



Is household food insecurity related to mothers' stress, anxiety and depression in Iran?

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ABSTRACT

Food insecurity is a public health concern with pervasive effects on numerous human biological factors. In addition to physical problems, food insecurity may have adverse social and psychological impacts. The present study aimed to determine the correlations between household food insecurity and stress, anxiety, and depression in mothers living in Mashhad, Iran. In this cross-sectional study we recruited 312 mothers. We collected data on the food insecurity status of households using the Household Food Insecurity Access Scale (HFIAS) and used the Depression Anxiety Stress Scale (DASS) to assess the levels of stress, anxiety, and depression in the subjects. The prevalence rate of food insecurity was 51.9%, and the prevalence rate of stress, anxiety, and depression was 70.2%, 70.2%, and 55.1%, respectively. In the food-insecure group, 94.3% of the mothers had stress, 91.4% had anxiety, and 87.1% had depression. While in the food-secure group, 60.7%, 61.3%, and 37.3% of the mothers had stressed, anxiety, and depression, respectively. In all the analytical models, food insecurity was significantly and positively associated with stress, anxiety, and depression ($P < 0.001$). Our results suggested that a higher level of food insecurity correlates with extreme degrees of stress, anxiety, and depression. Therefore, the improvement of mothers' mental health in terms of stress, anxiety, and depression depends on the improvement of household food insecurity.

1. Introduction

Household food insecurity (HFI) occurs when physical, economic, and social opportunities to use adequate, healthy, and nourishing food are limited, therefore making it difficult to lead a healthy and active life (Coates et al., 2007). HFI has remained a public health concern in both developed and developing countries (Nejati, 2017). According to the Food and Agriculture Organization of the United Nations (FAO, 2021), nearly 30% of the global population is affected by moderate or severe food insecurity (FAO, 2021). Although around 8% of North American and Europe populations have been suffering from food insecurity, the rate of HFI is considerably higher in developing countries, such as Iran. The prevalence of food insecurity among Iranian households, mothers, and children was at 49%, 61%, and 67% in 2016 (Behzadifar, 2016).

Daneshi-Maskooni et al. in 2017 reported near half of Iranians (49.2%) have food insecurity and 19.2% of them have food insecurity with hunger. These findings were for Iranians in all levels of food insecurity, not just severe. According to the results of Mohammadi's study, in 2011, 11.8, 14.4, and 17.5 percent (43.7 % in total) of households in Tehran had severe, moderate, and mild food insecurity (Mohammadi et al., 2012). The results of Fallah's study showed that 16.4 % of people resident in Mehriz a small city in Iran had food insecurity with hunger. While overall food insecurity and severe food insecurity were more (Fallah Madvari, 2015).

Food insecurity is considered a nutritional risk that can contribute to various forms of malnutrition including under-nutrition or over-nutrition, both of which bring about serious consequences for physical and psychological well-being (Anderson, 1990). Food insecure

Abbreviations: HFIAS, Household Food Insecurity Access Scale; DASS, Depression Anxiety Stress Scale; FFQ, Food Frequency Questionnaire; BMI, Body Mass Index.

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individuals may experience physiological distress as a result of having the limited ability or availability to access nutritious, adequate, and affordable food in socially appropriate ways (Huddleston-Casas et al., 2009). Previous studies reported that food insecurity is associated with higher prevalence rates of common mental disorders (Wolfson et al., 2021; Whittle et al., 2019).

Considering the unfavourable economic conditions and the high inflation rate in Iran, which directly related to the purchasing power of food, awareness of the prevalence of food insecurity in this period, can even be a predictor of mental health risks. Therefore, conducting this study is very important from this point of view and can help in designing preventive programs to provide enough food and maintain people's mental health. So that HFI could be contemplated a key source for poor mental health outcomes.

Different studies use various instruments to assess mental health status and in this study, we evaluate mental health with variables such as stress, anxiety and depression. Because they are the most common mental disorders that can be almost treated.

