Food Security and Its Association with Social Support in the Rural Households: A Cross-Sectional Study

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ABSTRACT: Food insecurity is a major and multidimensional global problem, particularly in rural and vulnerable areas. In this cross-sectional study, we aimed to identify the relationship between social support and food insecurity in 404 Iranian rural households. We selected the sample by cluster random sampling and collected data using three questionnaires [demographic, Multidimensional Perceived Social Support Scale (MSPSS), and United States Department of Agriculture food security questionnaires] and analyzed data using chi-square tests and logistic regression (using SPSS version 19.0). Of the 404 Iranian households, 168 (41.6%) were classified as food secure. The logistic regression analysis revealed that education and job status of the household heads and household income were significantly associated with food security status. Additionally, perceived social support was protective against food insecurity after adjusting for confounding factors [compared with the first quartile, second quartile odds ratio (OR)=1.76, 95% confidence interval (CI): 0.94~3.3 and fourth quartile OR=2.21, 95% CI: 1.13~4.33]. This study indicated that social support contributes to a reduced chance of food insecurity in rural households. These results suggest that policy makers should focus on strengthening social support in vulnerable communities to help protect against hunger and poverty.

Keywords: food security, logistic regression, rural households, social support

INTRODUCTION

Food security is one of the major health, social, economic, and political issues across the world, especially the third-world countries (Radimer et al., 1990). According to the World Food Summit definition, food security is achieved at the individual, household, national, regional, and global levels "when all people at all times have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life". This definition, which incorporates four aspects of food availability, access to food, stability of food intake, and usability has been narrowed down from the global to the local context at the household level. Household food security as a unit of analysis has gained increased popularity in recent years, especially in rural settings where households are the primary unit of production, consumption, and exchange (Radimer et al., 1990; Pinstrup-Andersen, 2009; Maharjan and Joshi, 2011).

The Food and Agriculture Organization has reported that 12.5% of the world's population (1 out of every 8 people) are suffering from chronic hunger (65% of who live in different parts of Asia) (Alimoradi et al., 2015). Food insecurity is a multidimensional and complex problem and several demographic, environmental, social, and economic factors should be considered in studies and in decision- and policy-making (Bocquier et al., 2015; Mokari Yamchi et al., 2018). Nevertheless, beyond poverty- and financial-related adverse conditions that make families vulnerable to food insecurity, other aspects of people's lifestyles that influence their success in meeting food intake needs. One aspect is social support (Miller, 2015; Sseguya et al., 2018). Social support can be emo-

tional or informational and includes companionships within a person's social network, such as spouses, family, friends, neighbors, and other community members (Brummett et al., 2005; Sharifi et al., 2017).

The type of social support varies based on culture, ethnicity, and socioeconomic status (Miller, 2015). Studies have shown that social support programs play an effective role in the management of food security and to decrease vulnerability (Devereux, 2016). Walker et al. (2007) demonstrated a reverse relationship between social support and food insecurity, which directly affects health status.

Food insecurity can cause several problems, including developmental, health, and nutritional problems. Therefore, awareness of factors affecting food insecurity improves our comprehension of what influences food insecurity for families. Assuming that social support can improve food and nutrition security and considering that this association has been understudied, we aimed to verify the association between social support and food insecurity in the rural households of Marand city, North West of Iran.

MATERIALS AND METHODS

This cross-sectional study was conducted on 404 households in rural regions of Marand city in 2019. Marand is located on the Northwest of the East Azarbaijan province of Iran. Sampling was carried out using cluster random sampling. The rural region of the city was sub-divided into three districts based on similarities in geographical characteristics. Each district was considered as a cluster. The appropriate sample size for each district was calculated and identified based on the number of household residents, whilst considering the main sample size. Health centers in each district were selected randomly for sampling. The study was reviewed and approved by the ethics committee (No: IR.SBMU.RETECH.REC.1398.578) of Shahid Beheshti University of Medical Sciences and all participants provided written informed consent. Data were collected using three questionnaires: demographic, Multidimensional Perceived Social Support Scale (MSPSS), and United States Department of Agriculture (USDA) food security questionnaires. The questionnaires were administered through individual structured interviews with the head of each household.

The MSPSS is a 12-item scale that measures perceived support from family, friends, and others. Each item is rated on a 7-point Likert-type scale (very strongly disagree to very strongly agree) (Zimet, 1988).

The MSPSS questionnaire has been validated in Iran by Bagherian-Sararoudi et al. (2013). The Cronbach's alpha values used in the current study were 0.89, 0.92, and 0.87 for the dimensions of friend, partner, and family, respectively (Bagherian-Sararoudi et al., 2013).

