

# Household food security status and associated factors among high-school students in Esfahan, Iran

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## Abstract

**Objective:** The present study was designed to determine household food security status and factors associated with food insecurity among high-school students in Esfahan, Iran.

**Design:** Cross-sectional surveys.

**Setting:** The present study was conducted in autumn 2008 in Esfahan, Iran. The samples were selected using systematic cluster sampling. Socio-economic questionnaires, food security questionnaires and FFQ were filled out during face-to-face interviews. In addition, data on participants' weights and heights were collected.

**Subjects:** A total of 580 students (261 boys and 319 girls) aged 14–17 years from forty high schools in Esfahan, Iran, were selected.

**Results:** The prevalence of household food insecurity according to the US Department of Agriculture food security questionnaire was 36.6% (95% CI 0.33, 0.40). Food insecurity was positively associated with number of members in the household ( $P < 0.05$ ) and negatively associated with parental education level and job status and household economic status ( $P < 0.05$ ). Moreover, students living in food-insecure households more frequently consumed bread, macaroni, potato and egg ( $P < 0.05$ ), while they less frequently consumed rice, red meat, sausage and hamburger, poultry, fish, green vegetables, root and bulb (coloured) vegetables, melons, apples and oranges, milk and yoghurt ( $P < 0.05$ ).

**Conclusions:** Food insecurity was prevalent among households in Esfahan, Iran, and food security status was associated with socio-economic factors. Students who belonged to food-secure households more frequently consumed healthy foods (except sausage and hamburger), whereas those living in food-insecure households more frequently consumed cheap foods containing high energy per kilogram. The present study suggests that intervention programmes be designed and carried out.

**Keywords**  
Food security  
Esfahan  
High-school students  
USDA

The concept of food security includes problems with the quantity of available food, uncertainty about food supply and experience of hunger in life<sup>(1,2)</sup>. Food insecurity is prevalent in both developed and developing countries, affecting 6–73% of the general population<sup>(3–16)</sup>. It has considerable health impacts on the physical, social and psychological status of individuals suffering from food insecurity. It also affects quality of life<sup>(17)</sup>. Various techniques and methods have been used to measure food insecurity in many countries<sup>(18–20)</sup>.

The aim of the present study was to determine household food security status and factors associated with food insecurity among high-school students in Esfahan, Iran.

## Methods

### Data collection and subjects

This cross-sectional study was conducted in autumn 2008 with 580 students (261 boys and 319 girls) from forty high schools in Esfahan. The average age of students was 15.7 years (range: 14–17 years), and the exclusion criterion was suffering from metabolic disease. The sampling method used in the present study was systemic clustering. Selection of schools and classes was carried out randomly from a complete list of schools (containing the names of classes and the number of students in each class).

Face-to-face interviews were used to fill out socio-economic questionnaires, food security questionnaires and FFQ, and these included twenty-seven, eighteen and nineteen items, respectively. Students and mothers were required to give written informed consent before participating. The

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socio-economic questionnaire was filled out by interviewing the students and their mothers, whereas the FFQ was filled out by interviewing the students. The US Department of Agriculture (USDA) Food Security Module was also filled out by interviewing the mother. The module consisted of questions about a household's experiences with food insufficiency during the previous 12-month period<sup>(21)</sup>. In Iran, one study assessed the validity of the Radimer/Cornell-modified questionnaire, which is similar to the USDA module, in measuring food insecurity in low-income urban households in Tehran. The study supported the validity and reliability of the Radimer/Cornell-modified questionnaire<sup>(22)</sup>. Another study, which was conducted on households from all sectors of the Esfahan population, assessed the internal validity of the adapted USDA module in measuring adult and child food insecurity. The results of the study showed that the module provides internally valid household-level measures of food insecurity among adults and children<sup>(23)</sup>. In addition, the USDA module was adapted in a recent study among households in Shiraz<sup>(16)</sup>. It is worth mentioning that we used the module that was adapted in the Shiraz study. After the interviews, responses were coded into the following four food security categories using standard scaling procedures<sup>(24)</sup>: food secure, food insecure without hunger, food insecure with moderate hunger and food insecure with severe hunger. A dichotomous variable was then created for food secure *v.* food insecure. Standing height of students and their mothers was measured with a portable direct reading stadiometer while they were shoeless. Body weight of students and their mothers were measured with a digital scale while they were wearing light indoor clothing and no shoes. BMI was then calculated as kg/m<sup>2</sup>. Mother's weight status was defined according to the Centers for Disease Control and Prevention BMI<sup>(25)</sup>. Students' weight status was defined according to the WHO 2005 BMI-for-age percentiles<sup>(26,27)</sup>. Furthermore, students' height status was defined according to the WHO 2005 height-for-age percentiles<sup>(28,29)</sup>.

