

## RESEARCH ARTICLE

# Food security, mental health, and socioeconomic status: A cross-sectional study among medical college students in central part of Iran, Kashan

Negin Amin<sup>1</sup> | Hossein Akbari<sup>2</sup> | Sadegh Jafarnejad<sup>1</sup> 

<sup>1</sup>Research Center for Biochemistry and Nutrition in Metabolic Diseases, Kashan University of Medical Sciences, Kashan, Iran

<sup>2</sup>Social Determinants of Health (SDH) Research Center, Department of Biostatistics and Epidemiology, School of Public Health, Kashan University of Medical Sciences, Kashan, Iran

**Correspondence**

Sadegh Jafarnejad, Research Center for Biochemistry and Nutrition in Metabolic Diseases, Kashan University of Medical Sciences, Kashan, Iran.

Email: sjafarnejad@alumnum.tums.ac.ir

**Abstract**

**Background and Aims:** Food security is a complex and multidimensional issue that has been recognized as a serious public health problem all over the world for the past two decades. The present study was designed and conducted to determine the prevalence of food insecurity among college students at the Kashan University of Medical Sciences and some related factors including socioeconomic and mental health determinants.

**Methods:** The present study is a cross-sectional study conducted on 358 students who were currently studying at the Kashan University of Medical Sciences. The students who were pregnant or had a special diet to follow were excluded. Samples were selected by the systematic method. Food security was measured using United States Department of Agriculture. Food Frequency Questionnaire, 21-items Depression Anxiety Stress Scales, and Socioeconomic Questionnaire were used to investigate the nutrients intake, depression/anxiety status, and socioeconomic factors, respectively. Chi-square, independent *t*-test, and logistic regression were used to analyze the data.

**Results:** Based on the findings of the present study, 16.8% of students experienced different levels of food insecurity, and 83.2% of participants were categorized as food secure. Gender, financial assistance, health insurance, depression, and students' occupation are associated with food insecurity ( $P < .05$ ). Additionally, the results of the logistic regression analysis showed that depression (OR 1.04; 95% CI 1.01-1.07), and students' jobs (OR 0.43; 95% CI 0.23-0.80) have the greatest impact on students' food insecurity.

**Conclusion:** The findings of the present study show that economic factors and gender have a significant impact on students' food security. Moreover, the association of food insecurity with mental disorders such as depression was demonstrated in the current study. However, we could not detect any significant association between daily energy intake and macronutrients which indicates the requirement for more detailed studies.

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.

© 2022 The Authors. *Health Science Reports* published by Wiley Periodicals LLC.

## KEYWORDS

anxiety, depression, food frequency, food insecurity, macronutrient, stress, University

## 1 | INTRODUCTION

Food security is described as the ability to access sufficient and safe food without any significant physical and economical limitations.<sup>1,2</sup> Based on this definition, food security is affected by multiple factors and among them, the economic situation should be considered as the most important factor.<sup>3</sup> There are multiple factors that may affect food security status in positive or negative ways such as culture,<sup>4</sup> climate change,<sup>5</sup> and disability.<sup>6</sup> In addition, some special conditions such as the Covid-19 pandemics, could increase the food insecurity prevalence all over the world.<sup>7</sup> Latest investigations reported that about 9% of the world population is in a severe food insecurity status which means nearly 697 million are food-insecure individuals.<sup>8</sup> Most of the time, the duration of the food insecurity experience is short, however, this situation is frequently repeated since the major reasons behind food insecurity still remain. The information on food insecurity consequences in adults is quite limited.<sup>9</sup> Investigations indicated that food insecurity is a major challenge in University students and the prevalence of food insecurity is much higher among college students than other groups; the association between food insecurity and poorer psychological status, academic performance, and diet has been shown in previous limited studies.<sup>10</sup>

Food insecurity among students is a critical issue and it is hard to be noticed because most of the students try to hide such problems and are ashamed to talk about these kinds of issues.<sup>11</sup> Until now, most of the limited studies conducted on University students' food security were about the prevalence and its association with economic variables.<sup>12</sup> An investigation in Australia indicated the food insecurity prevalence as 46.5% among University students.<sup>2</sup> Another study which was carried out on Illinois University students reported that 35% of included students were food insecure.<sup>13</sup> Another investigation on food insecurity prevalence in New Hampshire (USA) indicated that 25% of the 943 participants were food insecure.<sup>14</sup>

