


Food insecurity status and associated factors among rural households in the north of Iran

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Abstract

Background: Iran has been experiencing an accelerated change in the nutrition and health of its people, which has led to considerable variations in the country's nutritional status. Little is known about the food insecurity status in the north of Iran. **Aim:** The present study aimed to investigate the food insecurity status and factors associated with it in a rural area in the north of Iran. **Methods:** This cross-sectional study was conducted among 573 rural households in Guilan Province in the north of Iran. The food insecurity status of the households was measured using the Household Food Insecurity Access Scale. Data on the demographic characteristics of the households and their depression status were collected by interviewing the heads of the households. The socioeconomic status index of the households was constructed using factor analysis, and a multivariate ordinal logistic regression model was used to estimate the adjusted odds ratio of the independent predictors of food insecurity. **Results:** The results indicated that approximately half of the households (50.8%) had experienced mild (43.2%), moderate (6.5%) or severe (1.1%) food insecurity. The multivariate model showed that sex, age, depression status of the head of the household and having a patient with a chronic condition in the household were independently associated with food security status. **Conclusions:** This study showed that food insecurity was highly prevalent among rural households in the north of Iran. The study concludes that interventions with the aim of reducing the prevalence of food insecurity, depression and chronic diseases in the area can be effective in improving the nutritional status of the households.

Keywords

Food insecurity, nutrition, households, Iran

Introduction

Food security is defined as a status according to which 'all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life' (Dasgupta et al., 2016). Nutrition and food security are characterized by four dimensions: (a) availability of adequate amounts of nutritional food; (b) enough economic and physical access to food; (c) the ability to utilize food; and (d) the stability of the three items. The absence of any of these items results in food insecurity, which can be associated with a range of adverse health outcomes. Studies have shown that it is associated with several cardiometabolic problems including diabetes and obesity (Gundersen and Ziliak, 2015; Morales and Berkowitz, 2016). The uncertainty involved in not having access to adequate food can limit adherence to dietary measures needed to prevent and control chronic problems; as a result, studies have suggested that making a particular effort to address food insecurity can be a way of

improving health (Berkowitz et al., 2017). In addition to affecting the quality of life, insecurity is a complex and multidimensional phenomenon that may have negative psychological, social and cultural dimensions. Food insecurity is known to be an important public health problem across the world, and many people suffer from it.

According to the estimates by the Food and Agriculture Organization of the United Nations (FAO) in 2017, close to

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10% of the world's population (769.4 m people) suffer from severe food insecurity. In 2017, the prevalence of severe food insecurity in Asia and Western Asia was 6.9% (311.9 m people) and 10.5% (Automobile ownership 28 m people), respectively (Food and Agriculture Organization of the United Nations, 2018).

Household expenditure research studies in 2002 in Iran, which is located in Western Asia, showed that 20% of the population do not have economic access to satiety (Ghassemi et al., 2002). A meta-analysis of Iranian experiential and perception-based studies showed that the prevalence of food insecurity based on household income/expenditure surveys was 10% (Mohammadi-Nasrabadi et al., 2014). Additionally, in a study by Behzadifar et al. (2016), the overall prevalence of food insecurity among Iranian households was 49%.

Research has shown that food insecurity varies depending on gender, ethnicity and geographical differences (Rezazadeh et al., 2016; Yang et al., 2005). Furthermore, economic status, social policies that affect prices, income level, employment and food availability can also affect food security (Studdert et al., 2001).

Considering that food security is an indicator of individual and family health, understanding the factors associated with it is necessary for every society. According to relevant studies, a high percentage of the population in developing countries live in rural areas (Bashir and Schilizzi, 2013). These people are most vulnerable to food insecurity because rural areas have characteristics such as a limited number of markets and less diversity and availability of food items, which may affect the food security of people living there. Moreover, rural residents may be unable to obtain enough food for all family members because of insufficient money or other reasons such as the size of the family or education level of the head of the household.

The COVID-19 pandemic has posed many challenges for the world's population that have affected many aspects of people's lives, including nutritional behaviours. The enforced restrictions aimed at containing the infection can result in at least two undesirable consequences for food security. First, the closure of food supply industries and service providers results in limited access to fresh food. Ultimately, this may affect the immune system, which is crucial in the fight against COVID-19 (Ammar et al., 2020). Second, the loss of income and the subsequent economic crisis have increased the risk of food insecurity for many households (World Bank Group, 2020). Iran is a multiethnic country experiencing an accelerated change in the nutrition and health of its people, leading to considerable variations in the nutritional status of the population (Azizi et al., 2005). As a result, nutritionally poor food characterizes the diet of the people, and overeating and obesity are evident among more than a third of the population (Ghassemi et al., 2002; Mohammadi-Nasrabadi et al., 2014). Therefore, information on the population's food insecurity is needed to develop policies on the nutritional status of the people (Deitchler et al., 2010;

Mohammadi-Nasrabadi et al., 2014). Little is known about the food insecurity status in the north of Iran. Therefore, the present study has the aim of investigating the food insecurity status and possible factors associated with it in a rural area of Guilan Province in the north of Iran.

