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Impact of Food Insecurity on Mental Health Among Minia University Students, Egypt

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ABSTRACT

Introduction: Food insecurity is usually referred to lack of consistent access to enough food for an active and healthy lifestyle. It is a multifaceted, sophisticated condition that has been acknowledged globally as a major public health concern. Students who experience food insecurity report worsening mental health, which may eventually affect both their general health and academic performance.

Aim of study: to determine the prevalence of food insecurity among Minia university students and to identify the most common mental outcomes of it.

Methods: A cross-sectional study was conducted on random sample from Minia university students during 2023-2024 educational year. Data was collected using self-administered questionnaire. Food insecurity was assessed using the validated eight-item Food Insecurity Experience Scale. The mental health of college students was assessed using validated screening tools, Patient Health Questionnaire for depression, General Anxiety Disorder-7 for anxiety and Cohen Perceived Stress Scale 10 for stress. Verbal consent was ensured before applying the questionnaire. The Chi square and independent sample t-test were performed using SPSS 20 to identify associations and differences and Liner regression was used to analyze the data.

Results: Prevalence of food insecurity among college students was 61.1%. of which 40.7%, 16.1% and 4.2% reported mild, moderate and sever food insecure respectively. Food insecurity was associated with poor mental health (P <0.05). Additionally, the results of the Liner regression analysis showed that food insecurity had impact on students' depression, anxiety, and stress.

Conclusion: Students at Minia university had an alarming prevalence of food insecurity. Our results demonstrated an association between FI and poor mental health in college students. These findings support the necessity of public health initiatives to address and reduce the rising problem of FI and mental health consequences on college students.

Keywords: *Food insecurity - Mental health - College students*

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1. INTRODUCTION

The phrase of food security (FS) has changed in the past few decades despite the fact that the United Nations Declaration of Human Rights has recognised the right to food since 1948. FS is a flexible concept so there are many attempts to define it in research and policy usage **(FAO, 2006).** The most common used definition is when The State of Food Insecurity 2012 improved upon the even more comprehensive definition that was agreed at the 1996 World Food Summit. “Food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life”. Food insecurity (FI) is described as occurring when there is a lack of safe, nutritious foods options or when it is restricted or unreliable to obtain suitable foods in manners that are socially acceptable **(Marques et al., 2022).**

. Globally, there are 870 million people who experience FI **(luwole et al., 2023).** Compared to estimates of FI from the general population over the past ten years, a growing body of research on college students has found remarkably high levels of FI. Living independently for the first time is something that many students experience in college, and this independence may be a factor in FI **(Nikolaus et al., 2020).** Two-year students, members of racial or ethnic minorities, students with military service history, foster youth, students with criminal convictions, students from low-income families, students receiving multiple forms of financial aid, and students who are financially independent from their parents are among the groups of college students who may be more vulnerable to FI **(Reeder et al., 2020).**

FI prevalence among college students varies globally, ranging from 12.5% to 84% **(Aldubaybi et al., 2024; Nava-Amante et al., 2021).** In Egypt, according to cross-sectional study included 500 Cairo university students of the students, 25% had extremely low food security and 66% were food insecure **(Mohamed and Ismail, 2022).** FI may have an impact on health since it is interconnected in many facets of life **(Becerra et al., 2020).** FI has as potential negative consequences including nutritional outcomes as it could increases the risk of both undernutrition (such as micronutrient deficiencies) and overnutrition (obesity), psychosocial consequences (e.g. depression, anxiety and psychological distress) and social consequences that affect quality of life **(Richards et al., 2023)**. FI not only can exacerbate pre-existing mental health conditions but also hinder treatment adherence **(Nagata et al., 2019).**

