

Food Security Status of Pregnant Women in Yazd, Iran, 2014-2015

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ABSTRACT

Background: Food security status is an important indicator for measuring the level of individuals' access to sufficient and nutritious food. This study was conducted to investigating the food security status in pregnant women in Yazd, Iran. **Methods:** In this cross-sectional study, 351 pregnant women with gestational age of 24 to 32 weeks were randomly selected. Food security status was measured by household food insecurity access scale (HAFIS) questionnaire. Demographic information was extracted from the health records of mothers. The data were analyzed using logistic regression test. **Results:** The mean age of studied women was 27.84 ± 5.46 years and the mean of their food security score was 3.45 ± 4.40 . Food secure, marginal insecurity, and severe insecurity were observed in 45.6, 39, and 15.4 percent of participants, respectively. Socioeconomic status (SES) and non-Persian ethnicity had a significant relationship ($P = 0.40$) with food insecurity. Logistic regression analysis showed that the odds ratio of severe food insecurity in the low SES was 13 times higher than its odds in the high SES. The odds ratio of severe food insecurity for non-Persian was also 6 times higher than its odds for Persian people. **Conclusion:** More than half of the pregnant women were in the mild to severe range of food insecurity and the prevalence of this situation was higher in women with low social economic status and non-native groups.

Keywords: Pregnant women; Food security; Yazd

Introduction

Pregnancy is one of the most sensitive periods of life that affects the health of both mother and fetus. A healthy pregnancy is one of the important human rights (WHO, 2016). Due to some physiological changes such as an increase in

blood volume, metabolism change, growth of the placenta and fetus, as well as mother's need for energy, protein, and micronutrients increases (Grieger and Clifton, 2014). According to the studies, malnutrition during pregnancy can lead to

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low-weight baby birth, stillbirth, and even mother's death (Black *et al.*, 2013).

Studies have shown that mother's nutrition status during and even before pregnancy affects fetus health. According to David Barker's hypothesis in 1986, many chronic diseases such as obesity, insulin resistance, cardiovascular diseases, and even immunological and psychological disorders are rooted in fetal life (Barker, 2004). According to this theory, inappropriate intrauterine environment and exposure to factors such as stress, medicine, infection, and malnutrition can affect the genetic design of the fetus and cause chronic diseases in adolescence (Eriksson, 2016). Therefore, for a successful pregnancy, mother's nutrition is very important (Nnam, 2015).

One of the important factors influencing mother's nutrition is food security. Food security means people have access to adequate and healthy food at all times. It also entails making sure that people are able to access the food they need through socially acceptable ways (FAO, 1996). In fact, food security is one of the important indicators of the countries' development (Ivers and Cullen, 2011, WHO, 2016). According to the official statistics of the international organizations, the highest prevalence of food insecurity in the world is related to the countries of South Asia (WHO, 2016). Meanwhile, despite the significant improvements in Iran's food security in recent decades, we are still far from the desirable status. Based on a Meta-analysis, the prevalence of food insecurity in Iranian households is 49%; this rate is 61% among women (Behzadifar *et al.*, 2016). Food security has always been one of the most important international goals. Eradication of the poverty and reduction of the hunger are among the important global components of the Millennium Development Goals (MDGs) (WHO, 2013). Regarding that international food security status has not been improved considerably yet, in the new Sustainable Development Goals (SDGs) by 2030, Objectives 1, 2, 3, 6, and 12 are aimed at achieving food security (WHO, 2014)

Food security can affect mother's health through different mechanisms. According to the studies, food insecurity is more common in people who are in inappropriate socioeconomic status, which makes them eat cheap foods with often high calories (Laraia *et al.*, 2010). On the other hand, poverty can affect the individuals' level of access to meat, dairy, and fruit. In addition, food insecurity is a stressful condition that can be involved in creating stress and depression for people (Laraia *et al.*, 2010). Studies on pregnant women have shown that food insecurity causes pregnancy complications such as gestational diabetes, hypertension, and some chronic diseases (Laraia *et al.*, 2015). Women who were in food insecure range had 1.6% higher risk of anemia in comparison with similar women, who were in food secure range (Ghose *et al.*, 2016)

Food security is not a one-dimensional indicator; it measures the level of people's access to food considering their economic and social status in a period of time. Food security can be a good indicator for assessing the pregnant women's access to adequate food during their pregnancy (WHO, 2016). According to this issue that the study of food security status in pregnant women has only been carried out in Tehran, no complete picture of this indicator is available in different regions of the country with different levels of development (Hojaji *et al.*, 2015). Therefore, this study was designed to provide evidence of food security in pregnant women in Yazd city, Iran. The results of this study can be used to develop and implement evidence-based interventions and policies in this area of the country.