Stress is an emotional state in which a person believes that the total demands and expectations from him are beyond his facilities and abilities, and it has been known for years (1989) that it leads to anxiety and depression in the long term (Kendall and Watson, 1989). According to the World Health Organization (WHO) reports, nearly 332 and 264 million people worldwide are suffering from depression and anxiety disorders (Who, 2017). Anxiety affects 20% of adults each year (Munir and Takov, 2022). It has an estimated lifetime prevalence of 3.7% worldwide and is one of the most common mental disorders that causes fear, worry and a constant feeling of being overwhelmed. Anxious people are characterized by constant, excessive, and unrealistic worry about everyday things (Leonard and Abramovitch, 2019). Depression is a common health problem in developed and developing countries that leads to disability-adjusted life years in the world (Sotoudeh, 2020; Khosravi, 2019). Unfortunately, due to the placid nature of these disorders, as well as insufficient budget allocation, lack of government support, and inadequate knowledge of the disease and its consequences, more than two-thirds of the patients do not seek proper treatment (Organization, 2001; Khosravi et al., 2015). Therefore, identifying factors that are associated with an elevated risk of these disorders is crucial. We understood that food insecurity is strongly associated with the elevated risk of some chronic diseases, such as hypertension, diabetes, obesity, and even death due to cardiovascular diseases (Nagata et al., 2019) and the relationship between food insecurity and physical health has been vastly investigated, just a few studies were done on the relationship between food insecurity and mental health, specifically in Iran. Mothers are a vulnerable group in the community because of cultural reasons. On the other hand, given the sensitive role of mothers in the family, this group may have a higher risk of mental disorders. Therefore, we conducted this research with the aim of investigating the relationship between household food insecurity and mental health status in terms of stress, anxiety and depression in mothers.

2. Materials and methods

2.1. Sampling and data collection

We have conducted a cross-sectional study on mothers who referred to health care centers from June 2018 to September 2018 in Mashhad that is a city in northeastern of Iran (before the announcement of the epidemic of Covid-19 in Iran). We calculated the largest probable sample size based on the anxiety with power 80% and $P = 0.05$. The sampling was done through a multi-step process. First, we stratified the target population to three socio-economic strata including the rich, the middle class, and the poor according to the area of residence (Farhadi-khah, 2018; Abbasi-Shavazi, 2013), household size, education and job of mothers and household heads, as well housing ownership. Then we considered each of the health centers of Mashhad as a cluster and

prepared a list of all clusters in every socio-economic area. Next, we randomly selected three health care centers from each socio-economic area. Finally, in each cluster, we selected mothers visited on odd days and continued to recruit them until we reached 35 volunteers in each health center.

The inclusion criteria of the study were willingness to participate in the study, having a child, living in Mashhad city and age of 20–50 years. Non-inclusion criteria were pregnant or breastfeeding women, women with a recent abortion, alcohol or drug consumption, neurological diseases, using neuroleptics, antidepressants, and anxiety medication, having twins/multiple births, bereavement, and having premenstrual syndrome based on the physician's diagnosis or taking medicine by the mother.

The executive team of our study consisted of five nutrition students that collecting data through face-to-face interviews in all health centers. They explained the study objectives, and safety and privacy of study participants. After a brief explanation with more than 700 women, 312 mothers agreed to participate in the study and all of them signed a written informed consent form. The Ethics Committee of Mashhad University of Medical Sciences, Mashhad, Iran, approved the protocol of this study (IR.MUMS.MEDICAL.REC.1398.054).

2.2. Anthropometric measurement

We measured maternal weight and height with light clothing and no shoes using a weighing scale and Stadiometer (Seca 755, Hamburg, Germany) with an accuracy of 100 g for weight and one milli-meter for height. We calculated Body Mass Index (BMI) as weight divided by the square of height (Kilograms/Square meters).

2.3. Household food insecurity measurement

We used the Household Food insecurity Access Scale (HFIAS) to measure the prevalence and severity of food insecurity at national, regional, and local levels. The validity and reliability have previously confirmed in Iran (Mohammadi et al., 2012).