College students, who are increasingly identified as being vulnerable for both FI and psychological discomfort, are particularly at concern for the association between FI and mental health **(Nava-Amante et al., 2021).** FI and mental health may be correlated in both directions. The association between FI and mental health could be explained by a number of mechanisms. The chronic stress route is one important mechanism. The constant uncertainty regarding food availability that comes with having FI is a powerful psychological stressor. Prolonged stress triggers the hypothalamic-pituitary-adrenal (HPA) axis, which raises cortisol levels and exacerbates symptoms of depression and anxiety **((Hagedorn et al., 2021; Nagata et al., 2019).** Another important mechanism involves inadequate consumption of nutritious foods, low-cost and energy-dense due to financial constraints which associated to FI also impairs mental health. This is brought on by deficits in omega-3 fatty acids, iron, calcium, zinc, and vitamins B, C, and D which are essential for mood control and the best possible brain function. Inadequate nutrition can cause inflammation, inhibit neuroplasticity, and interfere with the manufacture of neurotransmitters like dopamine and serotonin **(Mousa and Dardas, 2024).**

Another important aspect in the relationship between FI and poor mental health is social and relational issues. Social stigma and isolation are common outcomes of FI. This isolation makes people more susceptible to depression and anxiety **(McGuire et al., 2023).** The psychological effects of FI are exacerbated by the particular stressors that college students encounter, such as social transitions, financial instability, and academic demands. In order to conserve money, many students report skipping meals or eating items that aren't nutritious enough, which exacerbates feelings of loneliness and humiliation. Additionally, food insecure students frequently struggle to focus, poor academic performance and participate less in campus events all of which contribute to their ongoing mental distress **(Nava-Amante et al., 2021).** On the other hand, poor mental health may impair an individual's ability to work or manage finances, lost productivity and their job, increased health expenditure, make people with poor mental health be more vulnerable to FI **(Hagedorn et al., 2021).**

Aim of study: to determine the prevalence of food insecurity among Minia university students and to identify the most common mental outcomes of it.

2. METHODS:

Study population: This study was conducted among college students, Minia university, Egypt during 2023-2024 educational year.

Study tool: A self-administered structured Arabic questionnaire was used to collect data about three main items, first part included students' demographic data and modified socioeconomic scale There are seven dimensions on modified socioeconomic scale: healthcare, education and cultural, family, economic, occupational, family possessions, and home sanitation. A total score of 84 was obtained, and the socioeconomic categories of very low (score <35), low (score 35-41), middle (score 42-47), and high (score ≥ 48) were determined based on the quartiles of the calculated score rather than a fixed point. This method of scoring was adapted from the previous system of **(Fahmy and EL Sherbini, 1983)** by **El-Gilany et al. (2012)**. Second part included Food Insecurity Experience Scale (FIES) which was used to evaluate the food insecurity of college students. The FIES has created and validated by The Food and Agriculture Organization's (FAO) "Voices of the Hungry (VOH)" Project. The FIES has an acceptable Cronbach's alpha coefficient of 0.759, making it a valid, reliable, and internally consistent indicator **(Itani et al.2021).** The Arabic version of the FIES was tested for validity in League of Arab States (LAS) and was found to be a valid and reliable tool to assess FI among Arab countries **(Sheikhomar et al.2021).** The FIES consists of eight questions evaluates people's real experiences getting food access. In the current study, the validated Arabic version of the FIES instrument were used.

The FIES score is a continuous measure of the degree of food insecurity among university students in previous 12 months as they were asked whether, they have worried about their ability to obtain enough food, they were unable to eat healthy

and nutritious food, they ate only a few kinds of foods, they had to skip a meal, they ate less than they thought they should, their household ran out of food, they were hungry but did not eat, they went without eating for a whole day owing to limited availability of money or other resources to obtain food. students were assigned a score value of '1' for any specific question that they have answered 'yes' and '0' if their answer was 'no'. The FIES score is calculated for each student by summing the codes for each question that ranges from 0 to 8.The total score was used to classify individual-level FI status: food secure (raw scores = 0); mild FI (1–3); moderate FI (4–6) and severe FI (7–8). For analyses, FI was further recoded into two categories: 1 – food secure (raw score = 0) and 2 – food insecure (raw score ≥ 1); the latter included individuals experiencing mild, moderate or severe FI.