Materials and Methods

Study design and participants: This cross-sectional study was conducted from June 2013 to April 2014. Pregnant women (n = 351) who referred to Yazd health centers were selected using cluster sampling method to take part in the study. Twenty health centers were randomly selected and 20 pregnant women who met the inclusion criteria were selected from each center. Pregnant women

aged 20-40 years old living in Yazd (stay in Yazd for at least 5 years) with gestational age of 24-28 weeks (6-7 months) and met the inclusion criteria entered the study. Since in some centers the number of eligible individuals was not enough, samples were selected from other health centers in the same region, and eventually 23 health centers were investigated in the sampling.

After the approval of this study in the research committee of public health school of the Shahid Sadoughi University of Medical Sciences in Yazd, the necessary requirements for sampling in health centers were obtained. Then, by referring to the health centers, women who had the inclusion criteria were selected. The pregnant women's participation was completely voluntarily and they were given detailed explanations about the study purpose. They were also asked to sign written informed consent forms. Samples were interviewed by trained experts according to food security questionnaire as well as socio-economic questionnaire. In addition, the weight and height of the participants were measured by a trained expert. Pre-pregnancy weight was also extracted from records at the health centers.

Measurements: Anthropometric measurements were performed according to standard guidelines. The participants' height was measured using a height-measuring device with a precision of 0.5cm and their weight was measured in light clothes and without shoes by the Seca scale with an accuracy of 100 g.

The standardized questionnaire of Household Food Insecurity Access Scale (HFIAS) was used to assess the food security. Validity and reliability of this questionnaire was confirmed for Iranian society in a previous study (Mohammadi *et al.*, 2012). The questionnaire consists of eight items, which indicate the severity, occurrence, and frequency of the food insecurity in the past month. Based on the responses and ideas obtained from the questionnaire, samples were divided into 4 groups: food security (0-1 points), food insecurity without hunger (2-7 points), food insecurity with moderate hunger, and food insecurity with severe hunger (8-14 points). In the present study, due to

the low number of people in some groups, food insecurity without hunger and food insecurity with moderate hunger were merged to make the marginal food insecure group. Food insecurity with moderate and severe hungers were also joined together and made the food insecure group. Subsequently, participants were divided into three groups of marginal (mild) food insecurity, severe food insecurity, and food security.

A standardized questionnaire, previously used in the comprehensive study of household consumption pattern and nutritional status of the country, was utilized in order to conduct a more precise assessment about the socio-economic status (Hojaji *et al.*, 2015). The questions indirectly assessed the economic and social status of individuals. The questions included: employment status, household size, number of rooms, insurance coverage, receiving donations from charities, living costs/expenditures, home area per capita, loan cost and possession of living facilities such as gas, refrigerator, car, mobile phone, vacuum cleaner, LCD TV, radio, internet, computer, dishwasher, washing machine, and freezer (Mohammadi *et al.*, 2012).

Data analysis: To analyze the data, SPSS 22 was used. The Kolmogorov-Smirnov test was also run to assess the data distribution. Central index, dispersion, number, and percentage were used for comparison of frequency distributions of qualitative variables. Logistic regression was further applied to analyze the data. In the logistic model, significance level was set at 0.3 to select the important variables that entered into the multivariate logistic regression model. Furthermore, the variables considered as significant by the significance level of 0.05 were investigated using backward method.

To analyze the socioeconomic status index/indicator (SES), based on the variables in the questionnaire, the "component analysis" or "focus index" analysis was used. According to this index, people were categorized into three groups with low, moderate, and high status. Finally, ethnic and socio-economic variables were found

to be significant for the severe insecurity model. For the mild insecurity model, the socioeconomic level remained in the model and the achieved odds ratios were compared at three levels.