HFIAS is composed of a set of nine items specific to an experience of food insecurity occurring within the past month and its validity has previously confirmed in Iran (Mohammadi et al., 2012). Endorsed a standard scoring was used with 1 point for occurrence and zero for non-occurrence. The frequency scores are within the range of 0–3, with zero indicating non-occurrence, one showing rare occurrence (once/twice in the past four weeks), two indicating some-times (3–10 times in the past four weeks), and three for often (<10 times in the past month) (31, 32). Scores 0–1 represented the food-secure group, while scores 2–7, 8–14, and 15–27 were defined as slight food insecurity, moderate food insecurity, and severe food insecurity (Coates et al., 2007).

2.4. Stress, anxiety, and depression measurement

We assessed maternal stress, anxiety, and depression in the past week using self-reporting of the valid Persian version of the DASS questionnaire, which includes 42 items with 14 separate items on each of these psychological factors. The depression scale includes terms that measure mood swings, lack of confidence, frustration, the worthlessness of life, lack of interest in engaging in social affairs, lack of enjoyment of life, and lack of energy/strength. The anxiety scale contains terms that measure physiological arousal, fears, and situational anxiety. The stress scale includes terms that measure difficulty in achieving calmness, nervous tension, irritability, and restlessness; notably, stress covers both physical and mental stress in this scale. DASS items are scored within the range of 0–3 (0 = Never, 1 = Slightly, 2 = Sometimes, 3 = Always) and their validity and reliability in Iran have been confirmed by Moghaddam et al. (Moghaddam, et al., 2008).

2.5. Dietary intake measurement

We collected the data on food consumption in the past year with a Food Frequency Questionnaire including 168 items. The validity and reliability of the FFQ have been confirmed by Mirmiran et al. in Iran (16). This scale is suitable to evaluate the type of foods by day, week, month, and year. We converted the obtained values into grams per day. In addition, the consumed foods by the subjects were coded in accordance with the software guide of Nutritionist IV based on US Department of Agriculture (USDA) food composition table revised for Iranian foods (Azar and Sarkisian, 1980). After coding, we analyzed the codes by the Nutritionist IV software (First Databank Inc., Hearst Corp., San Bruno, CA, USA) for energy, Carbohydrate, Protein and fat intakes.

2.6. Statistical analysis

We described continuous variables as Mean ± SD and categorical variables as frequencies and percentages. We evaluated the normality of data using the Kolmogorov-Smirnov test and used linear regression to evaluate the relations between levels of food insecurity and stress, anxiety, and depression and multiple regression for adjusting confounders. The significance level was less than 0.05 and we considered two-way in all tests. Data were statistically analysed using SPSS software version 25 (SPSS, Inc, Chicago, IL, 2007).

3. Results

In total, 312 mothers aged 23–50 years enrolled in the study. According to the information in Table 1, the mean daily energy intake of the mothers was 1797 ± 691 kcal. We also illustrated the daily intakes of macronutrients in each group of food insecurity in the same table.

According to the findings, the prevalence (Table 2.) rate of food insecurity was 51.9%, (Fig. 1) and the prevalence rate of stress, anxiety, and depression was 70.2%, 70.1%, and 55.1% (Fig. 2). In the food-insecure group, 94.3% of the mothers had stress, 91.4% had anxiety, and 87.1% had depression (Fig. 3).

The results showed that food insecurity positively and significantly related with the stress, anxiety, and depression scores in the unadjusted model. In model one (adjusted for age, and number of children), the relation of food insecurity with the stress, anxiety, and depression scores was also considered positive and significant. In model two (adjusted for extra variables including calorie intake, BMI, residence area, age, and number of children), the correlation of food insecurity with the stress, anxiety, and depression scores was considered positive and significant as well (Table 3). After adjusting the effect of confounders in two models, it was observed that more food insecurity is associated with more stress by 22% (R2 = 0.22), more anxiety by 32% (R2 = 0.32) and more depression by 40% (R2 = 0.4).

Table 1
Distribution of Demographic and Nutritional Variables of Participants as per food insecurity status.