Third part included mental health questions by using the following indicators: Patient Health Questionnaire (PHQ-9) which is a validated instrument for screening depression, consisting of nine items that are self-reported. With a Cronbach's alpha coefficient of 0.86 in the English version **(Kroenke et al, 2001**) and 0.857 in the Arabic version **(AlHadi et al, 2017).** The PHQ-9 is an internally reliable and consistent measure among university students. The PHQ-9 instrument was previously employed among university students in Lebanon, where it was discovered to be a reliable indicator for depression screening **(Itani et al, 2022).** Students in the study sample were asked how often, on a scale of not at all, several days, more than half of the days, nearly every day, they had experienced feelings like sadness or depression, tiredness, or low to no energy and so on over the previous two weeks. The Likert scale was used to score each response, with 0 representing "absence of a symptom" and 3 representing "presence of a symptom nearly every day." The PHQ-9 tool's assigned values for each responder were added together to create a raw score that goes from 0 to 27. Students ascribed to minimal (0–4), mild (5–9), moderate (10–14), moderately severe (15–19), and severe depression (20 or above) were categorized based on their overall PHQ-9 score **(Kroenke et al, 2001).**

Anxiety levels are self-reported on General Anxiety Disorder-7 for anxiety (GAD-7). Additionally, the GAD-7 was previously validated in university students in Lebanon and was proven to be an effective and sufficient tool for screening for general anxiety disorder **(Itani et al, 2022).** The scale's Cronbach's alpha coefficient in both its English **(Byrd-Bredbenner et al, 2017)** and Arabic **(AlHadi et al, 2017)** versions was found to be greater than 0.7, indicating that college students found it to be a valid and reliable indicator. Students were questioned if they have been nervous or anxious or on edge, not being able to stop or control worrying, having trouble relaxing, worrying too much about different things, restless, easily irritated, and annoyed, afraid that something might happen over the previous two weeks. The students were then asked to select a time-frequency of experiencing such episodes, giving them ratings of 0, 1, 2, and 3, depending on whether they occurred of not at all, several days, more than half of the days, nearly every day. The GAD-7 total score varied from 0 to 21, where 0–4 stood for minimal, 5–9 for mild, 10–14 for moderate, and 15–21 for severe anxiety **(Sawaya et al, 2016).**

One of the most used tools for measuring stress is Cohen Perceived Stress Scale 10 (PSS 10) **(Cohen et al, 1983).** PSS was also previously validated tool in the local context, and it was found to be an efficient and adequate tool to screen for perceived stress, assess its level of severity across the Minia university students **(Seedhom et al, 2019).** it is a tool that has been validated and is internally consistent, translated Cronbach's alpha score for PSS 10 in Arabic version was 0.836 **(Ghassan and Mashael, 2014)** and in English version was 0.72 **(Khalili et al, 2017).** The scale consists of ten questions; students were questioned if they have been upset because of something that happened unexpectedly, unable to control the important things in your life, felt nervous and stressed and so on over the previous four weeks. In the current study, the 5-point Likert scale (0 = Never, 1 = Almost Never, 2 = Sometimes, 3 = Fairly Often, and 4 = Very Often) is used to score the scale. The scores for the four positively stated items, 4, 5, 7, and 8, were inverted (i.e., 0 = 4, 1 = 3, 2 = 2, 3 = 1, and 4 = 0), and the total was obtained by adding the scores for each item. more scores on the PSS indicate more experienced stress (linear relation). stress was categorized as follows: A low-stress level is indicated by scores between 0 and 13. A moderate level of stress was indicated by scores ranging from 14 to 26. High-stress levels are indicated by scores between 27 and 40 **(Khalili et al, 2017).**

Study type: Cross sectional study.

Sample size and sampling: 378 students were selected through simple random technique who were available at their classrooms during data collection and agreed to participate in the study and fill out self-administered questionnaire.