Methods

Study design and sample

This cross-sectional study was conducted during the period 2018–2019 among the rural population of Rasht County, which is located in the north of Iran. Considering a previous estimate of 45% prevalence of food insecurity in rural areas (Zeraat Kish and Kamaei, 2017), a 5% precision level and a cluster sampling design effect of 1.5, 573 participants were recruited. The participants were selected using a multistage random sampling method. In Iran, households in rural areas are fully covered by the government public health system. A total of 4 clusters out of 16 rural health care centres were randomly selected. The participants were assigned to each cluster proportionally and were selected using a systematic random sampling method.

Measurement

The data collection form consisted of three parts: (a) demographic information and depression status of the head of the household; (b) characteristics of the household; and (c) the food security questionnaire. After informing the participants about the purposes of the study, informed consent was obtained from the heads of the households. All information was collected by interviewing the heads of the households. Depression was measured using the Beck Depression Inventory (Collet and Cottraux, 1986). The questionnaire contains 13 items based on a 4-point Likert scale and the items are scored from 0 to 3. Based on their answers, the respondents were categorized as having normal (0–4), mild (5–7), moderate (8–15) or severe depression (≥ 16 point). The psychometric properties of the inventory have been evaluated and confirmed by Collet and Cottraux (1986). Data on the characteristics of the households, including information on assets, belongings, existing infrastructure and sanitation facilities, were collected. The food security of the households was measured using the Household Food Insecurity Access Scale (HFIAS) (Coates, 2004). The HFIAS consists of a set of nine items and provides a simple and reliable approach for measuring the food access components of households. The questionnaire was translated into Persian and validated in a previous study (Mohammadi et al., 2012). In the study by Mohammadi et al, the construct validity of the questionnaire was assessed using exploratory factor analysis, and nine items were loaded into two factors accounting for 65% of the variance in responses. Using Cronbach's α , the reliability of the questionnaire was estimated at 0.855 (95%

CI: 0.837, 0.888) for the items, indicating an acceptable internal consistency.

Data analysis

The data analysis was performed using Stata version 13. The data were described using the mean, standard deviation, frequency and percentage depending on the type of variable. Based on Vyas and Kumaranayake (2006), we used principal component analysis of the households' assets to define a socioeconomic index (Ghassemi et al., 2002). The appropriateness of factor analysis was checked by Bartlett's test of sphericity. The first principal component was considered as the measure of socioeconomic condition. The socioeconomic index (SEI) was calculated as the sum of the characteristics of the individual. In this study, the SEI was considered as the main predictor, and other variables including age, sex, depression status of the head of the household and having a patient with a chronic condition in the household were considered as confounders. Baseline and socioeconomic variables were compared using the chi-square test, analysis of variance and the Kruskal–Wallis test. The significant variables with a p-value of less than 0.1 were entered into the multivariable model. To estimate the adjusted odds ratio of the independent predictors, a multivariate ordinal logistic regression model was used. The proportional odds assumption was assessed using a score test. A p-value of less than 0.05 was considered as statistically significant.

Results

Of the participants in the study, 274 were men with a mean age of 52.4 (SD=12.6) and 299 were women with a mean age of 50.3 (SD=13.2). The mean family size was 3.47 (SD=1.16). There was at least one patient with a chronic condition in 62% of the households. The SEI of the households (Ghassemi et al., 2002) was constructed by running a factor analysis on the properties of the household (Table 1). The variables with a positive factor score are associated with a higher SEI, and those with a negative factor score are associated with a lower SEI. The constructed socioeconomic index was then presented in the form of quintiles.

The mean score of food security in the area was 2.48 (SD=3.11, min=0, max=18). A total of 38 respondents (6.6%) did not complete the food security questionnaire and were not considered in the analysis. Approximately half of the households (50.8%) had experienced mild (43.2%), moderate (6.5%) or severe (1.1%) food insecurity. Post-hoc power analysis for the prevalence of food insecurity in the sample showed a power of 83%. Because of the small number of the respondents in the severe food insecurity status, the two groups of moderate and severe insecurity were merged. Table 2 illustrates the demographic and household characteristics in terms of food security status. The households with a female head were less likely to have

Table 1. Results from principal component analysis.

