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Food Insecurity and Depressive Symptoms among University Students: A Cross-Sectional Study from Iran

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ABSTRACT

Background: Food insecurity and depression are two public health problems in the developing countries. This study aimed to determine the association of food insecurity with depression and socioeconomic status (SES) among medical university students. **Methods:** This study was conducted among 272 students within the age range of 18-22 years. Participants' demographic and anthropometric information was evaluated using standard methods. The dietary intakes were collected using a 24-hour dietary recall. Physical activity level was estimated using the International Physical Activity Questionnaire-short form. Food security status was evaluated by the 18-item United States Department of Agriculture (USDA) questionnaire. Depression was assessed by Beck Depression Inventory. **Results:** The prevalence of food insecurity and depression in participants were 44.1% and 62.5%, respectively. An inverse relationship was found between food insecurity and dietary intake of energy and macronutrients among university students ($P < 0.05$). In addition, the results revealed an inverse relationship between food insecurity and SES status ($P < 0.05$). In the food secure group, 19.1% of participants were depressed and in the food insecure group, 54.3% of them were depressed. A positive correlation ($P < 0.05$) was found between food insecurity and depression. **Conclusion:** The findings of this study showed a significant relationship between food insecurity and depression. However, longitudinal and interventional studies are needed to establish a causal relationship.

Keywords: *Food security; University students; Mental health; Depression*

Introduction

Depression is a common mental disorder, characterized by reduced energy, loss of interest in daily activities, feelings of guilt, decentralization, anorexia, and suicidal thoughts

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(Mohammadzadeh, 2011). Depression is highly prevalent worldwide and is one of the leading causes of disability. It also accounts for over 40% of mental disabilities (Aeenparast *et al.*, 2012).

According to the literature, medical students experience a high level of stress that can contribute to development of mental health problems (Kaviani *et al.*, 2002). Therefore, depression is more prevalent among medical students than other groups and can reduce their performances such as their academic achievements (Othieno *et al.*, 2014).

Previous studies reported different prevalence rates of depression among university students. In one epidemiologic study, Thompson et al. reported that 59.1% of the medical students at the University of Hawaii had depressive symptoms (Thompson *et al.*, 2010). In another study in Australia, Stallman showed that university students had remarkably higher rates of psychological distress and depression symptoms compared to the general population and almost two-thirds of them had not sought help for their distress (Stallman, 2010). Rezaei et al. reported that 55% of the medical sciences students in Hamadan University were suffering from various degrees of depression; 24% had mild depression, 25.2% had moderate depression, and 4.6% had severe depression (Rezaei *et al.*, 2015).

Food and nutrition are among the basic needs of human society and food security is defined as a condition when all people have constant physical, social, and economic access to adequate, safe, and nutritious foods that meet their dietary needs for healthy living. On the contrary, food insecurity is often associated with low income and poverty (Ivers and Cullen, 2011), obesity, anxiety, and depressive symptoms (Ivers and Cullen, 2011).

The prevalence of food insecurity is 14.7% in American households (Coleman-Jensen *et al.*, 2010), while it is estimated as 44% in Iranian households (Ramesh *et al.*, 2010).

Food insecurity and hunger cause not only physical health problems, but also adverse psychological outcomes (Campbell, 1991). For example, Mirzadehahari et al. found a positive relationship between depression and food insecurity in women. The findings showed that prevalnce of depression was three times higher in individuals with severe food insecurity (Mirzadehahari *et al.*, 2015). Furthermore, increased food insecurity increased major depression (Mirzadehahari *et al.*, 2015). Payab et al. investigated 430 mothers with primary school children. Based on the findings, 34.6% of the mothers who were in "food secure" group were depressed and 77.8% who were in the "food insecure with hunger" group were depressed and this difference was statistically significant (Payab *et al.*, 2014).

Given that depression is associated with various factors such as physical and mental conditions of a person and can affect the academic performance of students, investigating the relationship between food security and depression is crucial. The aim of the current study was to evaluate the association between depression and food security among the medical students in University of Medical Sciences.