Previous studies suggest a correlation between food insecurity and using financial aids, having a job along with studying, house instability, and poorer academic performances.<sup>12</sup> One study has been performed on universities students in South Africa and the results indicated that 60% of students suffered from severe food insecurity. The authors of this study believe that food insecurity is one of the major reasons that half of the South African University students never complete their education.<sup>15</sup> It has been demonstrated that the students who lived with families with lower income are at a higher risk of food insecurity in their student life.<sup>16</sup> Another cross-sectional study approved that food-insecure students have a higher chance of being among 10% of the lowest grade point average (GPA).<sup>17</sup> In addition, food insecurity could have direct and indirect effects on the health of college students.<sup>18</sup> Multiple investigations emphasize on negative effects of food insecurity on the anthropometric indices.<sup>19-21</sup> Najibi

et al's study indicated that food insecurity could be a great risk factor contributing to type 2 diabetes and its complications.<sup>22</sup> On the other hand, food insecurity could negatively affect mental health and sleep quality in adults.<sup>23</sup> Adults with food insecurity backgrounds may have a higher odds for depression, stress, and eating disorders.<sup>24</sup>

In comparison with other students, medical students struggle more with mental and physical discomfort; due to the more intense daily schedule. One of the studies conducted on 588 medical students indicated that 11.8% of participants were food insecure.<sup>25</sup> Another investigation on dental students in the United States of America, demonstrated that 47% of 328 students who attended the study, were food insecure. The results of this study suggested that food-insecure students were at higher risk of stress, sleep disorder, and weak academic performance.<sup>26</sup> This highlights the importance of further research on the correlation of food security and mental/socioeconomic indices in medical students. Moreover, despite all the recently published food security-related articles; the available information about the correlation between food insecurity and mental/socioeconomic factors in college students is insufficient and most of the present studies have been performed in the United States of America. This study aims to find the prevalence of food insecurity among University students in Kashan Medical University in Iran, Kashan. In addition, the association between food security status and mental health, sociodemographic factors, academic performance, and macronutrients intake, will be assayed during the current study.

## 2 | METHOD

This cross-sectional study was designed to assay food security status and its association with various variables among students of Kashan Medical University students in 2020. Only students who were currently studying at Kashan University of Medical Science in 2020 were included. The students who were pregnant, had food intolerance, and suffered from chronic diseases such as diabetes, CKD, and so on were excluded. The online questionnaires were administered to the 360 students who were recruited randomly. The 18-items US Department of Agriculture (USDA) Food Security Module was used to investigate food security status. Further, sociodemographic, short versions of Depression Anxiety Stress Scales (DASS) and Food Frequency Questionnaire (FFQ) were used for collecting the needed data. All questionnaires were converted to online versions on the Porsall website ([www.porsall.com](http://www.porsall.com)), as an Iranian platform for online surveys and integrated digital feedback collection. In total, about 600 invitations were sent to students and 407 students accepted to participate and filled out the questionnaires. Eventually, after eliminating ineligible participants, 358 students were eligible to be included in the analysis. All the participants were informed that their personal information will stay

confidential. This study was approved by the Health Human Ethics committee at Kashan University of Medical Sciences (number: IR.KAUMS.MEDNT.REC.1399.08) in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study was supported by Kashan University of Medical Science (grant number 99109).

We assessed students' food security status using the 18-items USDA U.S. Household Food Security Survey Module. The validity and reliability of this questionnaire have been evaluated by Rafiei et al.<sup>27</sup> We have used it to investigate students' food security status in the past 12 months. Based on the coding guideline outlined in Table 1, the participants were categorized into food secure, food insecure without hunger, food insecure with moderate hunger, and food insecure with severe hunger. This categorization was conducted based on the number of positive and negative answers to questions. For a more accurate comparison, participants were divided into two groups of food secure and food insecure. The first class (food secure) was considered as the food secure group. In contrast, the other classes (food insecure without hunger, food insecure with moderate hunger, and food insecure with severe hunger) were considered as the food insecure group. In summary, students who got 0 to 2 scores on the USDA questionnaire were identified as food secure, and the score of more than two was characterized as food insecure.