		Food Security N = 150	Slight Food Insecurity N = 65 Mean±SD	Moderate Food Insecurity N = 27	Severe Food Insecurity N = 70	Total N = 312
Energy Intake (kcal/day)		2180.4±635	1698.7±608	1408.4±476	1218.5±357	1797.4±691.7
Carbohydrate Intake (g/day)		303.3±93.4	239.6±101	202.8±70	176.6±59	252.9±101.3
Protein Intake (g/day)		82.8±24.8	65.4±24.9	50.2±20.1	44.6±15.1	67.8±27.6
Fat Intake (g/day)		76.4±26.5	57.8±18.8	48.3±18.2	40.5±12.3	62±26.4
Number of Children per Family		2.4±1.3	2.2±1.1	2.4±1.3	3.1±1.8	2.5±1.4
Age (year)		43.1±12	38.9±10.6	37.9±9.9	42.7±9.6	41.7±11.2
BMI* (kg/m ²)		26.8±3.8	25.9±3.5	24.6±3.5	27.3±5	26.5±4.1
			N (%)			
socioeconomic status	The rich	85 (82.5)	14 (13.6)	2 (1.9)	2 (1.9)	103 (100)
	The middle class	56 (53.8)	34 (32.7)	10 (9.6)	4 (3.8)	104 (100)
	The poor	9 (8.6)	17 (16.2)	15 (14.3)	64 (61)	105 (100)

*BMI: Body Mass Index.

Table 2
Frequency of Stress, Anxiety, and Depression Status in Participants.

Stress ^a	Stress intensity ^b	N (%)	Sum (%)	Score
No	0	93 (29.8)	93 (29.8)	0–14
Yes	1	45 (14.4)	79.2	15–18
	2	66 (21.2)		19–25
	3	68 (21.8)		26–33
	4	40 (12.8)		≥34
Anxiety ^a	Anxiety intensity ^b	N (%)	Sum (%)	Score
No	0	93 (29.8)	29.8	0–7
Yes	1	36 (11.5)	79.2	8–9
	2	68 (21.8)		10–14
	3	51 (16.3)		15–19
	4	64 (20.5)		≥20
Depression ^a	Depression intensity ^b	N (%)	Sum (%)	Score
No	0	140 (44.9)	44.9	0–9
Yes	1	44 (14.1)	55.1	10–13
	2	49 (15.7)		14–20
	3	43 (13.8)		21–27
	4	36 (11.5)		≥28

0 = Normal, 1 = Slight; 2 = Moderate; 3 = Severe; 4 = Very Severe.

^a Qualitative variables; ^b Quantitative variables based on last column (Score).

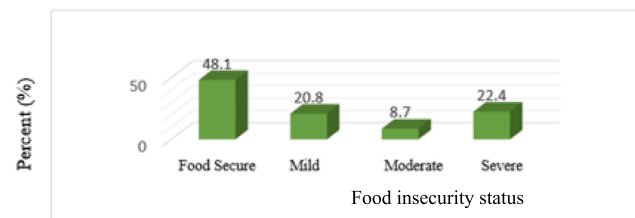


Fig. 1. The distribution of food insecurity in the mothers.

4. Discussion

The present study aimed to evaluate the status of food insecurity in Mashhad, Iran. The overall prevalence of food insecurity in the mothers was at 51.9%, while the rate of slight, moderate, and severe food insecurity was 20.8%, 8.7%, and 22.4%. Since the selected community represented families from all socioeconomic positions of Mashhad city, the estimated prevalence is probably generalizable to the entire population of Mashhad. This means the mothers suffered from severe food insecurity more than mild or moderate. We know mothers play an important role in managing of other family members. Therefore, mothers who are food insecure cannot take care of their children. Because food insecurity or chronic hunger leads to an increased risk of poor mental health, it further harms the family and society. Based on our results the prevalence of stress, anxiety and depression in our study's mothers were 70.2, 70.1%, and 55.1%, and the relationship between