The 18-item questionnaire proposed by the USDA was used to assess household food security status during the previous year. The validity of this questionnaire for Iranian households has been previously approved (Rafiei et al., 2009). Based on the USDA cut off, subjects were divided into 4 groups: high food security (score 0~2.32), borderline food security (score 2.33~4.55), low food security (score 4.56~6.52), and very low food security (score >6.52). To ensure a sufficient sample size in each group, participants were divided into two groups: food insecure (very low, low, and borderline food security groups), and food secure (high food security) (Bickel et al., 2000).

Dietary intake was assessed using a previously validated 168 item food frequency questionnaire (Mirmiran et al., 2010). The frequency of consumption (never, per day, per week, per month, or per year), and the usual amount consumed per meal for each food item were asked during face-to-face interviews. Food items were grouped into nine food groups, as follows: bread and cereals, legumes, fruits, vegetables, dairy, meat, eggs, oils, and sugars.

Statistical analysis

Data were analyzed using SPSS version 19.0 (IBM Corp., Armonk, NY, USA). The Kolmogorov-Smirnov test was used to determine normal distribution of the data. Chi-square tests was used to compare the qualitative variables. Linear logistic regression was carried out to examine the relationship between the variables and food security status. Also, we used adjusted logistic regression models based on evidence found in the literature supporting the association between variables with food security status (Stuff et al., 2007); variables included gender, age, and education level of the household heads, and total household income. One-way analysis of variance (ANOVA) was performed to evaluate the differences in dietary variables between groups. Tukey's post-hoc tests were carried out to evaluate differences within the groups. Analysis of covariance (ANCOVA) was also used to adjust values for total energy intake. P-values <0.05 were used to indicate statistical significance.

RESULTS

In total, 404 households from three participating regions were enrolled. Demographic characteristics of the households are summarized in Table 1. Chi-square tests showed a significant relationship between food security status and the household heads' education (P=0.001), job (P=0.02), household income (P=0.001), and family number (P=0.03). The mean average age of the household heads was 46.16±10.88 years and 89.6% were male. The over-

Table 1. Demographic characteristics of the households/household heads (n=404)

Variable	Insecure (n=236)	Secure (n=168)	P-value
Sex			
Male	207 (87.7)	155 (92.3)	0.18
Female	29 (12.3)	13 (7.7)	
Age			
Q1 (20~38 y)	72 (28.6)	35 (23)	0.71
Q2 (39~45 y)	64 (25.4)	51 (33.6)	
Q3 (46~55 y)	52 (20.6)	32 (21.1)	
Q4 (56~84 y)	64 (25.4)	34 (22.4)	
Marital status			
Married	177 (75)	117 (69.6)	0.25
Divorced or widowed	59 (25)	51 (30.4)	
Education			
Under diploma	216 (85.7)	74 (48.7)	0.001
Diploma and over	36 (14.3)	78 (51.3)	
Family number			
≤3	61 (24.2)	52 (34.2)	0.03
>3	191 (75.8)	100 (65.8)	
Job			
Worker and farmer	106 (42.1)	37 (24.3)	0.02
Government employee	15 (6)	30 (19.7)	
Self-employed	107 (42.5)	73 (48)	
Unemployed and retired	24 (9.5)	12 (7.9)	
Income			
Q1	131 (52)	37 (24.3)	0.001
Q2	90 (35.7)	63 (41.4)	
Q3	18 (7.1)	26 (17.1)	
Q4	13 (5.2)	26 (17.1)	

The variables are presented as frequency (%).
P-values are reported based on chi-squared tests.

all prevalence of food security is shown in Fig. 1; 41.6% of the households were classified as food secure, 37.9% were classified as having borderline food security, 17.1% were classified as having low food security and 3.5% were classified as having very low food security.

The social support statuses of the participants (three subscales of MSPSS including the significant other, family, friends, and total) are shown (lowest to highest) in Table 2.