Data collection and analysis: the semi-structured questionnaire was prepared. Data was collected over two months. Using self-administered questionnaire enquiring about personal data as (Age, sex, residence, accommodation, marital status, financial assistance and modified socioeconomic scale and include PHQ-9 for depression, GAD-7 for anxiety and PSS 10 for stress. Data were analyzed using SPSS version 20 results were presented using absolute figures and percentages. Quantitative data were presented by mean, standard deviation while qualitative data were presented by frequency distribution. The Chi- square test was used to compare between proportions. Student t-test was used to compare two means and Liner regression was used to analyze the data.

Ethical consideration: The study protocol was approved by the research ethical committee of faculty of Medicine in Minia University. Approval of the faculties' deans was obtained. Data were collected from participants after explaining the nature of the study and taking a verbal consent from each of them. Confidentiality, privacy and freedom to withdraw from

the study on the participant's decision were assured.

Food security classification	Socio-demographic characteristics	**Total No (%)**	Total **No (%)**
Total food secure	Age (years) (Mean± SD)	147(38.9%)	22.20±1.19
Total food insecure	Gender	231(61.1%)	
Mild food insecure	Male	154(40.7%)	138(36.5%)
Moderate food insecure	Female	61(16.1%)	240(63.5%)
Sever food insecure	Residence	16(4.2%)	
FIES score (Mean ± SD)	Urban	1.77±2.04	111(29.4%)
Total	Rural	378(100%)	267(70.6%)
	Accommodation		
	Private		69(18.3%)
	University city		59(15.6%)
	Within family house		250(66.1%)
	Marital status		
	Single		350(92.6%)
	Married		28(7.4%)
	Socio-economic score (Mean± SD)		50.46± 11.31
	Socioeconomic standard		
	Very low		94(24.9%)
	Low		107(28.3%)
	Middle		83(22.0%)
	High		94(24.9%)
	Financial aid status		
	Yes		53(14.0%)
	No		325(86.0%)
	Total		378(100%)

Results: Table (1): Socio-demographic characteristics of the studied college students.

Table (2): Food security status by Food Insecurity Experience Scale score among studied college students.

Food security classification	**Total No (%)**
Total food secure	147(38.9%)
Total food insecure • Mild food insecure • Moderate food insecure • Sever food insecure	231(61.1%) 154(40.7%) 61(16.1%) 16(4.2%)
FIES score (Mean ± SD)	1.77±2.04
Total	378(100%)

Table (3): Depression levels as result of The Patient Health Questionnaire score among studied college students according to food security status.

Levels of depression	Food security status			Significance	
	Food secure	**Food insecure**	**Total**	**χ2**	**P value**
	No (%)	**No (%)**	**No (%)**		
• Minimal	30(20.4%)	24(10.4%)	54(14.3%)	12.94	0.012*
• Mild	59(40.1%)	85(36.8%)	144(38.1%)		
• Moderate	40(27.2%)	69(29.9%)	109(28.8%)		
• Moderately sever	9(6.1%)	33(14.3%)	42(11.1%)		
• Sever	9(6.1%)	20(8.7%)	29(7.7%)		
Total depression score (Mean± SD)	8.82±5.22	10.76±5.35	10.00±5.38	0.001*	
Total	147(100.0%)	231(100.0%)	378(100.0%)		

Table (4): Anxiety levels as result of General Anxiety Disorder-7 score among studied college students according to food security status.

Levels of anxiety	Food security status			Significance	
	Food secure	**Food insecure**	**Total**	**χ2**	**P value**
	No (%)	**No (%)**	**No (%)**		
• Minimal	052(35.4%)	042(18.2%)	094(24.9%)	15.90	0.001*
• Mild	060(40.8%)	105(45.5%)	165(43.7%)		
• Moderate	024(16.3%)	053(22.9%)	077(20.4%)		
• Sever	011(07.5%)	031(13.4%)	042(11.1%)		
Total anxiety score (Mean ± SD)	6.69±4.59	8.56±4.79	7.83 ±4.80	<0.0001*	
Total	147(100.0%)	231(100.0%)	378(100.0%)		

Table (5): Level of stress according to Cohen Perceived Stress Scale 10 among studied college students according to food security status.