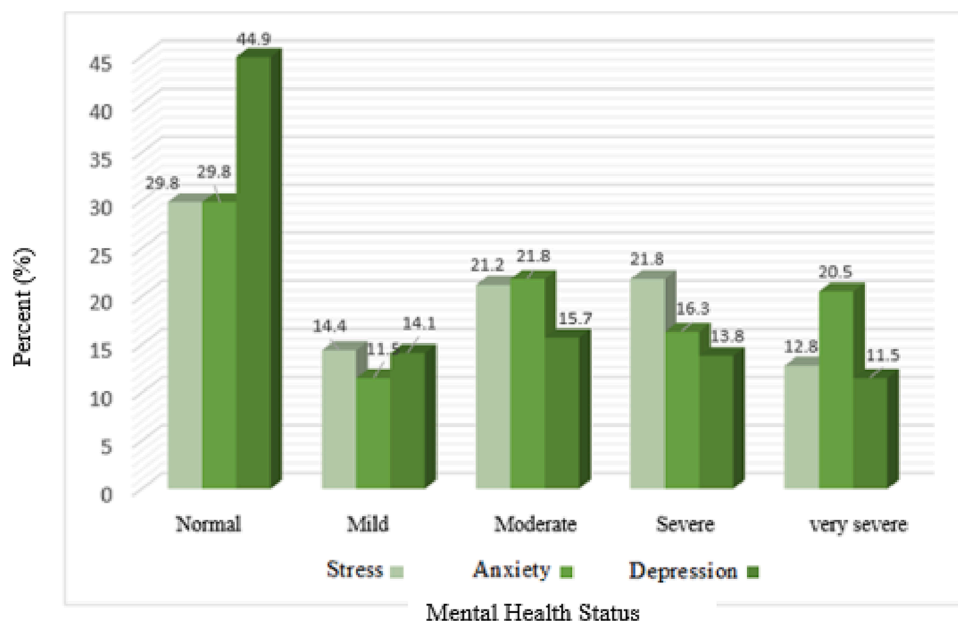


Fig. 2. The distribution of Stress, Anxiety and Depression in the mothers.

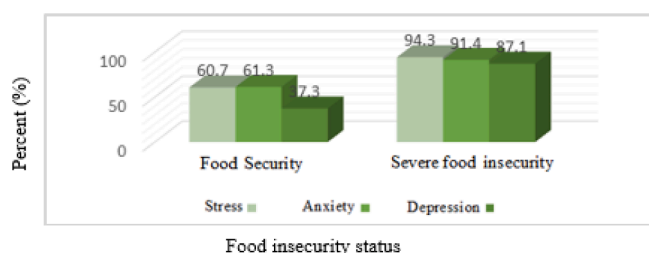


Fig. 3. The distribution of Stress, Anxiety and Depression in food secure mothers versus severely food insecure mothers.

food insecurity and stress, anxiety and depression was positive and significant.

Different studies in 2012 and 2017 in Iran reported that 43.7% and 49.2% of Iranians had some level of food insecurity (mild, moderate, and severe) (Daneshi-Maskooni et al., 2017; Mohammadi et al., 2012). Another study in 2015 showed that in Mehriz as a small city in Iran, 16.4 % of people had food insecurity with hunger and overall food insecurity and severe food insecurity were more prevalent (Fallah Madvari, 2015). Despite the limited female gender in our target samples, we cannot ignore the poor socio-economic situation in Iran, which is gradually getting worse. It is worth mentioning that we could not ignore the probable effects of sanctions on Iran’s economy. Sanctions affect the health of ordinary citizens. Despite the fact that it is claimed just to have a political purpose (Danaei et al., 2019; Salamati and Chaufan, 2019).

In particular, we observed an increase in the severity of food insecurity, which was significantly associated with the risk of stress, anxiety,