In the present study, DASS-21 was used for evaluating the mental status including depression, anxiety, and stress of students. This questionnaire contains 21 questions with one of the following options: Never (with zero scores), rarely (1 score), sometimes (2 scores), and most of the time (3 scores). Each of the depression, anxiety, and stress have seven related questions. Since this questionnaire is a short version of DASS-42; the final score of each of these subscales was duplicated. Table 2 indicates the interpretation of 21-item DASS

sub-variable scores and different classifications regarding depression, anxiety, and stress.

Sociodemographic and socioeconomic characteristics of participants were assessed using a questionnaire containing questions about gender, age, field and degree, housing situation, type of college/university attended (tuition payment), GPA, financial aids, and employment (unemployed, full-time, and part-time). In addition, macronutrient intakes were assessed by FFQ evaluation. We used a modified-FFQ which included 65 items specialized for national purposes. The reliability and validity of the questionnaire has been approved by Ahmadnezhad et al.<sup>28</sup> in 2017. The data obtained from FFQ were converted to the daily energy and macro-nutrients intake and were analyzed using Nutritionist 4 software (First Databank; Hearst, San Bruno, California).

## 2.1 | Statistical analysis

The data analysis was performed using SPSS version 22 (IBM, Armonk, New York). The status of food security was categorized into food secure and food insecure. We used Chi-square analysis to assess the statistical association between food security variables and qualitative variables which were derived from the sociodemographic and DASS questionnaires. Additionally, an independent-sample *t*-test was used to determine the association of quantitative variables and food security variables. Eventually, multiple logistic regression was performed independently to assess several potential risk factors for food insecurity among students. All tests were two-tailed and *P*-values <.05 were considered statistically significant.

## 3 | RESULT

After excluding two students due to diabetes according to the eligibility criteria, the final sample analysis included 358 students. The prevalence of food insecurity among students at Kashan University of Medical Sciences is estimated to be 16.8% according to the USDA food security questionnaire. A summary of the student's characteristics by food security status is presented in Table 3. A 22.3% of male students were food insecure while the prevalence of food insecurity in female students was 13.6%. According to Chi-square analysis results, food insecurity is significantly associated with the gender of students ( $P = .034$ ). A greater percentage of students who work as part-time (28.2%) or full-time (26.3%) employees were food insecure compared to students who did not have a specific job (12.6%). This finding shows that students' food insecurity is significantly associated with their employment status ( $P = .003$ ). There was a considerable association between food security and having health insurance ( $P = .006$ ). It was shown that 31.3% of students who did not had health insurance, were food insecure. Whereas, 14.7% of students with health insurance were food insecure. Moreover, 20.1% of students who used financial aid were food insecure, and of those who did not use financial aid, food insecurity prevalence was 12.5%.

**TABLE 1** Scoring and classification system of USDA food security questionnaire

Scores (positive answers)	Classification
0-2	Food secure
3-7	Food insecure without hunger
8-12	Food insecure with moderate hunger
13-18	Food insecure with severe hunger

**TABLE 2** Method of interpretation of DASS 21-item sub-variable scores and classification of the indices

	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Very severe	28 and more	20 and more	34 and more

**TABLE 3** Kashan Medical Science University students' food insecurity status based on socioeconomic, academic performance, and psychological health

Variable	Food security status			P-value
	No.	Food secure %	Food insecure %	
Sample	358	83.2	16.8	
Gender				
Male	130	77.7	22.3	.034
Female	228	86.4	13.6	
Degree <sup>a</sup>				
AD	4	75.0	25.0	.393
BS	185	79.5	20.5	
MS	21	85.7	14.3	
PhD	4	75.0	25.0	
Dental	36	86.1	13.9	
Medical	108	88.9	11.1	
Job				
Unemployed	261	87.4	12.6	.003
Full time	19	73.7	26.3	
Part-time	78	71.8	28.2	
Health insurance				
Yes	313	85.3	14.7	.006
No	45	68.9	31.3	
Housing situation				
Campus	228	83.3	16.7	.458
With family	106	81.1	18.9	
Suite	24	91.7	8.30	
Financial aid				
Yes	209	79.9	20.1	.045
No	149	87.9	12.1	
Type of admission				
Paying tuition	32	87.5	12.5	.499
Tuition-free	326	82.8	17.2	
GPA <sup>b</sup>				
0-12	2	100	0.0	.064
12.1-15	73	84.9	15.1	
15.1-18	258	84.5	15.5	
18.1-20	25	64.0	36.0	
Anxiety <sup>c</sup>				
Normal	306	84.3	15.7	.073
Mild	30	86.7	13.3	
Moderate	16	62.5	37.5	
Severe	6	66.7	33.5	
Depression <sup>c</sup>				
Normal	253	87.0	13.0	.036
Mild	34	73.5	26.5	
Moderate	43	74.4	25.6	
Severe	28	75.0	25.0	