The estimated odds ratios (OR) and 95% confidence intervals (CI) of binary logistic regression analysis are shown in Table 3. The results showed that a high level of education of the household head is protective against food security. The probability of food security in households with a well-educated head was 7.79 times higher than households with poorly-educated heads (OR=7.79, 95% CI: 4.73~12.8); this remained significant after controlling for sex and age of the household heads, and total household income (OR=6.24, 95% CI: 1.37~2.28). The probability of food security in households where the head of the family was an government employee was 7.08 times higher than when the head of the family was a worker or farmer (OR=7.08, 95% CI: 3.32~15); this remained significant after adjusting for other variables (OR
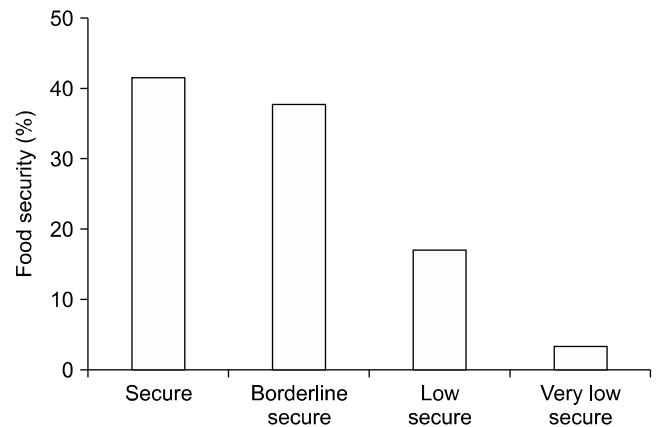

Fig. 1. Prevalence of food insecurity and its levels in the studied households.

=2.45, 95% CI: 1~5.95). Also, household in which the head of the family with self-employed had higher odds of food security (OR=2.1, 95% CI: 1.31~3.36). In both unadjusted and adjusted analyses, the risk of food insecurity decreased with increased income [compared with the first quartile, second quartile OR=2.53 (95% CI: 1.57~4.05); third quartile OR=4.76 (95% CI: 2.36~9.59); and fourth quartile OR=8.7 (95% CI: 3.91~19.3)].

Additionally, logistic regression analysis revealed that

Table 2. Distribution of food security status based on the participants' social support sub-scales

Variable	Insecure (n=236)	Secure (n=168)	P-value
Family			
Q1 (12~19)	86 (36.4)	43 (25.6)	0.001
Q2 (20~23)	70 (29.7)	31 (18.5)	
Q3 (24~26)	55 (23.3)	55 (32.7)	
Q4 (27~30)	25 (10.6)	39 (23.2)	
Friends			
Q1 (8~12)	68 (28.8)	41 (24.4)	0.57
Q2 (13~15)	76 (32.2)	54 (32.1)	
Q3 (16~18)	55 (23.3)	52 (31)	
Q4 (19~23)	37 (15.7)	21 (12.5)	
Significant others			
Q1 (11~20)	78 (33.1)	37 (20.2)	0.001
Q2 (21~23)	68 (28.8)	46 (27.4)	
Q3 (24~25)	47 (19.9)	36 (21.4)	
Q4 (26~33)	43 (18.2)	52 (31)	
Total			
Q1 (33~54)	76 (32.2)	35 (20.8)	0.01
Q2 (55~60)	61 (25.6)	49 (29.2)	
Q3 (61~64)	57 (24.2)	41 (24.4)	
Q4 (65~78)	42 (17.8)	43 (25.6)	

The variables are presented as frequency (%).
P-values are reported based on chi-squared test.

Table 3. Results of logistic regression analysis of food security status and the variables assessed

Variable	Unadjusted OR	95% CI	P-value	Adjusted OR[1]	95% CI	P-value
Sex						
Male	1	—	—	1	—	—
Female	0.59	0.3~1.18	0.14	0.82	0.38~1.86	0.61
Age						
Q1 (20~38 y)	1	—	—	1	—	—
Q2 (39~45 y)	1.43	0.83~2.44	0.19	1.52	0.82~2.83	0.17
Q3 (46~55 y)	1.13	0.63~2.04	0.66	1.12	0.57~2.2	0.73
Q4 (56~84 y)	1.2	0.67~2.11	0.51	1.31	0.69~2.5	0.39
Marital status						
Married	1	—	—	1	—	—
Divorced or widowed	1.3	0.84~2.03	0.23	0.74	0.95~3.18	0.07
Education						
Under diploma	1	—	—	1	—	—
Diploma and over	7.79	4.73~12.8	0.001	6.24	1.37~2.28	0.001
Family number						
≤3	1	—	—	1	—	—
>3	0.74	0.47~1.14	0.17	0.99	0.59~1.67	0.98
Job						
Worker and farmer	1	—	—	1	—	—
Government employee	7.08	3.32~15	0.001	2.45	1~5.95	0.04
Self-employed	2.1	1.31~3.36	0.002	1.31	0.77~2.22	0.31
Unemployed and retired	1.63	0.76~3.51	0.2	1.19	0.49~2.86	0.69
Income						
Q1	1	—	—	1	—	—
Q2	2.53	1.57~4.05	0.001	2.15	1.29~3.57	0.003
Q3	4.76	2.36~9.59	0.001	3.2	1.49~6.87	0.003
Q4	8.7	3.91~19.3	0.001	5.25	2.21~12.4	0.001

