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The Prevalence of Food Insecurity among Postgraduate Students and Its Impact on Their Academic Performance: Evidence from Jordan

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ABSTRACT

Background: Food insecurity (FI) is a public health issue which is receiving increasing attention in many countries. In responding to sustainable development goals, achieving food security is of essential importance. This study aims to demonstrate the level of food insecurity among postgraduate students at Jerash University/Jordan, discuss the most important factors associated with it, and show its relation to the student's academic performance. **Methods:** A random sample of 126 postgraduate students has been interviewed in this cross-sectional study. The level of FI for the study sample was determined using the 10-item US Adult Household Food Security Scale Module (HFSSM). The association between students' characteristics and their food security (FS) level was analyzed through chi-square test and a multivariate regression method. **Results:** The results of the study revealed that 67% had marginal or fragile food security level, 25% were highly food secure, and 8% of the sample suffered from food insecurity. The results showed that the association between food security and students' gender and age was insignificant ($P > 0.05$). As for the rest of the associated characteristics, there was a significant relationship between the students' food security and their marital status, family size, stable-income work, and their monthly income. **Conclusion:** A percentage of postgraduate students suffer from food insecurity, which is an important obstacle to their academic progress. Moreover, the level of food security is related to the student's marital status, family size, job with stable income, and the amount of monthly income.

Key word: *Food security; Food insecurity; Postgraduate students; Academic performance; Jordan.*

Introduction

Access to healthy food by legal means ,as one of the most important human rights, contributes to a healthy and productive life. Food security (FS) is essential in responding to the first (no poverty) and the second (zero hunger) sustainable development goals within the Sustainable Development Goals (SDGs) program formulated through the 2030 Agenda for sustainable development which was adopted in 2015 by all the member states of the United

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Nations (Perez-Escamilla, 2017).

At the global level, food insecurity (FI) is a public health issue and is seen as one of the most important obstacles to obtain adequate nutrition (Mukigi *et al.*, 2018, Rainville and Brink, 2002).

The risk of the spread of FI is increasing in low- to middle-income countries, including Jordan, which is a middle-income country (Unicef and World Health Organization, 2017). According to the estimates published in 2017, *a vast majority of the world's hungry* people live in low-income countries, with 60% of those experiencing some form of FI (Perez-Escamilla, 2017, Tarasuk *et al.*, 2016, Unicef and World Health Organization, 2017).

FI is defined as "the limited or uncertain availability of nutritionally adequate and hygienically safe food, or it is the limited ability of individuals to obtain food in socially acceptable ways" (National Research Council, 2006). FI is also defined as "not obtaining sufficient food due to its depletion" , "the inability to provide more of food" ,"the limited options available to the individual to obtain food," and "the state of concern among individuals about the inability to obtain food and resorting to other parties such as relief institutions to provide it" (Rychetnik *et al.*, 2003).

Nowadays, the increasing levels of FI among university students and its impact on their academic achievement is of increasing concern to researchers; however, the studies that dealt with this issue have mostly focused on undergraduate and school students without taking postgraduate students (Master and PhD) into consideration, except in few studies (Hoyland *et al.*, 2009, Van den Berg and Raubenheimer, 2015). Cady pointed out that FI posed a noticeable obstacle for university students ,prevented them from achieving their well-being, and negatively affected their educational achievement (Cady, 2014). The others concluded that the students' academic excellence was highly dependent on FS (Florence *et al.*, 2008, Taras, 2005). Lack of adequate and continuous food access to some of the postgraduate students in low to middle income countries was one of the most noticeable problems related to their academic performance (Bruening *et al.*, 2016).

Problems related to low academic performance of postgraduate students, general health, depression, stress and anxiety were also noticed as a result of some cases of FI among those students (Goldrick-Rab *et al.*, 2015). According to Davidson study, high tuition fees and insufficient financial aid, in light of the high cost of living, were the potential causes of FI among postgraduate students (Davidson and Morrell, 2020).

The main reason for conducting the current study is to shed light on the state of FI among postgraduate students in one of the middle-income countries and clarify the relationship between FI and the students' academic performance considering the absence of any research study in Jordan to the best of the researchers' knowledge.