**TABLE 3** (Continued)

Variable	Food security status			P-value
	No.	Food secure %	Food insecure %	
Stress <sup>c</sup>				
Normal	192	86.5	13.5	.124
Mild	49	85.7	14.3	
Moderate	64	79.7	20.3	
Severe	53	73.6	26.4	

<sup>a</sup>The grade that participants study on AD, Associate Degree; BS, Bachelor of Science; MS, Master of Science; PhD, Doctor of Philosophy.

<sup>b</sup>Grade point average, based on the Iranian academic system.

<sup>c</sup>Severe and very severe groups combined.

**TABLE 4** The result of the independent sample *t*-test for comparing numerical characteristics between food secure and insecure students

Variable	Mean ± SD		p-value
	Food security	Food insecurity	
Age	22.55 ± 2.90	23.54 ± 4.51	.106
GPA <sup>a</sup>	16.30 ± 1.28	16.49 ± 1.36	.312
Sleep duration	8.13 ± 1.22	8.06 ± 1.62	.720
Energy (daily)	2520.29 ± 1196.95	2470.66 ± 1113.89	.767
Protein (daily)	86.20 ± 52.24	79.65 ± 29.59	.348
Carbohydrate (daily)	278.29 ± 144.89	287.04 ± 123.59	.990
Fat (daily)	118.38 ± 69.87	116.04 ± 83.39	.819
Depression (score)	10.30 ± 8.68	13.33 ± 9.38	.016
Anxiety (score)	7.53 ± 6.22	9.63 ± 7.47	.022
Stress (score)	14.86 ± 8.77	17.86 ± 8.81	.016

Note: Unit of measurement: age: year, sleep duration: hour, energy: Kcal, protein: gram, carbohydrate: gram, fat: gram.

<sup>a</sup>Grade point average, based on the Iranian academic system.

A significant association was indicated between food insecurity and using monetary facilities ( $P = .045$ ). No significant difference was observed between food security status and housing situation, GPA, and type of university admission.

Regarding the mental health status of the participants according to the analysis of the DASS questionnaire, 13% of students who did not suffer from any level of depression were food insecure, while 26.5% of students with mild depression, 25.6% of students with moderate depression, and 25% of students with severe depression suffered from food insecurity. The association between food insecurity and depression was significant ( $P = .036$ ). The chi-square test was not able to find any association between food insecurity and anxiety/stress; however, the difference between anxiety scores' mean in food secure and food insecure students was significant ( $P = .022$ ). Moreover, depression scores' mean ( $P = .016$ ) and stress scores' mean ( $P = .016$ ) were higher significantly in the food insecure group. There was no significant difference in the mean GPA, sleep duration, age, calorie, and macronutrients intake between food secure and food-insecure groups (Table 4).

The results of multiple logistic regression (backward stepwise method) have been summarized in Table 5 and the variables with the

**TABLE 5** The final model of multiple logistic regression of association between food insecurity and students characteristics

Variable	B	Sig	OR	95% CI	
				Lower	Upper
Age	.085	.037	1.089	1.005	1.180
Financial aid	.729	.026	2.073	1.091	3.938
Health insurance	-.998	.008	.369	.176	.772
Job) no)	-.828	.008	.437	.238	.804
depression	.044	.006	1.045	1.012	1.078

Note: The reference group for the job is "unemployed," for health insurance, and financial aid is "No." Numerical values of depression were used in logistic regression.

strongest association with food insecurity were recognized. According to the outcome of the last step of logistic regression, food insecurity was more likely to happen in students who have a job (OR 0.43; 95% CI 0.23-0.80). Students who use financial aid had almost double the odds to be food insecure (OR 2.07; 95% CI 1.09-3.93). In comparison with students without health insurance, students who take advantage of health insurance had a lower chance of being food insecure

(OR 0.36; 95% CI 0.17-0.77). And also, students who suffer from various levels of depression were more likely to be food insecure compared to the normal students (OR 1.04; 95% CI 1.01-1.07). The amount of calorie and macronutrient intake was not significantly associated with food insecurity.