Materials and Methods

Study design and population: The present cross-sectional study was approved in Tehran University of Medical Sciences (Research ID: 19984). This research was conducted from October to December 2014 on 272 students randomly selected from seven colleges (medicine, dentistry, pharmacy, health, paramedical, nursing and midwifery, and rehabilitation). Inclusion criteria were: studying in Tehran University of Medical Sciences; living with their family for the last 12 months; and having 18 to 22 years of age. Exclusion criteria included suffering from chronic or infectious diseases that affect mental health as well as alcohol and /or drug abuse.

Measurements: Information about the participants' age and gender was recorded using a demographic questionnaire. Another structured questionnaire (Ramesh *et al.*, 2010) was also administered to assess the socioeconomic status (SES).

A Beurer digital scale with a precision of 0.1 kg was used to measure the body weight of participants, while they were in minimal clothing. The participants' height was measured in standing position to the nearest 0.1 cm using a measuring

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tape. The body mass index (BMI) was calculated by dividing weight (kg) by height^2 (m^2).

Dietary intake was assessed using a 24-hour dietary recall. To obtain the amounts of energy and macronutrients, Nutritionist IV software was run.

Physical activity level was measured using the International Physical Activity Questionnaire (IPAQ)-short form. Moderate and high physical activity levels were defined as achieving a minimum total physical activity score of at least 600 to 1500 MET-minutes/week, respectively. Those participants who did not meet the criteria for having moderate or high-intensity physical activity levels were considered to have low physical activity level (Craig *et al.*, 2003).

Food security status was evaluated by the 18-item United States Department of Agriculture (USDA) questionnaire. This questionnaire evaluates food security status in the last 12 months. The participants were classified into the following four groups based on the number of positive scores: food secure (0-2), food insecure without hunger (3-7), food insecure with moderate hunger (8-12), and food insecure with severe hunger (13-18) (Bickel *et al.*, 2000).

Depression was assessed by Beck Depression Inventory (BDI), which is a 21-item self-report inventory in multiple-choice format. Each answer is scored on a scale value of 0-3. No or minimal, mild-to-moderate, moderate-to-severe, high, and severe depression are defined as ≤ 9; 10-18; 19-29, and scores ≥ 30, respectively (Beck *et al.*, 1996).

Ethical consideration: The protocol of this study was approved by the Ethical Committee of Tehran University of Medical Sciences, Tehran, Iran. All participants were fully aware of the study objective and procedures and signed written informed consent.

Data analyses: Data were analyzed using SPSS software V.16 (SPSS Inc., Chicago, IL, USA). To examine the normal distribution of variables, the Kolmogorov-Smirnov test was used. Quantitative and qualitative data were presented as mean ± SD and frequency (percentages), respectively. The relationship between food security status and qualitative variables was assessed by Chi-square and this relationship with quantitative data was evaluated by ANOVA. The simple regression method was used to calculate the correlation between food security, depression, and other variables.

Results

In this study, a total of 272 students were enrolled. The mean age of the participants was 21.5±1.6 years. Of 272 participants, 42.6% (n = 116) were males and 57.4% (n = 156) were females.

Among the participants, 44.1% were food insecure and 55.9% were highly food secure (55.9%). The prevalence of food insecurity without hunger was 26.8% and 17.3% reported food insecurity with moderate hunger. No food insecurity was reported with severe hunger.

In the present study, more than half of the participants (62.5%) reported depressive symptoms. Of the total participants, 39.7% reported mild to moderate levels of depression, 17.3% reported moderate to severe depression, and 5.5% were severely depressed.

As shown in **Table 1**, participants' age, weight, height, and BMI had no significant relationship with food security ($P > 0.05$). However, an inverse relationship was found between food insecurity and dietary intake of energy and macronutrients ($P < 0.05$).

The distribution of participants in terms of socioeconomic status, gender, and their physical activity levels was not significantly different among groups with different levels of food security (**Table 2**). Food security had no significant relationship with gender and physical activity level ($P > 0.05$). An inverse association was observed between food insecurity and socioeconomic status ($P < 0.05$).