Materials and Methods

Study design and participants: A cross-sectional study was conducted at Jerash University, Jordan. A total of 126 participants out of 533 male and female graduate students were interviewed. The inclusion criteria consisted of the participants who were at least 22, had access to email, and were willing to fulfill the 10-item US adult Household Food Security Scale Module (HFSSM). Participants were excluded if they were not enrolled as a full-time student and did not provide information about their HFSSM. The interview was carried out using a research questionnaire developed based on a set of previous relevant studies. The questionnaire was made available electronically in its final form (Web-Based Questionnaire) using Google-drive application. The questionnaire consisted of two parts, the first part included information on the most important social and economic characteristics of the target group related to their FS. The second part of the questionnaire included the items of the FS scale used in the study.

Household food security scale module: The level of FI for the study sample was determined using HFSSM. This scale is commonly and successfully used to measure FS situations in

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many societal groups, including school and university students (Ahmad *et al.*, 2021, Ukegbu *et al.*, 2019). The scale was modified to 8 items in this study to suit its objectives. The possible answers of the respondents were tabulated, and a weight was given for each of them, defined by a value of 1 if the paragraph applied to the respondent, and a value of 0 if it did not. The FS/FN level was categorized on a scale of 0 to 8 based on the total of the weights of the possible answers from the respondents (scores). **Table 1** shows the items of the scale and their possible answers, and **Table 2** shows the assigned levels of FS.

Table 1. Food insecurity scale items used in the study.

During the past 12 months	No (Weight: 0)	Yes (Weight: 1)	Sometimes or Rarely (Weight: 1)
There was a time when you were worried about running out of food before you got money to buy more.			
There was a time when the food you bought did not last as long as you expected			
There was a time when you could not eat well-balanced meals			
There was a time when you had to reduce the size of your meals because there was not enough money to buy food.			
There was a time when you ate less than you felt you ought to eat			
There was a time when you were hungry, but you did not eat, because there was not enough money to buy food.			
There was a time when you lost your weight because there was not enough money to buy food			
There was a time when you did not eat for a whole day because there was not enough money to buy food			

Source: Modified by the researchers based on (Ahmad *et al.*, 2021, Ukegbu *et al.*, 2019) studies

Table 2. The assigned levels of Food security.

Category	Total score of the respondents' answers
High	0
Marginal or fragile	1 – 2
Low	3 – 5
Very low	6 - 8

Source: Modified by the researchers based on (Ahmad *et al.*, 2021, Ukegbu *et al.*, 2019) studies

To determine the degree of the association between the level of FI and the academic performance of the participants, the grade point average (GPA) of the participants were obtained from the Department of Registration in the university.

Data analysis: After extraction as Excel spreadsheet, data were cleaned, coded, and prepared for analysis. Then, data were analyzed using SPSS Version 25 software. The association between students' characteristics and their FS level was analyzed through chi-square test and a multivariate regression method

Results

The profile of the participants: The collected responses on the respondent's profile were analyzed, and the findings were presented in **Table 3**. As the distribution of the study sample in terms of gender was almost balanced, 53% were males, and 47% were females, which excluded the bias of the sample towards a specific gender. Most of the

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students were married (83%), that is, they were family members with responsibility, while the percentage of unmarried people was 17%, 2% of whom were divorced or widowed, and the rest (15%) were single.

Table 3. Profile of the respondents.

Variables	n	%
Gender		
Male	67	53
Female	59	47
Marital status		
Marriage	105	83
Single	19	15
Others	2	2
Age (y)		
< 25	24	19
26–35	69	55
36<	33	26
Family size (including the respondent)		
1–2	15	12
3–4	83	66
5<	28	22
Having a job with a stable monthly income		
Yes	121	96
No	5	4
Monthly income (JDs)		
<500	14	11
501–1000	99	79
1001<	13	10
Total	126	100

With regard to age, the average age of the students was approximately 30. The ages of over half of the sample (55%) were within the age group of 26-35, while the rest were distributed over the age group of less than 25 with a percentage of approximately 19%, and over 36 with a percentage of approximately 26%.

As for the number of students' families, the results indicated that about 66% of the students were within families with 3-4 members, and the rest were distributed within families with 1-2 members (12%) and over 5 members (22%). With regard to the monthly income, nearly 96% of the students had a job with a fixed monthly income, and the rest were self-employment with an unspecified income. The average monthly income of the students was approximately 696 JDs per month. 79% of those students had incomes ranging between 501-1000 JDs per month, and approximately 11% of them earned less than 500 JDs per month. Moreover, the income of 10% of them had been higher than 1001 JDs per month.