### Statistical analysis

Data were analysed using the Statistical Package for Social Sciences statistical software package version 11.5 (SPSS Inc., Chicago, IL, USA). The  $\chi^2$  test, the independent sample *t* test and multiple logistic regression by the forward stepwise method were used, and significance was measured at  $P < 0.05$ .

### Results

The overall prevalence of household food insecurity according to the USDA food security questionnaire was 36.6% (95% CI 0.33, 0.40; Table 1). The students living in food-insecure households were grouped together in subsequent analyses because of the low number of participants in each of these groups.

**Table 1** Frequency of household food insecurity

Food security status	<i>n</i>	%
Food secure	368	63.4
Food insecure without hunger	164	28.3
Food insecure with moderate hunger	34	5.9
Food insecure with severe hunger	14	2.4

### Bivariate associations

Number of household members was significantly associated with food security status ( $P < 0.001$ ). The results show that 83.8% of the students who lived in households with fewer than four people, and 39% of those living in households with more than six people were in food-secure households.

There were strong associations between parental education level and food security status ( $P < 0.001$ ). The results show that 94.1% of students whose fathers held a Masters or a PhD degree and 81.1% of students whose mothers had university education belonged to food-secure households, whereas 51.3% of students whose father's education level was below primary school and 49.0% of those whose mother's education level was below primary school belonged to food-secure households.

Significant associations were also observed between parental job status and food security status ( $P < 0.05$ ). The results illustrate that 71.1% of students whose fathers were workers or farmers and 38.1% of students whose mothers were housewives or retired belonged to food-insecure households, whereas 88.9% of students whose fathers were managers or academics and 71.7% of those whose mothers had jobs belonged to food-secure households.

There were strong associations between food security status and household economic status indicators (ownership of some home appliances, ownership of home and size of home;  $P < 0.001$ ). The results show that 97.8% of students who lived in households with good economic status, 70.5% of those living in households with a privately owned home and 78.6% of those living in homes  $\geq 196$  m<sup>2</sup> (the fourth quartile) belonged to food-secure households, whereas 70.3% of students who lived in households with weak economic status, 58.5% of those living in a rented home and 59.1% of those living in homes  $< 100$  m<sup>2</sup> (the first quartile) belonged to food-insecure households.

There was no significant association between food security status and sex, BMI-for-age percentiles, height-for-age percentiles, parents' age and mother's BMI ( $P > 0.05$ ).

### Results of independent sample *t* test

Table 2 depicts the mean and standard error of students' frequent consumption of some food groups per month by household food security status. Students who belonged to food-insecure households had higher mean intakes for bread, macaroni, potato and egg ( $P < 0.05$ ). In addition, the mean intakes for rice, red meat, sausage and hamburger,

**Table 2** Mean and standard error of student's frequent consumption of some food groups per month by household's food security status

Variable	Food secure		Food insecure		P value
	Mean	SE	Mean	SE	
Bread	52.0	20.9	71.0	19.0	<0.01
Rice	34.2	16.5	19.2	10.6	<0.01
Potato	9.6	6.9	13.1	8.5	<0.01
Red meat	16.4	8.4	9.0	5.7	<0.01
Green vegetables	23.2	16.4	17.8	14.0	<0.01

**Table 3** Multiple logistic regression results on the relationship between food insecurity and socio-economic factors

Socio-economic variable	OR	95 % CI	P value
Household number	1.97	1.49, 2.60	<0.01
Father's job			
Jobless/retired	1.00	–	–
Worker/farmer	2.81	1.18, 6.70	0.02
Public sector employees	0.72	0.36, 1.44	0.35
Private sector employees	0.68	0.24, 1.87	0.45
Manager/academic	0.34	0.03, 3.67	0.37
Self-employed	0.73	0.38, 1.38	0.33
Size of home	1.00	0.99, 1.00	<0.01
Household's economic status based on ownership of some home appliances			
Weak	1.00	–	–
Moderate	0.13	0.08, 0.20	<0.01
Good	0.02	0.00, 0.12	<0.01

poultry, fish, green vegetables, root and bulb (coloured) vegetables, melons, apples and oranges, milk, and yoghurt among students living in food-secure households were higher ( $P < 0.05$ ).

### Results of multiple logistic regression

Table 3 illustrates multiple logistic regression results on the relationship between food insecurity and socio-economic factors. According to the final model fit, number of household members, father's job status, size of home and household economic status had more significant association with food insecurity than other variables. Moreover, the final multiple logistic regression model on the relationship between food insecurity and frequency of food group intake shows that frequency of bread, rice, macaroni, potato, red meat, poultry, fish, egg and green vegetable consumption had more significant association with food insecurity than frequency of other food group intakes (Table 4).