## 4 | DISCUSSION

In the present study, the students' gender, employment, having health insurance, taking benefit of financial aid, depression, anxiety, and stress came out to be associated with college students' food insecurity. The prevalence of food insecurity among medical students at Kashan University of Medical Sciences was estimated at 16.8%, and 83.2% of students were considered as food secure. According to Soldavini et al investigation on food insecurity of college students during the Covid-19 pandemic, about 14% of college students in the United States were suffering from food insecurity during the Coronavirus pandemic. In addition, Gaines et al study has shown that the prevalence of food insecurity among college students at a public university in the southeastern United States was about 14%. This investigation was carried out in 2014 on 557 undergraduate students.<sup>29</sup> However, another investigation on food security status among 580 high school students in Isfahan, Iran indicated the prevalence of food insecurity as 36.6%.<sup>30</sup> The reason for the difference between the current study and the latter investigation could be due to the economic and decision-making independence of college students which make them less affected by family status as compared to high school students. Additionally, the time gap between the two studies should be considered.

Based on Broussard's report which was published in 2019, globally, women are marginally more likely to be at risk of food insecurity compared to men.<sup>31</sup> Several studies which have been performed on college students, had not reported a significant difference in food insecurity prevalence between male and female students.<sup>32-34</sup> However, Berg et al study indicated more prevalence of food insecurity among male students.<sup>15</sup> The present study indicated that men have a significantly higher chance of being food insecure. This might be because female students care more about their health generally and paying for food which is not the young men's priority. In addition, male students have taken less advantage of family financial supports compared to female students.

Melo et al study which has been performed on 5648 adults demonstrated that people without health insurance are more likely to be food insecure than insured people.<sup>35</sup> In another study conducted on college students, no significant association between food insecurity and health insurance was reported.<sup>36</sup> The observable association between food insecurity and health insurance in the present study could represent an association between food insecurity and students' household economic status indirectly. In agreement with these studies, food insecurity prevalence is higher in uninsured students in the present study which is probably because of lower income and the lack of a permanent job of the students or their parents.

Similar cross-sectional studies have indicated a higher rate of food insecurity in employed students in comparison with students who did not work within their study duration.<sup>1,37</sup> In our study, we found that students who had a job (part-time [28.2%] and full-time [26.3%]) were more in danger of food insecurity. The reason for the observed difference might be because most of the students who work during the study are possibly have a weaker economic status and the salary of their job is not sufficient. Additionally, the students who work and study at the same time, probably have less time for eating.

Food insecurity was found to be significantly related to using financial aid. Other studies have shown this relationship as well.<sup>38,39</sup> A study by Knol et al which has been conducted on 395 students, illustrated a higher rate of food insecurity among students who use financial assistance.<sup>40</sup> The reason for these outcomes could be that the students who rely on financial aid probably have not sufficient money for adequate food and nutrition and are more likely to be food insecure.

Wolfson et al have suggested a possible relationship between food insecurity and depression, anxiety, and stress. Their investigation has performed on 1476 adults in 2020 and indicated that food-insecure people are more likely to be diagnosed with depression, anxiety, and stress.<sup>41</sup> Another study which was published in 2021, investigated food insecurity and the psychological health of graduate students. This study demonstrated that graduate students who suffer from food insecurity have a higher chance of depression, anxiety, and stress.<sup>42</sup> Following the finding of the present study, there is a significant difference in food insecurity prevalence between students with some levels of depression, anxiety, or stress and normal students. These results can prove that mental health could affect the food security status in young adults and may make them less careful about food and physical health. On the other side, mental health and food security seem like a two-way association.

A study conducted on 301 college students in the United States indicated an observable association between food insecurity and academic performance. It has been shown that food-insecure students were more likely to get a lower GPA at university.<sup>43</sup> On the other hand, in a study performed on 269 university students, Kassier and Veldman did not show a significant association between food insecurity and academic performance.<sup>44</sup> The present study represented no significant association between students' GPA and food security status; however, the outcomes showed a slight increase in the GPA of food-insecure students. It can be concluded from the obtained results, that food-insecure students probably try harder and spend more time on their academic duties, to get better results and achieve better job opportunities. Nonetheless, for a more decisive conclusion, further studies are needed.