All variables were entered in the regression model simultaneously.
OR, odds ratio; CI, confidence interval.
[1]Adjusted for gender, age and education level of household heads and total household income.

social support was a protective factor against food insecurity. Adjusted and unadjusted OR of household food security increased with higher perceived social support [compared with the first quartile, second quartile OR= 1.74 (95% CI: 1~3.02) and fourth quartile OR=2.22 (95% CI: 1.24~3.98)]. Similar results were observed for the sub-categories of 'family' and 'others' social support (Table 4).

Analysis using the one-way ANOVA showed that mean total energy, legume, and sugar ($P<0.05$) intake were significantly higher in food secure households with high social support. Our analyses also showed that the food secure households with low social support had significantly higher intake of protein, fat, and sugars ($P<0.05$) compared with food insecure groups. Additionally, significances were not changed after adjusting for total energy intake using ANCOVA (Table 5).

DISCUSSION

This study aimed to estimate the prevalence of food insecurity and its association with social support in rural households. We found that the prevalence of household food insecurity (low, very low, and borderline food security) was 58.5%. Various studies have shown the prevalence of food insecurity in developed countries ranges from 4 to 14% (Booth and Smith, 2001), whereas the prevalence in developing countries is higher (estimated to range from 7.5 to 73%) (Sharifi et al., 2017). Inconsist-

ent to our findings, a recent study reported that the prevalence of food insecurity in 2,160 households in the southeastern of Iran was 58.8% (Mortazavi et al., 2017). A meta-analysis of 7 studies conducted in Iran from 1991 to 2011 determined that the estimated prevalence of mild, moderate, and severe food insecurity is 28.5%, 14.9 %, and 6.0%, respectively (Mohammadi-Nasrabadi et al., 2014). In a study of the rural households in Bam city, Iran, Khodabakhshzadeh et al. (2018) revealed that 35.67% of households had a full food security status and the rest (64.33%) were food insecure.

In the present study, we observed significant associations between food security and socioeconomic factors, including household income, and the education and job status of the household head.

Total household income was hypothesized to positively influence food security. In agreement with the hypothesis, households with higher incomes are less likely to have food insecurity. Increased household income level increases the purchasing power. Various studies in rural and urban contexts have indicated that income is an important determinant of household food insecurity (Sharifi et al., 2017; Khodabakhshzadeh et al., 2018).

The education level and job status of the household head have a significant positive impact on household food security. Accordingly, an increase in education level (from under diploma level to higher education) and an improvement in the employment status of the household head increased the likelihood of food security among households of rural areas in Marand city; this effect has also

Table 4. Results of logistic regression analysis of food security status and social support sub-scales

Variable	Unadjusted OR	95% CI	P-value	Adjusted OR[1]	95% CI	P-value
Family						
Q1 (12~19)	1	−	−	1	−	−
Q2 (20~23)	0.86	0.5~1.54	0.67	1	0.53~1.89	0.98
Q3 (24~26)	2	1.18~3.37	0.009	1.78	0.98~3.23	0.05
Q4 (27~30)	3.12	1.67~5.8	0.001	3.08	1.5~6.19	0.002
Friends						
Q1 (8~12)	1	−	−	1	−	−
Q2 (13~15)	1.17	0.7~1.98	0.53	1.25	0.68~2.29	0.46
Q3 (16~18)	1.5	0.91~2.69	0.1	1.77	0.95~3.29	0.07
Q4 (19~23)	0.85	0.48~1.82	0.85	0.79	0.36~1.71	0.55
Significant others						
Q1 (11~20)	1	−	−	1	−	−
Q2 (21~23)	1.55	0.89~2.68	0.11	1.6	0.85~3	0.13
Q3 (24~25)	1.75	0.97~3.17	0.06	1.7	0.85~3.4	0.13
Q4 (26~33)	2.77	1.56~4.9	0.001	3.2	1.66~6.22	0.001
Total						
Q1 (33~54)	1	−	−	1	−	−
Q2 (55~60)	1.74	1~3.02	0.04	1.76	0.94~3.3	0.07
Q3 (61~64)	1.56	0.88~2.75	0.12	1.35	0.7~2.6	0.35
Q4 (65~78)	2.22	1.24~3.98	0.007	2.21	1.13~4.33	0.02

All variables were entered in the regression model simultaneously.
OR, odds ratio; CI, confidence interval.
[1]Adjusted for gender, age, and education level of household heads and total household income.