### Discussion

In the present study, the prevalence of household food insecurity was 36.6%. According to the results of research in Shiraz, Iran, the prevalence of household food insecurity was 44%<sup>(16)</sup>. Although in both studies the same module was used to measure food insecurity, our sample

**Table 4** Multiple logistic regression results on the relationship between food insecurity and frequency of food group intake (per month)

Variable	OR	95%CI	P value
Bread	0.02	1.003, 1.03	<0.01
Rice	0.95	0.93, 0.97	<0.01
Macaroni	1.19	1.08, 1.33	<0.01
Potato	1.06	1.02, 1.10	<0.01
Red meat	0.87	0.83, 0.91	<0.01
Poultry	0.94	0.88, 1.00	<0.01
Fish	0.72	0.62, 0.84	<0.01
Egg	1.08	1.04, 1.13	<0.01
Green vegetables	0.98	0.96, 0.99	<0.01

was only of households with 14–17-year-old children in school. Mohammadi Nasrabadi *et al.*<sup>(14)</sup> measured food insecurity in Iran according to energy intake, and reported that 23.2% of Iranian households were food insecure. The results of a study in Yazd, Iran, using the USDA food security module showed that 32.9% of households with 6–12-year-old children in school were food insecure<sup>(12)</sup>. In another study in Tabriz, Iran, using a six-item questionnaire to measure food insecurity in adults coming to Asadabadi Medical Center, the prevalence of food insecurity among adults was 36.3%<sup>(13)</sup>. Qasemi *et al.*<sup>(3)</sup> measured food insecurity in Tehran Province, Iran, according to household income, and reported that 50% of households in this province were suffering from hunger. In addition, in a study among high-school girls from two areas in North (district three) and South (district sixteen) Tehran, student food insecurity was measured according to energy intake. The results of the study showed that the prevalence of food insecurity among high-school girls in districts three and sixteen was 36.8% and 42.5%, respectively<sup>(15)</sup>. In general, the difference between these results is presumably a result of timing of studies, cultural factors, instruments used in research and percentage of income used to supply food. Furthermore, our sample was of households with 14–17-year-old children in school.

In the present study, food insecurity was directly related to number of household members, which is consistent with the results of several studies<sup>(13,22,30,31)</sup>. The observed relationship between these variables is possibly due to the fact that in special situations, such as rise in price of food or temporary joblessness, when household food supplies decrease, the bigger the household is the lower the amount of food each household member consumes.

Confirming the results of other studies<sup>(13,22)</sup>, those of the present study illustrated a negative association of food insecurity and parental education level. The finding of a study in Malaysia indicated that the father's educational level was related to household food insecurity, whereas there was no such association between the mother's educational level and household food insecurity<sup>(7)</sup>. The relationship between parents' education level and food insecurity may be due to the fact that an increase in

parental education increases their knowledge, attitude and practice about the nutritional needs of their children. In addition, parents with higher education have higher income and therefore can provide enough food for their children much more easily than others.

In the present study, there was a significant indirect relationship between parental job status and food insecurity, which is consistent with the results of a study conducted in Tabriz, Iran<sup>(13)</sup>. In another study that was conducted in Malaysia, the father's job status was indirectly related to household food insecurity, but no association between the mother's job status and household food insecurity was found<sup>(7)</sup>. These findings may be due to the fact that parents who have well-paid jobs can provide enough food for their children much more easily than others.

Confirming those of other studies<sup>(7,13,22,30-33)</sup>, the results of the present study showed that food insecurity is negatively associated with household economic status indicators. The findings of a study on Iranian households also showed that food insecurity was inversely related to household economic status (size of home), in urban areas, but not in rural areas<sup>(14)</sup>. In general, the relationship between economic status and food insecurity could be explained through the important role of economic status in food availability.

The findings of other studies in Iran<sup>(13,22)</sup> indicated that food insecurity was directly related to frequency of bread and potato intake, while it was indirectly related to frequency of rice, red meat, fruit, vegetables and dairy intake. Furthermore, a study in Toronto, Canada illustrated that food insecurity was negatively associated with level of meat, fruit and vegetable intake<sup>(6)</sup>. The results of our research are similar to these. We found that students living in food-insecure households more frequently consumed bread, macaroni, potato and egg, while they less frequently consumed rice, red meat, sausage and hamburger, poultry, fish, green vegetables, root and bulb (coloured) vegetables, melons, apples and oranges, milk, and yoghurt. It seems that students who belonged to food-secure households more frequently consumed healthy foods (except sausage and hamburger), while those living in food-insecure households more frequently consumed cheap foods containing high energy per kilogram.

## Conclusion

The findings of the present study show that food insecurity is prevalent among households of high-school students in Esfahan, Iran. The observed associations among food insecurity, level of education and economic factors indicate that food assistance programmes are needed to provide support and education for food-insecure households. Additional prospective research is also needed to study the causality between food insecurity and social and health factors.

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