Level of stress	Food security status			Significance	
	Food secure	**Food insecure**	**Total**	**χ2**	**P value**
	No (%)	**No (%)**	**No (%)**		
• Low stress	7(4.8%)	6(2.6%)	13(3.4%)	9.16	0.010*
• Moderate stress	127(86.4%)	179(77.5%)	306(81.0%)		
• High stress	13(8.8%)	46(19.9%)	59(15.6%)		
Total stress score Mean± SD	20.72±4.58	21.89±4.99	21.44±4.87	0.022*	
Total	147(100.0%)	231(100.0%)	378(100.0%)		

Table (6): Liner regression of predictors of mental health scores among studied college students.

Predictors	Depression score	Anxiety Score	Stress score
Food insecurity score Adjusted OR (95% CI) P value	0.634(0.362-0.905) <0.0001*	0.598(0.359-0.838) <0.0001*	0.272(0.023-0.521) 0.032*
Socioeconomic score Adjusted OR (95% CI) P value	0.020(-0.038-0.079) 0.491	0.005(-0.05-0.051) 0.998	0.012(-0.041-0.066) 0.657
Age Adjusted OR (95% CI) P value	0.053(-0.437-0.543) 0.831	0.171(0.262-0.604) 0.438	-0.298(-0.748-0.152) 0.193
Marital State Adjusted OR (95% CI) P value	-0.725(-2.81-1.36) 0.494	-0.689(-.053-1.15) 0.462	-1.89(-3.80-0.025) 0.053
Residence Adjusted OR (95% CI) P value	0.371(-.913-1.66) 0.570	0.820(-0.315-1.95) 0.156	0.293(-0.887-1.47) 0.626
Financial aid status Adjusted OR (95% CI) P value	-0.610(-2.44-1.22) 0.513	-0.740(-2.36-0.878) 0.369	-0.559(-2.24-1.12) 0.513
Accommodation Adjusted OR (95% CI) P value	0.505(-0.256-1.27) 0.193	0.341(-0.330-1.01) 0.318	-0.177(-0.875-0.521) 0.619

3. DISCUSSION:

The current study included 378 college students. The mean age of students was 22.20±1.19 years, about 63.5% of students were females, 70.6% from rural residence, 66.1% lived with their family, and 86.0% not receive financial aid **(Table 1).** the prevalence of FI was 61.1% as the total number of students who food insecure was 231**(Table 2).** 40.7%, 16.1% and 4.2% of students reported mild, moderate and sever food insecure respectively. A potential explanation for the high prevalence of FI reported in the present study could be attributed to the high rate of poverty in Egypt, poverty and low income had a greater impact on FI than food availability. Different issues including inflation, devaluation of the Egyptian pound since 2022, and the effects of regional and global crises as COVID-19 epidemic and the conflict between Ukraine and Russia, increase economic burden which exacerbated FI levels among Egyption people especially vulnerable population like college students **(WFP, 2025; Mahfouz et al., 2021).**

FI prevalence among college students in the present study fallen within global range from 12.5% to 84% **(Aldubaybi et al., 2024; Nava-Amante et al., 2021).** This prevalence in line with previous study was conducted among college students in Egypt, a cross-sectional study included 500 Cairo university students of the students as the prevalence of FI was 66% **(Mohamed and Ismail, 2022).** The results of the study also supported the rates of FI recorded by college students from other different countries. For example, Turkish college students revealed that 68.2% of them experienced FI **(Esin and Ayyıldız, 2024).** Higher prevalence and severity of FI was recorded by study was conducted in Qulubba village of Mallawi in Minia governorate, nearly 70% of the 497 households reported some degree of FI, with 14.3%, 38%, and 17.3% classified as mildly, moderately, and severely food insecure households, respectively. These higher rates could be explained by variations in the target populations, sample sizes, or the sociodemographic makeup of the sample as well as inflated FI since some families believed that the responses would affect their eligibility for government assistance **(Mahfouz et al., 2021).** The prevalence of FI in the current study was within the 10%–75% range found by **Nikolaus et al. (2020)** in a recent systematic analysis of college students in the US.