Ethical considerations: This study was conducted under Helsinki II ethical principles after approval by the Shahid Sadoughi University of Medical Sciences.

Results

The mean age of the participants was 27.84 ± 5.46 years and their mean score of food security was 4.40 ± 3.45 . According to the grouping of the total score of HFIAS questionnaire, 160 people (45.6%) were in the food security, 137 (39%) in the marginal food insecurity, 45 (12.8%) in the moderate food insecurity, and 9 (2.6%) were in the severe food insecurity range. As it can be seen in **Table 1**, the frequency rates of the moderate and severe food insecurity groups were merged to make the severe food insecurity with frequency of 54 individuals (15.4%). Frequency distribution of participants based on different demographic variables in different food security levels is shown in **Table 1**

The results of single-variable regression between the desired variables with mild and severe food insecurity levels are separately shown in **Table 2**. According to the results, a significant relationship was observed between the socioeconomic status and severe and mild food insecurity ($P \leq 0.001$) as well as ethnicity and severe food insecurity ($P \leq 0.006$). The

relationship between food insecurity and ethnicity revealed that the probability of food insecurity among non-Persian groups was 2.4 times more than the probability of food insecurity in Persian groups [CI: 1.64 - 20.83]. Probability of mild food insecurity in people with low socioeconomic status was 2.4 times higher than others [CI: 4.61 - 43.15]. In addition, probability of the food insecurity in people with moderate socioeconomic level was 1.6 times higher than those at high level [CI: 0.94 - 2.91].

For controlling the confounding variables by backward method, the multivariate logistic regression was conducted for the variables with the significance level of less than 0.3 and only the food security group remained in the model. The odds of severe and moderate food insecurity in the age group above 35 years was 47% higher than that of the age groups of below 35 years ($P = 0.40$). However, this odds ratio was not statistically significant.

The logistic regression analysis was used to compare the under-weight and the obese individuals with the normal-weight individuals in terms of food security status. This dependent variable was derived from a three-component variable (skinny, natural, and obese). The results of this analysis are represented in **Table 2**. Food insecurity rate in the low and moderate SES was 13 and 8 times higher than those with high SES, respectively. As it can be seen, **Table 3** also shows the relationship between food security status with ethnicity and the economic situation.

Table 1. Frequency of variables in terms of different levels of food security status

Variables	Food secure n (%)	Marginally food secure n (%)	Food insecure n (%)
Mother's education			
Elementary and diploma	92 (57.0)	90 (66.2)	39 (72.2)
Associate Degree	69 (42.9)	46 (33.8)	15 (27.8)
Father's education			
Elementary and diploma	110 (68.3)	103 (75.7)	41 (75.9)
Associate Degree	51(31.7)	33 (24.3)	13 (24.1)
Father's job			
Employed	115 (71.4)	99 (72.8)	41 (75.9)
Unemployed	46 (28.6)	34 (25.0)	11 (20.4)
Mother's age(year)			
<35	144 (89.4)	114 (83.8)	46 (85.2)
35≤	17 (10.6)	22 (16.2)	8 (14.8)
Socioeconomic status			
Low	37 (23.0)	50 (36.8)	29 (53.7)
Moderate	50 (31.1)	45 (33.1)	20 (37.0)
High	72 (44.7)	39 (28.7)	4 (7.4)
Ethnicity			
Fars	157 (97.5)	128 (94.1)	47 (87.0)
Others	4 (2.5)	8 (5.9)	7 (13.0)
Mother's job			
Housewife	155 (96.3)	129 (94.9)	52 (96.3)
Employee	6 (3.7)	7 (5.1)	2 (3.7)
Body mass index before pregnancy (kg/m²)			
<18.5	13 (8.1)	15 (11.0)	2 (3.7)
18.5-24.9	77 (47.8)	61 (44.9)	29 (53.7)
25<	71 (44.1)	60 (44.1)	23 (42.6)

Table 2. Single-variable regression analysis to examine the relationship between food security status and demographic and socioeconomic variables in pregnant women