Respondents' FS levels: The participants' FS levels as well as their GPA were determined based on the adopted methodology in this study. The findings of this section are presented in **Table 4** in frequency and percentage and in **Figure 1** in percentage. The results indicated that the majority of the study sample (nearly 67%) had a marginal or fragile level of FS. The results also showed that almost 25% of the respondents were highly food secure, and 8% suffered from low (nearly 5%) to very low (nearly 3%) level of FS.

Table 4. Sample's distribution according to FS level and GPA.

Food security level	n	%	Average of responses to FS scale	GPA(%)
High	32	25.3	0	91
Marginal or fragile	83	66.7	1.98	86
Low	7	5.2	3.87	79
Very low	4	2.8	6.13	
Total	126	100		

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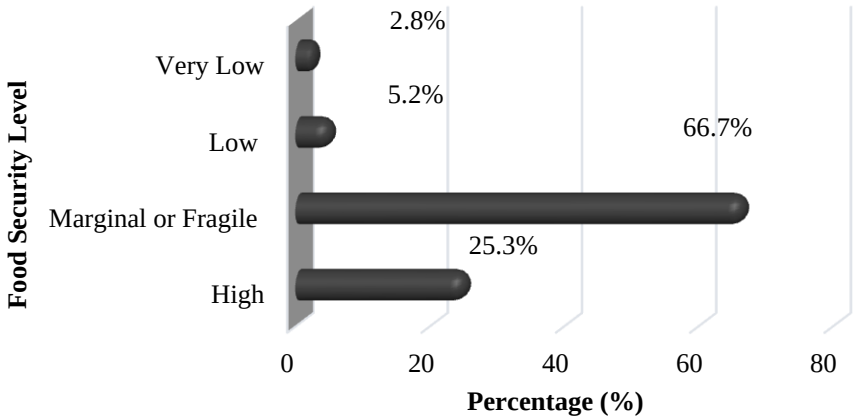

Figure 1. Respondents' percentages according to their food security levels.

The characteristics associated with FS are presented in **Table 5**. The association between FS and the students' gender and age was insignificant (P>0.05). No significant difference was observed between male and female students in terms of their FS level, indicating that the variable of gender had no effect on the occurrence or non-occurrence of FS among students. The results also indicated that the age difference between students did not affect their level of FS. As for the rest of the associated characteristics, there was a significant correlation between the student's FS and marital status, family size, a job with a stable income and monthly income. Also, there was a significant association between marital status and FS showed (P=0.03). The number of married students with low and very low level of FS (high level of FI) was higher (8) than the number of unmarried (3) with the same level of FS.

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Table 5. Respondents' characteristics associated with their FI status.

Variables	Food security level (frequency)				P-value[a]
	High (n=32)	Marginal or fragile (n=83)	Low (n=7)	Very low (n=4)	
Gender					
Male	19(28.4)	42(62.6)	4(6.0)	2(3.0)	0.89
Female	13(22.1)	41(69.4)	3(5.1)	2(3.4)	
Marital status					
Married	23(21.9)	74(70.4)	5(4.7)	3(2.8)	
Single	8(42.1)	8(42.1)	2(10.5)	1(5.3)	0.03
Others	1(50.0)	1(50.0)	0(0.0)	0(0.0)	
Age (y)					
< 25	5(20.8)	15(62.5)	3(12.5)	1(4.2)	
26–35	21(30.5)	44(63.9)	2(2.8)	2(2.8)	0.53
36<	6(18.2)	24(72.8)	2(6.0)	1(3.0)	
Family size					
1–2	5(33.4)	8(53.4)	1(6.6)	1(6.6)	
3–4	22(26.5)	59(71.1)	1(1.2)	1(1.2)	0.02
5<	5(17.8)	16(57.2)	5(17.8)	2(7.2)	
Having a job with a stable monthly income					
Yes	32(28.0)	80(70.2)	1(0.9)	1(0.9)	0.01
No	0(0.0)	3(25.0)	6(50.0)	3(25.0)	
Monthly income (JDs)					
<500	3(16.6)	8(44.4)	5(27.8)	2(11.2)	
501–1000	26(27.2)	67(70.5)	1(1.1)	1(1.1)	0.02
1001<	3(23.1)	8(61.2)	1(7.6)	1(7.6)	