Zizza et al study has shed new light on food insecurity and energy intake association and proved that if is not necessarily associated with lower energy intake.<sup>45</sup> However, more detailed studies like Larson et al survey, suggested that food-insecure adults have a less nutritious diet (lower amount of vegetables and whole grains) and more unhealthy food (added-sugars and simple carbohydrates).<sup>46</sup> Several studies have compared the differences of food groups between food secure and food insecure subjects; though, no noteworthy study has

been observed to investigate nutrient intake among food secure and food-insecure people. In the present cross-sectional, there was no association between food insecurity and energy and macronutrient intake. Interestingly, the daily intake of carbohydrates was non-significantly higher in the food insecure group of students. The number of studies that have examined the subject is small and further studies are certainly required. In general, these results show that although most of the food insecure students met the dietary energy needs, their food choices could be limited. This could be because food insecure students focus more on relieving hunger rather than the retaining quality of the nutrients.

In this study, we tried to investigate various aspects of food insecurity among medical college students. Nevertheless, there were some undeniable limitations in our research. Considering the medical students' tight schedule and limited time, the short versions of DASS and FFQ were used to augment the accuracy of answers. Another limitation was that we had to rely on some self-reported data such as GPA and bodyweight. Further studies must be conducted to concentrate more on specific questionnaires, using the longer and multiple versions of questionnaires to obtain more reliable findings.

## 5 | CONCLUSION

Food insecurity is one of the serious health problems worldwide which has a negative impact on both mental and physical health. In the current study, we investigated to see how food insecurity could affect the mental health and dietary intake of medical students. Additionally, we have assessed some of the possible factors that might increase the risk of food insecurity such as gender. Our findings suggested that food insecurity is related to mental health but affects nothing on energy intake and academic performance. Depression was significantly higher in food-insecure students compared to food-secured participants. Additionally, average scores of anxiety and stress were higher in the food insecure group of students. Moreover, a significant association between food insecurity status and socioeconomic factors such as students' employment, using financial aid, and health insurance have been indicated. However, no significant associations were observed between food insecurity and students' sleep duration, GPA, and macronutrient intake. Due to the contradictory results of food security-related studies, further investigations on the association between food security and dietary assessment and mental health or other relevant factors in medical students are warranted.

## ACKNOWLEDGMENTS

The current study was supported by a grant from the Vice-chancellor for Research, Kashan University of Medical Sciences (KAUMS), Kashan, Iran.

## FUNDING

This work was funded by KAUMS (grant number: 99109) for the planning, data collection, analysis, interpretation, writing of the manuscript, and the decision to submit it for publication.

## CONFLICT OF INTEREST

The authors do hereby declare that there are no actual or perceived conflicts of interest regarding this manuscript.

## AUTHOR CONTRIBUTIONS

Conceptualization: Negin Amin, Hossein Akbari, Sadegh Jafarnejad.

Formal Analysis: Hossein Akbari.

Investigation: Negin Amin, Sadegh Jafarnejad.

Methodology: Hossein Akbari, Sadegh Jafarnejad.

Project Administration: Sadegh Jafarnejad.

Resources: Sadegh Jafarnejad.

Software: Negin Amin.

Supervision: Sadegh Jafarnejad.

Validation: Hossein Akbari.

Writing – Original Draft Preparation: Negin Amin.

Writing – Review & Editing: Negin Amin, Sadegh Jafarnejad.

All authors have read and approved the final version of the manuscript.

Sadegh Jafarnejad had full access to all of the data in this study and takes complete responsibility for the integrity of the data and the accuracy of the data analysis. Negin Amin affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

## TRANSPARENCY STATEMENT

Sadegh Jafarnejad affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned have been explained.

## DATA AVAILABILITY STATEMENT

We incorporated only peer-reviewed, published articles. The datasets (as derived from the published papers) used and analyzed during the current study are available on reasonable request from the corresponding author.

## ETHICS STATEMENT

The study was approved by the Research Ethics Committee of KAUMS (Ethics Committee approval number: IR.KAUMS.MEDNT.REC.1399.08).