In the "food secure" group, 19.1% of the participants were depressed and among those who reported food insecurity without hunger, 28.7% were depressed. The prevalence of depression among the "food insecure with hunger" group was 25.6% ($P < 0.05$, **Table 3**).

In addition, according to simple linear regression, food insecurity was directly correlated with depression (β ± SE: 0.15 ± 0.08, $P = 0.01$).

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Table 1. Relationship of age, anthropometric characteristics, intake of energy and macronutrients with food security status.

Variables	Food secure	Food insecurity		P-value[a]
		Without hunger	With hunger	
Age (y)	21.4 ± 1.6	21.6 ± 1.5	21.8 ± 1.5	0.3
Weight (kg)	59.9 ± 11.2	63.7 ± 15.3	61.3 ± 6.4	0.3
Height (cm)	167.8 ± 7.6	169.4 ± 10.1	166.3 ± 4.8	0.7
Body mass index (kg/m^2)	21.2 ± 3.0	21.6 ± 3.2	22.5 ± 2.4	0.3
Energy (kcal)	2898.8 ± 465.4	2193.5 ± 645.9	1909.8 ± 843.9	0.01
Carbohydrate (g)	448.4 ± 242.6	332.9 ± 114.5	311.6 ± 147.8	0.01
Protein (g)	93.7 ± 15.7	65.1 ± 12.5	54.7 ± 12.3	0.01
Fat (g)	81.1 ± 23.6	64.0 ± 22.6	50.2 ± 25.0	0.01

[a]: P-values were estimated using ANOVA test.

Table 2. Relationship of sex, socioeconomic status and physical activity with food security status in university students

Variables	Food secure	Food insecurity		P-value[a]
		Without hunger	With hunger	
Sex				
Men	63 (54.3)[b]	32 (27.6)	21 (18.1)	0.2
Women	89 (57.0)	41 (26.3)	26 (16.7)	
Socioeconomic status				
Low	27 (22.3)	20 (16.5)	74 (61.2)	0.01
Moderate	15 (14.3)	38 (36.2)	52 (49.5)	
High	26 (56.5)	15 (32.6)	5 (11.4)	
Physical activity				
Low	73(53.3)	40(29.2)	24(11.4)	0.4
Moderate	73(58.4)	29(23.2)	23(18.4)	
High	6(60.0)	4(40.0)	0(0)	

[a]: P-values were estimated using chi-square test, [b]: n (%).

Table 3. Relationship of food security with depression in university students.

Variables	Food secure	Food insecurity		P-value[a]
		Without hunger	With hunger	
Without depression	55 (54.0)[b]	24 (23.5)	23 (22.5)	0.02
Mild depression	68 (63.0)	28 (26.0)	12 (11.0)	
Moderate depression	25 (53.2)	12 (25.5)	10 (21.3)	
Severe depression	4 (26.7)	9 (60.0)	2 (13.3)	
Total	152 (55.9)	73 (26.8)	47 (17.3)	

[a]: P-values were estimated using chi-square test, [b]: n (%).

Discussion

In this study, 44.1% of students were food insecure and 62.5% had mild to severe depression. Additionally, we studied the association between depression and food insecurity. Our findings showed an association between the level of food insecurity and the prevalence of depressive symptoms. We found that students with low food-security were more likely to experience depressive symptoms than their food-secure peers.

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The findings of this study indicate that food insecurity affects several symptoms of depression, including behaviors, thoughts, and depressive feelings. These findings are similar to previous studies reporting an association between food insufficiency or food insecurity and the risk of mental distress or major depression (Leung *et al.*, 2014, Mirzadehahari *et al.*, 2015, Payab *et al.*, 2014, Siefert *et al.*, 2001, Silverman *et al.*, 2015). Huddleston-Casas et al. also showed that household food insecurity and maternal depression in a rural population had a causal relationship ($p<0.05$) (Huddleston-Casas *et al.*, 2009). In a cohort study, Noonan et al. found that maternal depression could increase children and household food insecurity at least 23% and 11% in U.S, respectively (Noonan *et al.*, 2016).

A comprehensive literature review (Weaver and Hadley, 2009) over food insecurity and mental health in developing countries disclosed that food insecurity damaged mental health, more importantly, food insecurity was reported as a mentally and emotionally damaging experience.

