

Household food insecurity and associated factors among rural and urban high school students in Kurdish population of Iran

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Summary. *Objective:* There is limited information in Kurdish-inhabited areas of Iran on the prevalence of food insecurity, dietary patterns, and socioeconomic factors that are related to food insecurity. We investigated mentioned factors among Kurdish population, focusing on high school students and their families. *Study design:* Cross sectional study *Design:* A cross-sectional study on 364 high-school students and their families was done. Food insecurity was evaluated with the use of the USDA 18-Item Household Food Security Questionnaire. Food insecurity, food frequency questionnaires and socio-economic (the combination or interaction of social and economic factors) data were filled out during face to face interviews with students and their mothers. *Results:* The overall food insecurity prevalence in the studied population was 41.8% (38.4% and 49.1% for urban and rural areas, respectively). There were three dietary patterns in the studied subjects. In the studied subjects food insecurity was associated with dietary pattern ($P < 0.05$). Food insecurity was associated with father's job, mother's job, father's education, mother's age, household's economic status, and grade point average. *Conclusion:* Food insecurity is common and is in the range of other part of Iran among Iranian Kurdish population. Associations between food insecurity, dietary pattern, parents related factors and economic status demonstrated.

Key words: food insecurity, dietary pattern, socioeconomic factor, Iran

Introduction

Food is a basic human need, and limitation in its accessibility is considered as a violation of human rights (1). Food insecurity is a condition which people experience uncertain or limited physical and economical access to safe, sufficient, nutritious, and healthy food to meet their dietary needs for a productive, active and health life (2-4). Food insecurity affects personal health, home and scholar performances (5). There is increasing evidence representing that in young and school-age children population, food insecurity is associated with augmented risk of developmental

problems (6). It has significant health impacts on the physical, psychological and social status of people who suffering from food insecurity in both developed and developing countries and moreover, the quality of life also can be affected (7). At personal level food insecurity linked to less vegetable and fruit consumption, insufficient intake of vitamins, lower energy intake, and higher cholesterol intake (8-10).

Some previous studies have been showed an association between food insecurity and mental health which resulting in psychological dysfunction (6). The relationship between micronutrient and also protein-energy deficiency and impaired immunity and thus

with an augmented risk of serious illness is well established.

The main predictor of food insecurity is poverty or low income, which can lead to complications in enough food providing (11). Having a lower level of education (12), ethnic minority (13), family type (couples with children or single-parent family) (14), younger age (15) and dietary pattern (16) are the other predictors for food insecurity. Food insecurity may be related to lower fruit and vegetable intakes, poorer general health, lower consumption of lean meats (17), overweight or obesity and even chronic conditions such as depression and cardio vascular disease (18-20).

As FAO represented in 2015, there are 800 million undernourished people in the world (21). The prevalence of food insecurity is different between states and countries (22). There are few studies in different areas of Iran on the subject (23), but no study has been published on Kurdish population, yet. With attention to the data scarcity on the food insecurity and dietary patterns in the west of Iran, especially Kurdish population, the study was done to assay food insecurity and its related socioeconomic factors as well as dietary patterns among Kurdish population focusing on high school students and their families.

Materials and methods

Participants

This cross-sectional study was conducted over a seven-month period between September and March, 2015-2016. The study population consisted of 364 high-school students (68.68% urban and 31.32% rural), and their family. The subjects were randomly selected from high schools located in the city and rural areas of Paveh, Kermanshah province in the western part of Iran. The students were in grades 9-12 (based on Iranian high school education system) and aged 14 to 18 years. Permission to conduct the research was obtained from the state Department of Education and the school authorities involved. Ethical approval for the research was granted from the ethical review committee of Tabriz University of Medical Sciences. Written consent was obtained from each student and their householder (father in most cases). The adolescents

were given the opportunity to refuse participation, but none of them declined.