## ORCID

Sadegh Jafarnejad  <https://orcid.org/0000-0002-4666-1918>

## REFERENCES

1. Patton-López MM, López-Cevallos DF, Cancel-Tirado DI, Vazquez L. Prevalence and correlates of food insecurity among students attending a Mid-size Rural University in Oregon. *J Nutr Educ Behav*. 2014;46(3):209-214.
2. Hughes R, Serebryanikova I, Donaldson K, Leveritt M. Student food insecurity: the skeleton in the university closet. *Nutr Diet*. 2011;68(1):27-32.
3. Chaparro MP, Zaghoul SS, Holck P, Dobbs J. Food insecurity prevalence among college students at the University of Hawai'i at Mānoa. *Public Health Nutr*. 2009;12(11):2097-2103.

4. Alonso EB, Cockx L, Swinnen J. Culture and food security. *Glob Food Sec.* 2018;17:113-127.
5. Ruwoldt G. Food insecurity and climate change. *Am J Public Health.* 2013;103(1):E1.
6. Schwartz N, Buliung R, Wilson K. Disability and food access and insecurity: a scoping review of the literature. *Health Place.* 2019;57:107-121.
7. Pereira M, Oliveira AM. Poverty and food insecurity may increase as the threat of COVID-19 spreads. *Public Health Nutr.* 2020;23(17):3236-3240.
8. Roser M, Ritchie H. Hunger and undernourishment. *Our World in Data.* 2019.
9. Seligman HK, Laraia BA, Kushel MB. Food insecurity is associated with chronic disease among low-income NHANES participants. *J Nutr.* 2010;140(2):304-310.
10. Whatnall MC, Hutchesson MJ, Patterson AJ. Predictors of food insecurity among Australian University students: a cross-sectional study. *Int J Environ Res Public Health.* 2020;17(1):60.
11. Cady CL. Food insecurity as a student issue. *J Coll Character.* 2014;15(4):265-272.
12. Bruening M, Brennhofers S, Van Woerden I, Todd M, Laska M. Factors related to the high rates of food insecurity among diverse, urban college freshmen. *J Acad Nutr Diet.* 2016;116(9):1450-1457.
13. Morris LM, Smith S, Davis J, Null DB. The prevalence of food security and insecurity among Illinois University students. *J Nutr Educ Behav.* 2016;48(6):376-382.e1.
14. Davidson A, Morrell J. Food insecurity prevalence among University students in New Hampshire. *J Hunger Environ Nutr.* 2020;15(1):118-127.
15. Van den Berg L, Raubenheimer J. Food insecurity among students at the University of the Free State, South Africa. *South African J Clin Nutr.* 2015;28(4):160-169.
16. Broton KM, Weaver KE, Mai M. Hunger in higher education: experiences and correlates of food insecurity among Wisconsin undergraduates from low-income families. *Soc Sci.* 2018;7(10):179.
17. Weaver RR, Vaughn NA, Hendricks SP, et al. University student food insecurity and academic performance. *J Am Coll Heal.* 2020;68(7):727-733.
18. Martinez SM, Grandner MA, Nazmi A, Canedo ER, Ritchie LD. Pathways from food insecurity to health outcomes among California University students. *Nutrients.* 2019;11(6):1419.
19. Olson CM, Strawderman MS. The relationship between food insecurity and obesity in rural childbearing women. *J Rural Health.* 2008;24(1):60-66.
20. Townsend MS, Peerson J, Love B, Achterberg C, Murphy SP. Food insecurity is positively related to overweight in women. *J Nutr.* 2001;131(6):1738-1745.
21. Jones AD. Food insecurity and mental health status: a global analysis of 149 countries. *Am J Prev Med.* 2017;53(2):264-273.
22. Najibi N, Firoozi R, Shahrezaee S, Eshraghian M, Daneshi-Maskooni M, Dorosty-Motlagh A. Food insecurity is an important risk factor for type 2 diabetes: a case-control study of new referrals to the University clinics, Shiraz, Southern Iran. *BMC Public Health.* 2019;19(1):1-8.
23. Nagata JM, Palar K, Gooding HC, et al. Food insecurity is associated with poorer mental health and sleep outcomes in young adults. *J Adolesc Health.* 2019;65(6):805-811.
24. Darling KE, Fahrenkamp AJ, Wilson SM, D'Auria AL, Sato AF. Physical and mental health outcomes associated with prior food insecurity among young adults. *J Health Psychol.* 2017;22(5):572-581.
25. Flynn MM, Monteiro K, George P, Tunkel AR. Assessing food insecurity in medical students. *Fam Med.* 2020;52(7):512-513.