Table 5. Comparison of dietary intake according to food security and social support status

Variable	Insecure		Secure		P-value[1]	P-value[2]
	Low social support	High social support	Low social support	High social support		
Energy	1,695.31±281.28[‡]	1,653.09±254.11[‡]	1,759.61±317.27	1,836.11±362.89[*#]	<0.001	—
Carbohydrate	253.62±11.81	252.18±11.14	250.28±13.49	251.82±11.07	0.238	0.289
Protein	52.20±1.97[†]	52.21±1.86[†]	53.13±2.23[*#]	52.48±1.89	0.004	0.008
Fat	52.06±1.79[†]	52.06±1.77[†]	52.98±2.06[*#]	52.66±1.92	0.001	0.001
Bread and cereals	356.80±15.55	356.53±13.58	354.25±13.46	352.98±13.49	0.180	0.260
Legumes	72.85±9.30[‡]	71.14±9.65	71.45±9.47	68.57±10.28[*]	0.017	0.023
Fruits	206.45±40.65	210.73±35.04	210.67±39.33	215.52±36.51	0.397	0.404
Vegetables	209.95±37.03	206.90±41.09	210.97±40.03	208.51±33.03	0.890	0.904
Dairy	197.12±47.64	192.28±45.96	198.30±46.09	184.92±34.28	0.167	0.190
Meats	57.19±43.05	52.52±11.12	55.45±10.73	55.86±13.07	0.620	0.657
Eggs	43.27±10.17	43.01±8.79	44.23±10.01	42.66±9.44	0.744	0.676
Oils	23.56±4.87	23.31±4.77	23.71±4.95	24.20±3.18	0.611	0.602
Sugars	20.14±4.30[†‡]	20.39±4.26	21.65±4.62[*]	21.67±4.60[*]	0.018	0.025

[1]Reported based on ANOVA. [2]Reported based on ANCOVA after adjusting for total energy intake.
*P<0.05 compared with the food insecure low support group. #P<0.05 compared with the food insecure high support group.
†P<0.05 compared with the food secure low support group. ‡P<0.05 compared with the food secure high support group.

been reported in other studies (Ziaee et al., 2014; Khoda-bakhshzadeh et al., 2018). In low-income families, inadequate income can lead to the inability to provide enough food for family members, whereas a higher level of education allows for better jobs and socioeconomic conditions, thus leading to improved quality of life and welfare (Mortazavi et al., 2017).

In addition, our study confirmed the protective role of social support on household food security. Households with high social support had 2.22 times increased odds of food security than those with low social support; this association remained significant after adjusting for gender, age, and the education level of the household head, and total household income. The link between social support and food security is very important for developing countries. For example, Martin et al. (2004) suggested that households that know and trust neighbors may be more likely to borrow food, especially for rural households that mainly rely on subsistence farming activities and face a greater risk of food insecurity (e.g., due to frequent droughts and low farm productivity) (Dzanja et al., 2013). Our results are in agreement with a previous study that determined the relationship between food security and perceived social support in rural Tanzania. This study reported significant associations between food insecurity and higher social support, suggesting that higher social support may protect against the occurrence of seasonal food insecurity (Hadley et al., 2007).

Of the social support sub-scales, family support has the largest protective role against food insecurity (Table 4). Support from friends had no significant effect on food security. To the best of our knowledge this is the first study to consider the effect of social support sub-scales on food security. In the 3-factor structure of the MSPSS, the items measuring support from family, friends, and a significant other are referred to as "my family", "my friends", and "a special person", respectively. We agree with Aroian et al. (2010) that interpretation of the term "a special person" may be ambiguous for responders; it may be interpreted as a particularly close relationship, possibly of a romantic nature.

This study has certain limitations. First, since this was a cross-sectional study, authors could not describe the cause and effect relationship between social support and food insecurity, or understand if food insecurity was a temporary or chronic condition in the households. Moreover, in our study the number of the households with very low levels of food security was limited; it was therefore impossible to analyze the relationship between social support and very low levels of food security.

Our findings showed a high level of food insecurity among the studied rural households. Several socioeconomic factors, including household income and the education level and job status of the household head, was

strongly associated with food security. Furthermore, our study indicated that social support contributes to reduced food insecurity in rural households. In this regard, policies to strengthen social support in vulnerable communities should be developed and included in national programs to help fight hunger and poverty.

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AUTHOR DISCLOSURE STATEMENT

The authors declare no conflict of interest.

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