Data collection

Arrangements were made with state Department of Education and schools. The investigators visited each participating school for data collection. Sampling technique used in the study was stratified random sampling with proportionate allocation. Schools and classes were selected randomly from a list of urban and rural high schools as strata. Six high schools (3 girls, 3 boys) were selected by the mentioned method. Within each selected school, 60 students were selected randomly including 10 students from each grade (that is grades 4, 5, 6 and 7). Each student was familiarized with the study and any questions were answered by the investigator. Data were collected through direct interview for food security questionnaire, general socioeconomic questionnaire (SEQ) and food frequency questionnaire (FFQ). Household food insecurity was evaluated using the USDA (US Department of Agriculture) Food Security questionnaire and dietary intake was assessed with food frequency questionnaires. This 18-items questionnaire which examined household food security status in the last 12 months was completed by interviewing mothers (Bickel et al., 2000)(24). It should be mentioned that 18-item USDA household food security questionnaire has been validated of previous studies in Iran (7, 25-27). Rating of 18-item USDA household food security status questionnaire was: positive rate to answers "often true", "sometimes true", "almost every month", "some months", and "yes" and zero score to responses "not true", "does not know or refused", "only 1 or 2 months", and "no". Finally, scores 0-2 in food secure group, 3-7 in food insecure group without hunger, 8-12 in food insecure group with moderate hunger, and 13 and higher in food insecure group with severe hunger were situated (24). The reliability of the food security questionnaire was calculated to be 0.84 by employing Cronbach's alpha coefficient. The socio-economic questionnaire was used to collect the demographic characteristics including 21 variables (age, sex, family size, birth rank, using of dietary supplements, having breakfast, parental education level, economical status or having living facilities, occupational status of mother and head of the family,

size of home range, and residential property ownership status). About living facilities, mothers were asked that how many items of these 9 items they have (refrigerator, home, hand-sewn carpet, car, flat-screen color television, computer, dishwasher, washing machine, and microwave). Living facilities in socio-economic questionnaire was considered less than or equal to 3-item as low economic level, 4 to 6-item as moderate economic level, and more of 7-item as good economic level (27). Also, the participants were asked to provide their last year's Grade Point Average (GPA). The GPA range was from 0.00 to 20.00 scores.

Body weight (BW) was measured while the participants were minimally clothed without shoes, using digital scales and recorded to 0.1 kg. Direct measures of height were taken with the subject in a relaxed and erect position. Measurements were taken to the nearest millimeter and are reported in centimeter. During the measurements, the student was without shoes and with minimally clothing. Body mass index (BMI as weight (kg)/height (m)² was then calculated. Height and BMI z-scores were calculated with the use of the WHO 2007 (BMI-for-age and height-for-age z-scores)(28). The Omron digital blood pressure monitor (Model MX3, Japan) was used for measuring of blood pressure (BP). After a 5-minute rest period, BP was measured twice times in the right arm (sitting with the arms supported precisely at the right atrium level), at an interval of 30seconds and mean value of the two measurements were calculated. High blood pressure (HBP) was defined as average systolic and/or diastolic BP $\geq 95^{\text{th}}$ percentile for age, sex, and height on 3 or more separate occasions. Blood pressure levels $\geq 90^{\text{th}}$ percentile and $< 95^{\text{th}}$ percentile were regarded as pre-hypertension (29).

Data analysis

Food intake was evaluated using a 40-item food frequency questionnaire. Food items were grouped into pre-defined food groups based on similarity in culinary usage and nutrient profile. A total of food items were grouped into 9 food groups.

Dietary patterns were extracted by exploratory factor analysis (13) using Principal Components Analysis (PCA). Direct oblimin rotation was used to extract factors in the derivation sample. Eigenvalue

greater than 1 was applied to identify the number of dietary patterns. With this setting for EFA, three dietary patterns were extracted. To assess the suitability of the respondent data for factor analysis, Kaiser Meyer Olkin (KMO) Measure of Sampling Adequacy, and Bartlett's Test of Sphericity were used. EFA solutions were assessed for the magnitude of loadings of food groups, and each pattern was named based on loadings of $\geq \pm 0.4$. A dietary pattern score was calculated for each subject as a function of the contribution ("loading") that each food made to the pattern.

Generalized linear models with strata as a fixed effect to consider the effects due to the stratification sampling, were performed to compare the demographic and socio-economic factors of food secure and insecure students.

The dietary pattern scores of each pattern were categorized into group: greater than median and less than median then crude and adjusted logistic regression models were performed to study the associations between food insecurity and dietary patterns scores. Data analysis was performed with SPSS22 and P value less than 0.05 was considered to be statistically significant.