and depression in mothers, even after adjusting for some confounding factors. The Arenas study in the United States shows that food insecurity is significantly and positively associated with depression and anxiety (Arenas et al., 2019). The case control study of Mirzadeh et al. showed a positive significant relationship between major depression and food insecurity in women, so that in the severe food insecurity group, the risk of major depression was 3.34 times more than in the food secure group (OR = 3.34, %95CI = 1.04–8.90, P = 0.029) (Mirzadehahari, 2015). The results of Pourmotabbed et al. (Pourmotabbed et al., 2020) showed a positive, significant association between food insecurity and the risk of depression and stress; but the association was not significant for anxiety. The studies of Farzaneh et al. (Farzaneh et al., 2019) and Khoshgoo et al. (Mahdi, 2020) revealed that HFI was significantly associated with the increased risk of depressive symptoms (OR = 3.31, 95% CI = 2.07, 5.29). The study of Zahidi et al. (Zahidi, 2021) on reproductive-aged women in Kabul-Afghanistan showed that food insecurity was associated with depression (OR = 4.9, 95% CI: 2.7–8.9), anxiety (OR = 4.7, 95% CI: 2.5–8.8), and stress (OR = 3.8, 95% CI: 2.2–6.7). Of course, there was no significant relationship between food insecurity and anxiety in the Bruening study, probably because the target population was different (the participants were 18–19 years old, single, and lived in university residence halls) (Bruening et al., 2016). The difference may be due to differences in the demographic characteristics and sample size of the studies, lifestyle variables, and clinical/genetic variations. Jebena et al. have explained the possible mechanisms of the relation between food insecurity and the occurrence of mental disorders using some hypotheses (Jebena et al., 2016).

Unfortunately, the spread of food insecurity by a continuous decrease in the ability to buy enough and healthy food, as well as an

Table 3
Relationship of Food Insecurity scores with Stress, Anxiety, and Depression scores.

Variable		Stress Score				Anxiety Score				Depression Score			
		Exp.(β)	95% CI	P-value	R ²	Exp.(β)	95% CI	P-value	R ²	Exp.(β)	95% CI	P-value	R ²
Food Insecurity Score	Unadjusted Model ^a	0.43	0.4–0.6	<0.001	0.18	0.47	0.3–0.5	<0.001	0.22	0.55	0.6–0.8	<0.001	0.3
	Model 1 ^b	0.27	0.1–0.5	<0.001	0.22	0.25	0.1–0.3	<0.001	0.32	0.34	0.2–0.6	<0.001	0.39
	Model 2 ^b	0.28	0.1–0.5	<0.001	0.22	0.25	0.1–0.4	<0.001	0.32	0.33	0.2–0.6	<0.001	0.4

Model 1: Adjusted for age, and number of children.

Model 2: Model 1 + Adjusted for extra variables including calorie intake, BMI, and socioeconomic status.

^a Linear regression; ^b Multiple linear regression.

increase in the risk of stress, anxiety and depression can lead to an important health problem in mothers and their families.

From a biological perspective, the first hypothesis suggests that unfavorable nutritional status mediates the relationship between food insecurity and the occurrence of mental disorders. In the second hypothesis, from a psychological perspective, individuals with food insecurity may experience negative emotions, which will eventually lead to psychological complications (Jebena et al., 2016; Bruening et al., 2017). The third hypothesis of the mentioned research highlighted the role of the lack of physical health and exposure to other risk factors/diseases as a link in the relation of food insecurity and mental disorders. Food insecurity could affect physical health, and physical illnesses that lead to mental disorders. Furthermore, some studies have indicated a direct correlation between food insecurity and the occurrence of mental disorders. Finally, it was concluded that food insecurity may jeopardize mental health status regardless of social, cultural, and even genetic differences (Jebena et al., 2016). The strength of our study was random sampling. However, we did not consider other mental health risk factors (e.g., chronic diseases) in the sample, which is a limitation.

5. Conclusion

According to the results, mothers who experienced higher levels of food insecurity in their families had more severe levels of stress, anxiety, and depression. Given that household food insecurity has serious effects on mothers' mental health, paying attention to this public health problem is one of our society's priorities.

Database linking: There is no database link, but all data is available if necessary.

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CRedit authorship contribution statement

Maryam Nikoonia: Data curation, Conceptualization. **Maryam Khosravi:** Supervision, Formal analysis, Investigation, Conceptualization, Methodology. **Sheikh Mohammed Shariful Islam:** Writing – review & editing. **Seyed Reza Sobhani:** Formal analysis, Investigation, Methodology. **Ali Ebrahimi Dabagh:** Writing – original draft. **Mohammad-Amin Senobari:** Methodology.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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