	Mean	SD	Factor score
Automobile	0.55	0.49	0.118
Motor	0.34	0.47	0.042
Television	0.84	0.37	0.096
Washing machine	0.56	0.49	0.155
Vacuum cleaner	0.67	0.46	0.023
Refrigerator	0.84	0.37	0.099
Stove	0.52	0.50	-0.022
Oven	0.39	0.49	0.111
Computer	0.36	0.48	0.161
Internet	0.27	0.44	0.159
Electricity	0.98	0.12	0.029
Telephone	0.85	0.35	0.054
Piped gas	0.90	0.29	0.079
Water piping	0.76	0.42	0.132
Bathroom	0.92	0.28	0.091
Kitchen	0.90	0.29	0.092
Crowding index*	1.97	1.03	-0.106
House area (m ²)	215	282	0.105

SD: standard deviation.

*ratio of number of people to the number of rooms in the household.

Table 2. Demographic and household characteristics of rural households according to food security status.

Variables	Food security N=263	Mild insecurity N=231	Moderate to severe insecurity N=41	p-value
Sex				0.005
Male	109(42.4)	122(47.5)	26(10.1)	
Female	154(55.4)	109(39.2)	15(5.4)	
Age in years	52(12.5)	49.7(13.1)	53(14.1)	0.06
Mean (SD)				
Household income (in Rial*)				0.52
<2,500,000	185(48)	175(45.1)	28(7.2)	
2,500,000–4,500,000	76(53)	54(38)	12(8.5)	
>4,500,000	2(40)	2(40)	1(20)	
Family size				0.37
1–2	47(44.8)	50(47.6)	8(7.6)	
3–5	200(49.3)	175(43.1)	31(7.6)	
6–10	16(66.7)	6(25)	2(8.3)	
Number of children				0.59
0–2	200(48.3)	180(43.5)	34(8.2)	
3–6	63(52.1)	51(42.1)	7(5.8)	
Having a chronic patient in the household				0.04
No	104(51.7)	89(44.3)	8(4)	
Yes	159(47.6)	142(42.5)	33(9.9)	
Depression score of head of household				0.001
Mean (SD)	1.92(4.4)	2.89(4.4)	5.12(5.8)	
Socioeconomic indices				0.035
Poorest	55(43)	64(50)	9(7)	
Second	55(42.3)	59(45.4)	16(12.3)	
Middle	95(56.2)	62(36.7)	12(7.1)	
Richest	58(53.7)	46(42.6)	4(3.7)	

SD: standard deviation.

*currency unit of Iran.

Values are frequency (%) unless otherwise indicated.

Table 3. Ordinal logistic regression for predictors of food insecurity.

	Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Sex (female)	0.58(0.42–0.81)	0.001	0.61(0.42–0.89)	0.01
Age				
23–45	1	0.04	1	0.004
45–65	0.68(0.48–0.97)	0.78	0.58(0.39–0.83)	0.19
65–85	0.93(0.55–1.56)		0.69(0.39–1.19)	
Depression status of head of household				
Normal	1	0.04	1	0.13
Mild	1.79(1.02–3.13)	0.001	1.56(0.87–2.81)	0.001
Moderate to severe	3.63(2.20–6.01)		3.63(2.15–6.12)	
Having a patient with a chronic condition in the household	1.29(0.92–1.81)	0.14	1.46(1.02–2.08)	0.04
Socioeconomic index				
Poorest				
Second	1	-	1	-
Middle	1.14(0.71–1.83)	0.57	1.25(0.77–2.05)	0.36
Richest	0.63(0.40–0.98)	0.04	0.87(0.54–1.39)	0.55
	0.65(0.39–1.07)	0.09	1.00(0.58–1.75)	0.98

OR: odds ratio; CI: confidence interval.

food insecurity (44.6%) than those with a male head (57.6%). The proportion of food insecurity in households that had a patient with a chronic condition (52.4%) was significantly higher than in those without (44.7%). The mean score of the depression scale for the heads of households with moderate to severe food insecurity and mild insecurity was significantly higher than those with food security.

Table 3 shows the results of the multivariate ordinal logistic model. After adjustments for potential confounders, it was discovered that the variables of sex, age, depression status of the head of household and having a patient with a chronic condition in the household were independently associated with food security status. Households that had a patient with a chronic condition were 1.46 times more likely to have mild to severe food insecurity. The households with a female head were significantly less likely to experience food insecurity. The households with heads in the 45–65 age bracket had the lowest odds of food insecurity compared with the households that had either younger or older heads. Those households with heads having a moderate to severe depression status were more than three times as likely to suffer from mild to moderate food insecurity than the households with heads who had a normal depression status (p-value=0.001).

Discussion

In the current cross-sectional study, 50.8% of the rural households had food insecurity. The level of food security was independently associated with sex, age and the depression status of the head of the household. Additionally, having a patient with a chronic condition in the household was associated with food security status.

The prevalence of food insecurity in our research is in agreement with the findings of previous studies in Iran.