26. Marshall TA, Zheng R, Anderson CL, Handoo N, Qian F. Is food insecurity a barrier to dental student success? *J Dent Educ.* 2021;85(9):1518-1524.
27. Rafiei M, Nord M, Sadeghizadeh A, Entezari MH. Assessing the internal validity of a household survey-based food security measure adapted for use in Iran. *Nutr J.* 2009;8(1):1-11.
28. Ahmadnezhad M, Asadi Z, Miri HH, Ebrahimi-Mamaghani M, Ghayour-Mobarhan M, Ferns GA. Validation of a short semi-quantitative food frequency questionnaire for adults: a pilot study. *J Nutr Sci Diet.* 2017;3(2):49-55.
29. Gaines A, Robb CA, Knol LL, Sickler S. Examining the role of financial factors, resources and skills in predicting food security status among college students. *Int J Consum Stud.* 2014;38(4):374-384.
30. Mohammadzadeh A, Dorosty A, Eshraghian M. Household food security status and associated factors among high-school students in Esfahan, Iran. *Public Health Nutr.* 2010;13(10):1609-1613.
31. Broussard NH. What explains gender differences in food insecurity? *Food Policy.* 2019;83:180-194.
32. Raskind IG, Haardorfer R, Berg CJ. Food insecurity, psychosocial health, and academic performance among college and University students in Georgia, USA. *Public Health Nutr.* 2019;22(3):476-485.
33. El Zein A, Shelnuitt KP, Colby S, et al. Prevalence and correlates of food insecurity among US college students: a multi-institutional study. *BMC Public Health.* 2019;19(1):1-12.
34. Micevski DA, Thornton LE, Brockington S. Food insecurity among University students in Victoria: a pilot study. *Nutr Diet.* 2014;71(4):258-264.
35. Melo A, Matias MA, Dias SS, et al. Is food insecurity related to health-care use, access and absenteeism? *Public Health Nutr.* 2019;22(17):3211-3219.
36. Wooten R, Spence M, Colby S, Steeves EA. Assessing food insecurity prevalence and associated factors among college students enrolled in a University in the Southeast USA. *Public Health Nutr.* 2019;22(3):383-390.
37. Broton KM, Goldrick-Rab S. Going without: an exploration of food and housing insecurity among undergraduates. *Educ Res.* 2018;47(2):121-133.
38. Meldrum LA, Willows ND. Food insecurity in University students receiving financial aid. *Can J Diet Pract Res.* 2006;67(1):43-46.
39. Munro N, Quayle M, Simpson H, Barnsley S. Hunger for knowledge: food insecurity among students at the University of KwaZulu-Natal. *Perspect Educ.* 2013;31(4):168-179.
40. Knol LL, Robb CA, McKinley EM, Wood M. Food insecurity is related to financial aid debt among college students. *J Fam Consum Sci.* 2018;110(4):35-41.
41. Wolfson JA, Garcia T, Leung CW. Food insecurity is associated with depression, anxiety, and stress: evidence from the early days of the COVID-19 pandemic in the United States. *Health Equity.* 2021;5(1):64-71.
42. Coffino JA, Spoor SP, Drach RD, Hormes JM. Food insecurity among graduate students: prevalence and association with depression, anxiety and stress. *Public Health Nutr.* 2021;24(7):1889-1894.
43. Maroto ME, Snelling A, Linck H. Food insecurity among community college students: prevalence and association with grade point average. *Community Coll J Res Pract.* 2015;39(6):515-526.
44. Kassier S, Veldman F. Food security status and academic performance of students on financial aid: the case of University of KwaZulu-Natal. *Alternation.* 2013;9:248-264.
45. Zizza CA, Duffy PA, Gerrior SA. Food insecurity is not associated with lower energy intakes. *Obesity.* 2008;16(8):1908-1913.
46. Larson N, Laska MN, Neumark-Sztainer D. Food insecurity, diet quality, home food availability, and health risk behaviors among emerging adults: findings from the EAT 2010-2018 study. *Am J Public Health.* 2020;110(9):1422-1428.

**How to cite this article:** Amin N, Akbari H, Jafarnejad S. Food security, mental health, and socioeconomic status: A cross-sectional study among medical college students in central part of Iran, Kashan. *Health Sci Rep.* 2022;5:e476. doi:10.1002/hsr2.476