[a]: *Chi square test*

Table 5 also shows the impact of students' family size on FS; the results indicated that the correlation between family size and FS was significant (P=0.02). The number of students in families with 5 members and above who had low and very low level of FS (they suffered from some form of FI) was higher (7) than the number of students in families with 4 members and lower (4) who the same level of FS. In addition, the correlation between FS and a job with stable income and its amount was significant (P<0.05). The number of students without a stable income who suffered from low and very low level of FS was higher (9) than the number of those with a stable income and the same level of FS (2). The number of students with an income of less than 500 JDs who had low and very low level of FS was higher (7) than the number of those with an income of above 500 JDs who had the same level of FS (4).

Table 6 shows the results of the multivariate regression model, which was used to confirm the association of students' characteristics with their level of FS. In the model, the characteristics of the students related to their level of FS as independent variables, and the level of FS represented by the score obtained using HFSSM as a dependent variable (Y) were demonstrated. The independent variables included marital status (x_1: married = 1, others = 0), family size (x_2), a job with a stable-income (x_3: yes = 1, no = 0), and monthly income (x_4). To determine an appropriate and reliable multiple linear regression model, a test was conducted to estimate the fit of the data to the required model (Curve Estimation), and it was found that the linear formula was the best among the formulas conducted based on the value of R^2.

In order to detect the presence of autocorrelation between the study variables or not, the Durbin-Watson test was conducted, the result of which showed the absence of any kind of autocorrelation in the study variables, as the value of this test came within the range of 1.5-2.5).

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Table 6. Summary of the regression model.

Model	R	R^2	Adjusted R^2	Durbin-Watson
1	0.799	0.638	0.597	1.931

Dependent variable: Food Security Score (FSS).

The regression model had the following standard form:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4\ \varepsilon$$

After confirming the reliability of the regression model, a regression analysis was performed among the variables under study. The results of the regression analysis are shown in **Table 7**. Accordingly, married students had a 61% chance of exposure to FI compared to the unmarried ones.

Table 7. Regression coefficients.

Model		Unstandardized coefficients		Standardized coefficients	t	P-value
		B	*Std. Error*	*Beta*		
1	(Constant)	1.424	1.072		4.546	0.041
	Marital status	0.612	0.257	0.019	3.821	0.028
	Family size	0.307	0.237	0.107	2.997	0.034
	Having a permanent Job	- 0.478	0.198	- 0.627	-1.879	<0.001
	Income	0.235	0.108	0.374	2.689	<0.001

Dependent Variable: Food Security Score (FSS); Predictors: (Constant), Marital status, Family size, Having a permanent job, Income.

Discussion

The results of this study showed that the majority of the respondents had a marginal or fragile level of FS because they had problems regarding access to adequate food, or they experienced a point of concern about obtaining adequate food, and at the same time, the quality, variety and amount of food were not reduced. Therefore, they were somewhat protected against FI.

Students who had been at a high level of FS did not have any problems and were not concerned about obtaining adequate, healthy, and safe food. As for those who were at a low level of FS, they faced a decrease in quality and availability of food, but the amount of food they received or their eating patterns were not negatively impacted. On the other hand, the students with a very low level of FS sometimes had experienced a change in their eating patterns during the past year and had a relatively reduced food intake at certain times due to the lack of money and other resources to obtain food.

For most of the subjects, the fragile state of FS was a major influence on the level of academic performance. The students who received enough food and had low to very low FS level would face problems in their academic achievement compared to those with a higher FS level. The results showed that the GPA of the group of the students with a marginal or fragile FS level was approximately 86%, compared with an average of approximately 91% for those with a high FS level, while the GPA of students with a low and very low FS level was approximately 79%. The participants who suffered from low to very low FS level while receiving enough food posed problems for their academic achievement compared to those with a higher FS level. These results confirmed the existence of an inverse relationship between the students' level of FI and their academic achievement. These results were consistent with the results of the study by (Ahmad *et al.*, 2021, Maroto *et al.*, 2015, McArthur *et al.*, 2018, Morris *et al.*, 2016, Perez-Escamilla, 2017).

Furthermore, these results confirmed the existence of an inverse relationship between the level of FI and the academic achievement. These results were consistent with the results of the studies by (Ahmad *et al.*, 2021, Maroto *et al.*,

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2015, McArthur *et al.*, 2018, Morris *et al.*, 2016).