According to the results of a systematic review in 2016, the overall prevalence of food insecurity among Iranian households was 49% (Behzadifar et al., 2016).

Both developed and developing countries are worried about food insecurity. In the USA, 14.6% of households had food insecurity (Nord, 2010). Similarly, in Australia and Canada, Over 5% and 10% of the population, respectively, suffered from food insecurity (Booth and Smith, 2001; Che and Chen, 2001). The situation is worsening in the developing regions because high food prices and economic crises are deeply affecting these areas. Around 294.7 m people are suffering from food insecurity in South Asia alone (Zhou et al., 2019). Specifically, a study by Bashir et al. (2013) showed that about 23% of the households in Pakistan were found to be suffering from food insecurity.

In our study, the households with heads who had a moderate to severe depression status were over three times more likely to suffer from mild to moderate food insecurity than those households with heads having a normal depression status, which is consistent with the results of previous studies. The majority of analyses examining depression and food insecurity have reported some form of association (Alpert et al., 2000; Huddleston-Casas et al., 2009; Olson et al., 2006). A study by Huddleston-Casas et al. (2009) discovered a causal relationship between food insecurity and depression in a sample of rural low-income families in the USA. In a review of 36 articles, Maynard et al. (2018) showed a link between food insecurity and depression among women in high-income countries.

It is known that the experience of food insecurity is a stressful life event. Additionally, food insecurity is linked to dietary inadequacy, specific nutrient deficiencies and symptoms of depression (Bodnar and Wisner, 2005; Huddleston-Casas et al., 2009). Furthermore, depression could inhibit an

individual from maintaining steady employment, thereby increasing his/her vulnerability to food insecurity.

Gender can also be viewed as an important factor contributing to food security. In our population, households with a female head were significantly less likely to experience food insecurity.

In rural areas of northern Iran, most women cultivate agricultural products and are the major labour force for rice cultivation. It is also true that women's skill in financial management has a positive impact on household diet.

The results of our study, however, were in contrast to previous studies in other developing countries.

Studies in South Africa (Oluwatayo, 2009) and Yemen (Kabbani, 2005) showed that the relationship between a female head of household and food security was negative, suggesting that the incidence of food insecurity increased in those households that had a female head.

In the present study, households that had a patient with a chronic condition were 1.46 times more likely to have food insecurity. Several studies have demonstrated degrees of association between food insecurity and chronic diseases such as cardiovascular disease, diabetes, chronic kidney disease and hypertension (Berkowitz et al., 2015; Seligman et al., 2009; Wang et al., 2015). In a study that used data from the Continuous National Health and Nutrition Examination Survey 2005–2012 to calculate the rates of food insecurity for those with and without conditions such as diabetes mellitus, hypertension, coronary heart disease and heart failure, the average annual percentage change in food insecurity for those with a cardiometabolic condition was 13.0% (Berkowitz et al., 2017). According to previous studies, chronic diseases are nutrition-related diseases, and the introduction of therapy to prevent and manage chronic diseases is a new method of treatment (Eckel et al., 2014; Salari et al., 2017; Seligman and Schillinger, 2010). This can explain the association between food insecurity and chronic diseases that we evaluated in our study. Although Seligman et al. (2009) showed that food insecurity was associated with clinical evidence of hypertension and diabetes, the association between food insecurity and hyperlipidemia was weak. In a study by Holben et al. (2006) among adults in rural Ohio, no relationship between food insecurity and clinical indicators of disease including hypertension, hyperlipidemia and hyperglycemia was reported.

The age of the head of the household is expected to have an impact on the food security of the family. However, the expected effect of age on food security could be positive or negative. In this study, the heads of households in the 45–65 age bracket had the lowest odds of food insecurity compared with the younger and older ones. Babatunde et al. (2007) showed that the older the head of the household, the lower the probability that the household would be food secure. They also reported that young people are stronger and are expected to cultivate a larger size farm than older people.

This study showed that food insecurity was highly prevalent among rural households in the north of Iran. The study concludes that interventions with the aim of reducing

the prevalence of food insecurity, depression and chronic diseases in the area can be effective in improving the nutritional status of the households. Improving nutrition culture and literacy, and nutrition education can improve the knowledge and practices of food providers. Additionally, primary care clinics can be a main channel through which to address food insecurity and could screen patients for this. In our study it was shown that depressed heads of household were over three times more likely to suffer from food insecurity than those not suffering from depression. Therefore, programmes and services designed to improve the mental health of rural families could include food security and nutritional evaluations as part of their assessments. Moreover, food security programmes directed at the nutritional needs of low-income families could address the potential influence of depression on food insecurity by assessing the need for mental health services. In our study, we used cross-sectional design. Hence, it is impossible to determine a causal relationship between the various factors.

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Declaration of conflicting interests

The authors have no conflicts of interest to declare.


Ethical statement

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