The current study found that college students who are food insecure have considerably higher levels of depression than those who are food secure. The depression score of the former is 8.82±5.22, while that of the latter is 10.76±5.35 **(Table 3).** This also aligned with the findings of earlier research conducted among college students **(Pourmotabbed et al., 2020;**

McGuire et al., 2023; Laska et al., 2021; Elharake et al., 2023; Becerra and Becerra, 2020; Wolfson et al., 2022; Coffino et al.,2021; Amin et al., 2022; Oh et al., 2022; Neal and Zigmont, 2022). The results of the current study revealed that nearly 78% of students had mild to moderately severe depressive symptoms **(Table 3).** This finding is similar to that of Lebanese college students **(Itani et al., 2022),** who reported that 70% of their college students had mild to moderately severe depressive symptoms. In current study FI is predictor of depression as adjusted OR (95% CI) 0.634 (0.362-0.905) P<0.0001 **(Table 6)** same result was detected among college students at Iran (**Amin et al., 2021),** Lebanon **(Itani et al., 2022),** and US **(Fang et al.,2021).**

Food insecure college students in the current study had higher level of anxiety with their mean total anxiety score being 8.56±4.79 compared to 6.69±4.59 for food secure college students **(Table 4),** Many previous studies that included college students came to the same conclusion **(Itani et al., 2022; Pourmotabbed et al., 2020; Wolfson et al., 2021; Coffino et al.,2021; Amin et al., 2022; Oh et al., 2022; Reeder et al., 2020).** The present study result showed that 64.1% of the student sample experienced mild to moderate symptoms of anxiety **(Table 4),** and this finding is comparable to result among Lebanese college students **(Itani et al., 2022)** as 50% of college students experienced mild to moderate symptoms of anxiety. In the current investigation, FI predicts anxiety as adjusted OR (95% CI) 0.598 (0.359-0.838) P<0.0001 (Table 6). The same outcome was observed among Lebanon's college students **(Itani et al., 2022)** and US college students **(Fang et al.,2021).**

Food insecure college students experiencing high levels of stress as the mean of total stress score in food secure college student was 20.72±4.58 compare to 21.89±4.99 in food insecure college student **(Table 5).** Several previous studies reported the same conclusion **(Pourmotabbed et al., 2020; Itani et al., 2022; Wolfson et al., 2021; Coffino et al.,2021; Amin et al., 2022).** This result can be explained by FI acting as a "toxic" stressor that disrupts physiological functions and harms mental well-being. Additional pressures experienced throughout college, when students are trying to balance a variety of responsibilities, such as employment, school, and personal relationships, and are growing more independent from their family, may make FI-related stress worse **(Raskind et al., 2019).**

4. CONCLUSION AND RECOMMENDATIONS:

Food insecurity is a current public health problem facing college students in Minia university. These food-insecure students report declined mental health which may have long-term effects on both their general health and college success this make need to implement preventive progammes at different level. At the college students' level, it is suggested to implement financial counseling and health education. At the institutional level, college and university wellness programmes should aim to support food-insecure students as a means of improving the mental well-being of students by different methods like support food pantries, increase financial aid and create food aid programs for college students. Further at the policymakers' level, these results can be used by organizations for college food security to show policymakers the layers of impact food insecurity may have on college students' welfare. The current study recommends that to maintaining government programs to alleviate hunger and improving people's nutritional status, the following are required: improvements in education, well-paying jobs, social security, availability of healthy food at affordable prices, and sustainable diet and production system.

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