Result

Frequency of household food insecurity

Table 1 shows frequency of household food security and insecurity status among the study participants. The prevalence of household food insecurity according to the USDA food security questionnaire was 38.4% in urban area and 49.1% in rural area. In addition, the

Table 1. Frequency of household food insecurity among student subject, west of Iran.

| | Urban | Rural | All |
|------------------------------------|------------|-----------|------------|
| Food security status | N (%) | N (%) | N (%) |
| Food Secure | 154 (61.6) | 58 (50.9) | 212 (58.2) |
| Food insecure without hunger | 49 (19.6) | 26 (22.8) | 75 (20.6) |
| Food insecure with moderate hunger | 34 (13.6) | 23 (20.2) | 57 (15.7) |
| Food insecure with severe hunger | 13 (5.2) | 7 (6.1) | 20 (5.5) |

overall food insecurity level in the studied subject was 41.8%. The participants living in food-insecure households groups (included food insecure without hunger, with moderate hunger and with sever hunger) were combined in one group together in next analyses because of the low number of students in each of groups.

Dietary patterns

Table 2 shows the factor loading matrix for the major dietary patterns identified by using FFQ data. As it can be seen, three major dietary patterns were extracted by factor analysis. The three major dietary patterns were: pattern 1: vegetable, dairy products, fruit, meat, and legumes; pattern 2: junk foods and drinks, and pattern 3: potato and grains.

Table 2. Factor loading matrix for the major dietary patterns identified using FFQ data among Iranian Kurdish ethnic living in Paveh, Iran

| Food group | Major dietary pattern | | |
|----------------|-----------------------|---------|---------|
| | Group 1 | Group 2 | Group 3 |
| Vegetables | 0.832 | - | - |
| Dairy products | 0.731 | - | - |
| Fruits | 0.605 | - | -0.255 |
| Meat | 0.588 | - | - |
| Legumes | 0.448 | - | -0.417 |
| Junk foods | - | -0.880 | - |
| Drinks | - | -0.874 | - |
| Potato | - | - | 0.728 |
| Grains | - | - | 0.674 |

Association between dietary patterns scores with food insecurity

Odds ratio and 95% CIs for food insecurity according to the dietary patterns scores in the study population are presented in Table 3. Model 1: adjusted for age, sex and resident. Model 2: Model 1 + economical status and Model 3: Model 2 + mother’s education and mother’s job. The dietary pattern scores of each pattern were categorized into two groups: less than median (group 1) and greater than median (group 2). As it was shown in the Table 5, the subjects in the group 2 (in pattern 1) were less susceptible to food insecurity compared with group 1 in all used models (*P*-value was < 0.01 for 3 models). In addition, in the pattern 2 there was not statistically significantly difference between two groups by all models. Also, the subjects in the group 2 (in pattern 3) were more susceptible to food insecurity compared with group 1 in each 3 models. (*P*-value was 0.03 to > 0.1).

Demographic differences between food security statuses

As shown in Table 4, mother’s age was significantly different (*P* = 0.01) while students and fathers age were not significantly different among food secure and insecure groups. The students who had older mothers were more food insecure. Home size also were highly associated with food insecurity (*P* < 0.001). Table 2 also depicts significant difference between student’s grade point average among secure and insecure groups (*p* = 0.03). The students in food insecure group had low grade point average compared to the secure one.

Table 3. Odds ratio and 95% CIs for food insecurity according to dietary patterns scores.

| Dietary pattern | Food insecurity | | | | | | | | |
|-----------------|-----------------|-----------|-----------------------|---------|-----------|-----------------------|---------|-----------|-----------------------|
| | Model 1 | | | Model 2 | | | Model 3 | | |
| | OR | 95% CI | <i>P</i> ^a | OR | 95% CI | <i>P</i> ^a | OR | 95% CI | <i>P</i> ^a |
| Pattern 1 | | | | | | | | | |
| Group 1 | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |
| Group 2 | 0.44 | 0.28-0.70 | <0.01 | 0.49 | 0.37-0.79 | <0.01 | 0.46 | 0.27-0.76 | <0.01 |
| Pattern 2 | | | | | | | | | |
| Group 1 | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |
| Group 2 | 1.16 | 0.75-1.82 | 0.49 | 0.96 | 0.60-1.54 | 0.87 | 1.03 | 0.62-1.74 | 0.90 |
| Pattern 3 | | | | | | | | | |
| Group 1 | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |
| Group 2 | 1.84 | 1.13-2.99 | <0.01 | 1.65 | 1.00-2.74 | 0.04 | 1.83 | 1.05-3.18 | 0.03 |

^a Regression logistic

Note: Model 1: adjusted for age, sex and resident. Model 2: Model 1 + economical status. Model 3: Model 2 + mother’s education and mother’s job. Group 1: dietary pattern score less than med. Group 2: dietary pattern score more than med.

