reference and low-cost in terms of food security of rural household Gorgan. *J Rural Dev*. 2014;17(3):123-142.[in Persian].

33. Souza BF, Marín-León L. Food insecurity among the older adults: cross-sectional study with soup kitchen users. *Rev Nutr*. 2013;26(6): 679-691.

34. Khodabakhshzadeh S, Moradabadi SA, Khodabakhshzadeh S, Baniasadi M, Khalilabad TH. Food security and its related factors in the rural households of Bam city in Iran: a logistic regression model approach. *Arch Iran Med*. 2018;21(1):26-28.

35. Rezapour A, Vahedi S, Khiavi FF, Esmaeilzadeh F, Javan-Noughabi J, Rajabi A. Catastrophic health expenditure of chronic diseases: evidence from Hamadan, Iran. *Int J Prev Med*. 2017;8:22-31.

36. Jih J, Stijacic-Cenzer I, Seligman HK, Boscardin WJ, Nguyen TT, Ritchie CS. Chronic disease burden predicts food insecurity among older adults. *Public Health Nutr*. 2018;21(9):1737-1742.

37. Wicks R, Trevena LJ, Quine S. Experiences of food insecurity among urban soup kitchen consumers: insights for improving nutrition and well-being. *J Am Diet Assoc*. 2006;106(6):921-924. https://doi.org/10.1016/j.jada.2006.03.006.