These consistent findings support the existence of a relatively strong association between food insecurity and depressive symptoms. Food insecurity is associated with adverse mental health because it pushes people to consume food in socially unacceptable ways, which is associated with experiencing stress or anxiety (Weaver and Hadley, 2009). In this regard, feelings of shame associated with food insecurity are reported (Nordanger, 2007, Piaseu *et al.*, 2004)

To sum up, provision of the food supply is the primary concern and low access to safe and nutritious food may be related to the development of mental health problems such as depression. In addition, food security improvement in those with food insecurity may relieve mental distress (Weigel *et al.*, 2016). Thus, improving food security among college students needs more attention.

Considering the potential overlap between SES and food security, we also examined the relationship between dimensions of socioeconomic status and food security. Students with lower SES had significantly higher food insecurity than students living in higher SES levels. In this regard, it is suggested that food insecurity is a consequence and reflection of low SES in the longer-term (McCoy *et al.*, 2014). Ramsey et al. reported that food insecurity was associated with lower household income and residence in poor socioeconomic areas among an urban population in Australia (Ramsey *et al.*, 2012).

With respect to the findings, it can be concluded that food insecurity is prevalent in lower SES, which is due to a decrease in food choices and access. Thus, university students who are not financially independent and receive financial aid are at a higher risk or food insecurity. Although many students receive financial support from family, their current financial status or background SES might not be sufficient to meet their basic and nutritional needs (Payne-Sturges *et al.*, 2018). Similarly, Akerele et al. reported that a lower level of income was associated with lower opportunity of meeting nutrient requirements (Akerele *et al.*, 2017). Among college students, food insecurity, food insufficiency, or hunger is an important health concern that was associated with academic performance and adverse psychosocial development (Payne-Sturges *et al.*, 2018). Thus, addressing this problem needs more attention.

In this study, we found a positive relationship between low intake of energy and macronutrient with food insecurity among the university student. Payab et al. found that food insecurity status had a significant inverse relationship with average daily energy, carbohydrates, and protein intakes (Payab *et al.*, 2014). Inconsistent with these results, the study by Kirkpatrick and Tarasuk showed that food-insecure children and adults had a high prevalence of inadequate nutrient intakes such as protein, fat, and vitamins (Kirkpatrick and Tarasuk, 2008). Similarly, Rosas et al. showed that daily intake of energy and fat was higher in the food insecure group (Rosas *et al.*, 2009). Moreover, Ortiz-Hernandez et al. reported that children with food insecurity had higher intakes of carbohydrate source like sweet bread, snacks, ice cream, candy, and sodas in Mexico City (Ortiz-

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Hernandez *et al.*, 2007). Overall, it seems that food insecurity can increase and decrease intake of energy and macronutrients in different cases. In this regard, increase of food insecurity decreased people's access to adequate healthy and nutritious food, so that they consume more cheap and energy-dense foods such as sweets and fried snacks that provide high calorie to the body.

Based on our knowledge, this study is the first research that examined the association of food security and depression in university students. Considering the cross-sectional design of this study, the exact causal relationship could not be determined between food insecurity and depression. Another limitation of this study was that we did not assess other factors affecting depression.

We suggest future researchers to design and conduct cohort studies and surveys to investigate other factors that might affect food insecurity and depression. In addition, future researchers are recommended to determine the prevalence of food insecurity among other students and to see whether improvement of the food security status will improve the participants' mood or academic achievement.

Conclusion

The findings suggest that food insecurity, as a public health issue, can affect university students' mood status. Given that vulnerability to food insecurity has increased over the past years, more studies are needed in this field, food insecurity should be routinely monitored among students, and some strategies should be found to support students and meet their nutritional needs.

Authors' contributions

Bayat B was involved in designing the study. Piran F collected the data. Izadi A and Askari GH participated in formal analysis and, writing manuscript. Zolfaghari H was the supervision and project administration. All authors critically reviewed the manuscript and approved the final version submitted for publication.

Conflict of interests

There is no conflict of interests.

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