Variables	Low food insecurity		Sever and moderate food insecurity	
	Odds ratio (%95 CI)	P	Odds ratio (%95 CI)	P
Age (year)				
< 35	<i>Reference group</i>		<i>Reference group</i>	
35 <	1.6 (0.82, 3.22)	0.15	1.47 (0.59, 3.63)	0.4
Father's job				
Employed	<i>Reference group</i>			
Unemployed	1.16 (0.69, 1.95)	0.18	1.49 (0.70, 3.15)	0.29
Mother's job				
Employed	<i>Reference group</i>		<i>Reference group</i>	
Housewife	0.71 (0.23, 2.17)	0.55	1 (0.19, 5.14)	0.99
Father's education				
Associate degree	<i>Reference group</i>		<i>Reference group</i>	
Elementary and diploma	1.44 (0.86, 2.41)	0.15	1.46 (0.72, 2.96)	0.29
Mother education				
Associate degree	<i>Reference group</i>		<i>Reference group</i>	
Elementary and diploma	1.46 (0.91, 2.35)	0.11	1.95 (0.99, 3.82)	0.05
Body mass index before pregnancy (kg/m²)				
18.5-24.9	<i>Reference group</i>		<i>Reference group</i>	

<18.5	1.45 (0.64, 3.29)	0.66	0.40 (0.8, 1.92)	0.25
25 <	1.06 (0.66, 1.72)	0.79	0.86 (0.45, 1.62)	0.64
Ethnicity				
Fars	<i>Reference group</i>		<i>Reference group</i>	
Others	2.45 (0.72, 8.33)	0.15	5.84 (1.64, 20.83)	0.006
Socio-economic status				
High	<i>Reference group</i>		<i>Reference group</i>	
Moderate	1.66 (0.94, 2.91)	0.07	7.2 (2.32, 22.34)	0.001
Low	2.49 (1.40, 4.44)	0.002	14.10 (4.61, 43.15)	0.001

Table 3. Logistic regression analysis results to examine the relationship between food security and ethnicity and socioeconomic situation

Variables	Odds ratio (%95 CI)	P
Socio-economic status		
High	<i>Reference group</i>	
Moderate	8.15 (2.55-26.03)	0.001
Low	13.78 (4.40-43.17)	0.001
Ethnicity		
Fars	<i>Reference group</i>	
Others	6.16 (1.36-27-88)	0.01

Discussion

According to the results, 45.6% of women were in food security range, 39% were in the marginal food insecurity range, and 15.4% were in the moderate and severe food insecurity range. In general, 54.4% of women suffered from some degree of food insecurity. According to the study of Barbara et al. in North Carolina, among 810 pregnant women, the prevalence of food insecurity was 10% and the prevalence of marginal food insecurity was 14% (Laraia et al., 2010). The results of a study by Gamba et al. on 1158 American pregnant women also indicated that 9% had marginal food insecurity and 12% had food insecurity (Gamba et al., 2016). Thus, the results of both studies showed that their participants were at a better status than Iran. Ghose et al. in Bangladesh conducted a study on 5,666 women in the reproductive age. They reported that only 18.4% of women were in the food insecurity range (Ghose et al., 2016). In a study by Hojaji et al. on 700 women in Tehran, the prevalence of food insecurity was 34.8 (Hojaji et al., 2015). The prevalence of food insecurity in the present study was more than all of these studies. The difference between the food security status in different cities of Iran can be attributed to the cultural, social, and economic

differences (Hojaji et al., 2015). Community-based interventions and regional supportive policies can also be a reason for the differences in the prevalence rates of the food insecurity. For example, some nutritional supportive programs such as Women, Infants, and, Children program (WIC) as well as Farmers' Market Nutrition Program (FMNP) in the United States (Conrey et al., 2003, Gamba et al., 2016) can explain a part of these differences (Andreyeva et al., 2012, Conrey et al., 2003). In Iran, two nutrition programs exist in this regard: one is for the needy pregnant and lactating women (including allocation of food baskets to pregnant women up to six months postpartum) and the other deals with the integrated care of mothers' health (for the continuous monitoring of mothers' health during pregnancy) (Jourabchi et al., 2013, Moghasemi et al., 2014). However, in some regions, a high percentage of pregnant women still suffer from food insecurity. In a systematic review, 61% of the Iranian women were reported in food insecurity range, which is a very high prevalence rate (Behzadifar et al., 2016). In addition, another study in Bushehr showed that food insecurity among women was 86% (Mohammadpour Kaldeh et al., 2010), which is similar to the results of the current study. According to the results of these studies and

the general status of food security in Iran, the nutritional status of Iranian women, especially in the reproductive age, should be considered and special interventions should be conducted to deal with this issue.