The fact that 8% of the sample had low to very low level of FS indicated that the subjects were on the verge becoming food insecure at one time; but, this did not mean that these students suffered from hunger and could not afford their food; it revealed that at some point they faced economic problems and could not have enough food. This is very different from hunger, which is defined as the discomfort, weakness, illness or pain caused by a long-term lack of food (National Research Council, 2006).

The results of the current study showed that the number of married students with low and high level of FI was higher than the number of unmarried cases. This result confirmed that the marital status of married couples reduced the likelihood of maintaining a high level of FS, and they may be subject to suffer from some form of FS, unlike those who are not household heads. The presence of a high percentage of married students in the study sample suggested that they were mostly the heads of households; thus, they were responsible for their families, especially with regard to achieving an acceptable level of FS. This responsibility included themselves and was not limited to their families. Therefore, they had other responsibilities that affected the level of FS regarding both themselves and their families. This situation would probably lead to FI if it would be accompanied by other factors such as an increase in the number of family members or a decrease in income. The findings respecting the association between marital status and the level of FS was consistent with the results of the studies (Agidew and Singh, 2018, Chege *et al.*, 2016, Yusuf *et al.*, 2015). Moreover, the large size families was a pressing factor towards consumption rather than saving resources, especially the resources regarding providing food, which contributed to a lower level of FS, and may become food insecure, in particular, if other factors such as limited income contributed to the pressure on family's resources. It could be concluded the families' FS level was inversely related to their size, especially with members in unproductive ages. This finding was consistent with the results of the research by Mota (Mota *et al.*, 2019). Furthermore, the results confirmed the importance of working with a stable income in maintaining an acceptable level of FS, and the significance of having a good income to ensure FS; this was because the stability and amount of income was one of the most important determinants of the students FS. The In fact, low-income students were more likely to be food insecure compared with those with higher income because the low-income ones spent a greater proportion of their income on their food than the subjects with a high income students. Since the amount spent on food was almost equal but the incomes differed, the percentage was higher for students with low income, resulting in higher level of FI. In addition, healthy food cost low-income students more, and thus they were more inclined to buy food at lower prices, disregarding its health factors. Furthermore, lack of planning for the way income is distributed was another factor affecting FI among the students and their families. Food may not be a priority in the distribution of income, leading to unhealthy food choices by students and their families. These results were consistent with the results of several studies that addressed the relationship between income and its stability and FI among the university students (Ahsan, 2013, Muhammad *et al.*, 2013, Nord and Hopwood, 2008, Sulaiman *et al.*, 2021). In addition, the current study showed that married students were showed more vulnerability towards FI compared to the unmarried cases. This result was consistent with the results of the studies by Chege (Chege *et al.*, 2016, Yusuf *et al.*, 2015). Furthermore, the results indicated that the likelihood of the students becoming food insecure increased with more family members. Each extra child in the family increased the student's FI score by approximately one third. This result was consistent with that of (Mota *et al.*, 2019). Having a job with a stable income and its the amount were two important factors in determining the state of FI regarding students. The results revealed that those with a stable income showed lower likelihood of suffering from FI compared to those without a stable

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income, indicating that lower amount of income was often associated with a lower level of FI. This finding was consistent with Ramos study (Ramos *et al.*, 2017).

Conclusion

A percentage of postgraduate students in Jordan suffer from FI, which poses an important obstacle to their academic progress. The level of FS is related to the students' marital status, the size of their families, having a stable income, and the amount of their monthly income. This study recommends that FI be addressed in universities by the administrations, decision-makers, and policy-makers related to higher education. The study also recommends conducting more studies at the national level in the field of FI in order to determine appropriate methods for intervention and develop solutions to improve the level of FS for university students of different stages. This will undoubtedly reflect positively on their academic achievement and, consequently, their future.

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Conflict of interests

The authors declared no conflict of interests.

Authors' contribution

Alsharafat A and Aldeseit B designed the study; Alsharafat A, Aldeseit B, Al-Tarawneh H, and Abu Salma B conducted the research; Alsharafat A analyzed data; Alsharafat A, Aldeseit B, Al-Tarawneh H, and Abu Salma B wrote the manuscript. Alsharafat A had the primary responsibility for final manuscript. All the authors read and approved the final manuscript.

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