Table 4. Demographic details of high-school students (n = 364).

| Variables | Food secure | Food insecure | <i>P-value</i> |
|---------------------|---------------|---------------|----------------|
| | Mean (SE) | Mean (SE) | |
| Age | 16.31 (0.05) | 16.38 (0.63) | 0.39 |
| Father's age | 47.81 (0.44) | 48.25 (0.48) | 0.51 |
| Mother's age | 40.81 (0.41) | 42.45 (0.45) | 0.01 |
| Family size | 4.72 (0.81) | 4.97 (0.88) | 0.03 |
| Home size | 156.93 (3.99) | 123.18 (4.26) | 0.001 |
| Grade point average | 17.02 (0.14) | 16.56 (0.15) | 0.03 |
| Height | 165.79 (0.72) | 165.76 (0.77) | 0.97 |
| Weight | 60.15 (1.05) | 61.85 (1.13) | 0.27 |
| BMI | 21.80 (0.31) | 22.43 (0.34) | 0.17 |

BMI: Body mass index

Self-reported food insecurity factors

The results of multiple logistic regression analyses of socio-economic factors associated with food insecurity is shown in Table 5. The results showed that parents' (fathers' and mothers') job status, parents' education level, household's economic status, and systolic blood pressure were significantly associated with food insecurity. However, no significant association was found between the diastolic blood pressure and BMI with the reported food insecurity.

Discussion

The findings of this study indicated that the overall prevalence of food insecurity among high school students and their family was 41.8% (38.4% in urban and 49.1% in rural areas, respectively). One newly published review article showed that the overall prevalence of food insecurity among Iranian households was 49%. Our study's findings on the prevalence of food insecurity in the Kurdish population, west of Iran is in the range of other studies which have been done on the subject in the other provinces of Iran. Previous studies have shown that the food insecurity in four cities, (Asadabad, Isfahan, Shiraz, and Tabriz) of Iran was 36.3% (30), 36.6% (7), 44% (27), and 30% (31), respectively. Same studies in different countries have showed 14.3 percent food insecurity in United states in 2012 (32) and also swinging trend in European countries(Europe Union), which showed food insecurity fall from 12% to 8.7% from 2005 to 2009 and then

Table 5. Multiple logistic regression results on the relationship between food insecurity and socio-economic factors.

| Socio-economic variables | Food insecurity | | |
|--|-----------------|------------|------------------|
| | OR | 95% CI | <i>P-value</i> |
| Father's job | | | |
| Manager, academic, Employee, businessman | 1.00 | - | - |
| Worker, farmer or self-employed and jobless | 3.26 | 2.06-5.17 | <0.001 |
| Mather's job | | | |
| Employee, retired | 1.00 | - | - |
| Worker, self-employed, Jobless, housekeeper | 5.43 | 1.59-18.55 | <0.01 |
| Father's education level | | | |
| Academic | 1.00 | - | - |
| Non academic | 3.51 | 2.08-5.91 | <0.001 |
| Mother's education level | | | |
| Academic | 1.00 | - | - |
| Non academic | 4.09 | 1.17-14.25 | 0.02 |
| Household's economic status (according to living facilities) | | | |
| Good | 1.00 | - | - |
| Moderate | 7.10 | 3.38-14.92 | <0.001 |
| Week | 12.95 | 5.32-31.54 | <0.001 |
| Breakfast | | | |
| Yes | 1.00 | - | - |
| No | 2.24 | 1.36-3.71 | <0.01 |
| BMI | | | |
| Obesity | 1.00 | - | - |
| Overweight | 0.78 | 0.34-2.18 | 0.76 |
| Normal | 0.47 | 0.20-1.08 | 0.07 |
| Underweight | 0.58 | 0.12-2.75 | 0.49 |
| Systolic blood pressure | | | |
| Hypertension | 1.00 | - | - |
| Prehypertension | 0.05 | 0.01-0.28 | <0.001 |
| Normal | 0.35 | 0.18-0.68 | <0.01 |
| Diastolic blood pressure | | | |
| Hypertension | 1.00 | - | - |
| Prehypertension | 0.66 | 0.28-1.55 | 0.34 |
| Normal | 1.01 | 0.56-1.83 | 0.96 |

BMI: Body mass index

this trend reversed and rose up to 10.9% in 2012 and remained augmented in 2013(33).