The socioeconomic status is one of the important indicators for assessing food security status. In some studies, income was singly used as an economic indicator, but in the present study, to increase the accuracy, various SES indices were applied. According to the results, a significant relationship was found between food security and socioeconomic status. The chance of mild food insecurity for people with low and moderate socioeconomic status was 2.57 and 1.7 times higher than the individuals with high socioeconomic status, respectively. The results of the present study were consistent with the study by Hojaji *et al.*, in which women with food insecurity status had lower level of education and income and most of them were housewives (Hojaji *et al.*, 2015). The study by Kelishadi *et al.* showed that SES is effective on humans' lifestyle (Kelishadi *et al.*, 2016) and people with a better SES status had healthier eating habits and more physical mobility (Alkerwi *et al.*, 2015, Kelishadi *et al.*, 2016). Ricciuto *et al.* indicated a strong and significant relationship between SES and purchasing power (Ricciuto *et al.*, 2006). Darmon's study showed that people with low SES mostly used low quality food (Ricciuto *et al.*, 2006). In addition, the results of several other studies showed that people with lower SES consumed less fruits and vegetables and more carbohydrates (Alkerwi *et al.*, 2015, Darmon and Drewnowski, 2015, Hulshof *et al.*, 2003). Evidence suggests that high-calorie, high-fat, and high-sugar products are less expensive than other foods; so, low-income people are more likely to pay for these food supplies (Darmon and Drewnowski, 2015). Consequently, this creates more theories about the relationship between obesity and food insecurity. Although no relationship was observed between weight gaining in pregnancy and food security in the present study, the results of some studies indicated a significant relationship between food insecurity and obesity as well as between low

levels of SES and obesity (Mohammadi *et al.*, 2012, Rezazadeh *et al.*, 2016).

The results of this study showed that the probability of severe food insecurity in non-Persian people was 64% higher than the Persian individuals. In the study by Hakimi *et al.* in Dezful city over the women's food security, ethnicity was significantly associated with food security (Hakim *et al.*, 2010). In addition, a significant relationship was seen between ethnicity and food security in Gamba *et al.*'s study (Gamba *et al.*, 2016). This suggests that non-native groups are more vulnerable to food insecurity than native groups in many areas.

Investigation of the food security status of the pregnant women for the first time in Yazd is considered as the strength of this study. However, the lack of health records in pregnant mothers was one of the weaknesses of this study, since it could provide a clearer picture of the food security status in this group. Another weakness of this study is related to the impact of society's culture, because the health of pregnant mothers is important in the Iranian culture. In some cases, despite the food insecurity of the household, these women had a fairly good nutrition, which was due to the preferential nutrition of pregnant women or their parental support. Therefore, other researchers are recommended to design a questionnaire according to the Iranian's culture. In addition, considering that food security assessment was done only by mental perception tools, other instruments, such as the dietary intake questionnaire are suggested to be used.

Conclusion

The results of this study have shown that more than half of the pregnant women are in mild to severe food insecurity range and this rate is higher in women with lower socioeconomic status and non-native groups.

Conflict of interest

The authors state no conflict of interest.

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Authors' contributions

Nadjarzadeh A was involved in designing and supervising the study. Rajizadeh A was involved in

designing the study, data collecting, and data analyzing. Tavakoli M and Rabiye-Faradonbeh M participated in data collection and data analysis, Hajipour M participated in data analysis. Rajizadeh A, Nadjarzadeh A, Salehi-Abargouei A, and Milani Bonab A participated in writing the manuscript. All authors critically reviewed the manuscript and approved the final version submitted for publication.

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