In studies conducted by Rezazadeh (2016)(16) and Ntwenya (2015)(34) significant relationship was observed between food insecurity and dietary patterns. In the studied subjects in our study there were three major dietary patterns. The dietary pattern scores of each pattern were categorized into two groups: less than median (group 1) and greater than median (group 2). Student in the group 2 in pattern 1(including: vegetable, dairy

products, fruit, meat, and legumes), were less susceptible to food insecurity. Also student in the group 2 in pattern 1 (including: potato and grains) were more susceptible to food insecurity compared with subject group 1. The results indicated that individuals with food insecurity, consuming more grains (rice, bread, and pasta) and potato and consumed less meat, vegetable, fruit and poultry. This is similar to the findings of the studies conducted by Drewnowski and Eichelsdoerfer (2010) and Kim and Oh (2015) (35, 36).

Based on the findings of the current study, mother's age was most strongly associated with food insecurity. This is consistent with the result of the Mohammadi Nasrabadi et al. (2008) - on members of Iranian households? - and Payab et al. (2012) -on primary school children mothers- (37, 38). Unlike our study's result, Ramesh et al. (2009) -among Shirazian households in Tehran- and Ihab et al. (2013) -on mothers in rural Malaysia- did not show any association between mother age and food insecurity (39, 40).

Our study also revealed that family size was directly associated with food insecurity. This can be attributed to the crucial situations such as temporary joblessness and increased food price. In family with high family size, when incomes drop and family budgets shrink and availability of food decrease, reducing the amount of food for each member is natural. This result is in agreement with several previous studies on food insecurity (41-43).

Our study findings showed that food insecure households had lower grade point average students. This is in line with Shanafelt et al. (2016) who reported food insecurity was accompanied by lower grade point average in rural adolescents (5). Also Diana F et al. study suggested that food insecurity can influence school performance through affecting social and academic skills in students who lives in food insecure households(44). Based on the current study findings, a strong relationship between parent's job and food insecurity was seen. This is consistent with the results of a research performed by Kim et al. (2011) on household food insecurity in the Republic of Korea (45). The source of a household's income is strongly related to food insecurity. The higher-paying jobs and income up can cause economic growth, and providing high availability of the most important food resources. Moreover, the results also revealed a

significant positive relationship between parents' education level and food security. Generally, food insecurity decreases with increase in education level. A large number of researches have shown a significant relationship between food security and education level (46-49). We showed positive relationship between food security and economical status. Food insecurity odds ratio had an increasing trend in the weak, moderate, and good economic status groups. The results are in agreement with previous studies (50-53).

In our study breakfast consumption had a negative relationship with food insecurity. The households didn't have breakfast for ≥ 5 times per week were food insecure. This results are in same line with Jutith S et al study which suggest that offering free or reduced price breakfast in school can improves household food security(54).

Our findings suggest that systolic blood pressure is associated with food insecurity. This is consistent with the results of the research performed by Irvin et al. (55). Findings from Irvin et al. study showed that adequate food accessing related stress in insecure families resulting to higher blood pressure in this families. Also limitation in adherence to a healthy dietary pattern have been suggested as a reason for elevated blood pressure in food insecure individuals (56).

Limitations

It is important to consider the current findings are in the context of the cross-sectional data and causal relationships cannot be drawn. It is also necessary to highlight that the data rely on the reliability and accuracy of self-report, which may be subject to recall or interviewer bias. With all of these, the present study is one of the first attempts to understanding of food and nutrition status of high-school students with attention to the prevalence of food insecurity and its associated factors among Iranian Kurdish population.

Conclusion

According to the result of present study it can be concluded that food insecurity is prevalent among households of high-school students in Kurdish popu-

lation, west of Iran. Its prevalence is in the range of other areas of Iran. The students which lived in food-secure households consumed more foods such as vegetable, dairy products, fruit, meat, and legumes, while student who lived in food-insecure households had more foods such as potato and grains.

By the observed associations among food insecurity, dietary patterns, parents related factors and economic factors, providing food assistance and educational programs are necessary to support food insecure households.

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