The relationship between household food insecurity and quality of life among children aged 7–13 years: effects of parent-reported disordered eating, anxiety and depression

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Abstract

Background Food insecurity (FI) has been linked to adverse child health outcomes, including developmental, physical, and psychological disorders. However, little is known about the impact of FI on Lebanese children, especially considering the daily social and economic challenges the population faces. These challenges heighten children's vulnerability, particularly with regard to disordered eating, anxiety, and depression, which may act as mediating factors affecting their overall quality of life. This study aims to assess the mediating effects of disordered eating, anxiety, and depression between FI and quality of life among Lebanese children aged 7–13 years.

Methods A cross-sectional study was conducted among 504 Lebanese parents of children aged 7–13 years. FI was assessed using the Arab Family Food Security Scale (AFFSS), quality of life using the KIDSCREEN-10, disordered eating with the Eating Disorder Examination-Questionnaire Short-Parent version, anxiety with the Spence Children's Anxiety Scale-Parent, and depression with the Short Mood and Feelings Questionnaire-Parent version. Mediation analysis was performed using PROCESS MACRO v3.4 in SPSS, with 5000 bootstrapped samples.

Results In total, 30.8% of parents reported severe levels of household FI. The results of the mediation analysis showed that disordered eating, depression and anxiety fully mediated the association between FI and quality of life. Higher FI was significantly associated with higher disordered eating/depression/anxiety, whereas higher disordered eating/depression/anxiety were significantly associated with lower quality of life. FI was not directly associated with quality of life.

Conclusion FI indirectly affects child's quality of life through its impact on disordered eating, anxiety, and depression. Addressing these psychological disorders in children from food-insecure households appears to be essential to improve their overall quality of life. The implications are specific to Lebanon but may provide valuable insights applicable to similar socio-economically and politically challenged areas.

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Introduction

Food insecurity (FI) is defined as the disruption of eating patterns or food intake due to insufficient money and other resources [1]. Despite all efforts done by governments and institutions, as well as the scientific and technological advancement to ensure a constant supply of nutritious aliments, FI remains a global complex challenge. Moreover, it is estimated that by 2050 the global population will need 70% more food than what we have today [2]. It is no doubt that this challenge is most burdensome on poorer populations and lower-income countries. In fact, FI constitutes a threat in the Middle East and North Africa (MENA) region and specifically in Lebanon, considering the economic and financial crisis, the corruption of the state, the massive disparity in value between Lebanese pounds and US dollars, the dependence on food importation and the impact of the Russia-Ukraine war on the wheat reserve [3]. Not to mention the COVID-19 outbreak and lockdowns that have resulted in lower incomes and reduced food affordability [4]. Families with children are among the most vulnerable populations to the combined effects of FI and mental health challenges, especially in Lebanon, where nearly half of households with children experience some level of FI [5]. Studies have shown that FI in Lebanon is significantly associated with socioeconomic adversities, reduced dietary diversity, and increased emotional distress among children, highlighting the critical need for targeted interventions to support this population [5].

FI has been the topic of many studies showing its long-term sequelae on children's health [6]. As evidenced by Cook's study [7], FI can lead to major adverse health outcomes, with increased risk of hospitalization, developmental retardation and increased risk of iron deficiency anemia. These findings are consistent with other studies reviewing the detrimental impact of FI on child physical health and development. For instance, Gallegos et al. [8] suggested that the consequences of FI can be long-term and can even impede the developmental trajectory of the youth across cognitive and behavioral domains. Increased probability of hospitalization [7], recurrent headaches and stomachaches [9], higher risk of chronic diseases [10], greater odds of having been to a psychologist [9], impaired cognitive competence [11], and finally behavioral problems [12] have all been positively associated with FI in children and infants. Additionally, in a study done in Lebanon aimed to determine the frequency of FI among Lebanese children during the COVID-19 pandemic, a strong correlation between severe FI and overall poor health status was noted. FI was associated with decreased food intake quantity, fruit and vegetable intake, nutritional supplements intake, sleep quality and number of sleeping hours as well as junk food consumption [4].

Knowing that children are most vulnerable at early stages of their lives, these circumstances can aggravate the possibility of developing psychological issues. Indeed, a systematic review conducted on 108 studies highlighted that children in food insecure households are more likely to have mental health issues, including higher rates of depression, externalizing/internalizing behaviors, and hyperactivity [13]. Moreover, a meta-analysis conducted among U.S. adults by Arenas et al. [14] highlighted a strong association between FI, depression, anxiety, and sleep disorders. The myriad of detrimental effects that FI has on children's health extend beyond physical and mental illnesses, impacting their overall quality of life [15]. This association has been also proved in a comprehensive quantitative and qualitative review of Weaver et al. conducted in developing countries [16]. However, to our knowledge, no specific systematic review for the Middle-East and North Africa countries has been conducted to this date.

The relationship between FI and children's quality of life

Health-Related Quality of Life refers to a child's comprehensive physical, emotional, mental, and social health. It encompasses how children perceive and experience their lives, including their ability to function in daily activities, manage emotions, form relationships, and engage in school and social environments [17, 18]. This multi-dimensional approach is crucial as it goes beyond the absence of disease, focusing instead on a child's holistic health status [18, 19]. Empirical research on the impact of household FI on children's quality of life remains to date scarce. A cross-sectional study by Casey et al. found that food-insecure children in the U.S. exhibited poorer quality of life compared to their food-secure peers [15]. However, the study had certain limitations, including unmeasured covariates that could potentially influence the relationship between FI and children's quality of life. This study proposes to contribute to extending the existing literature not only by examining the relationship between FI and children's quality of life in a highly vulnerable population of Lebanon, but also by testing the effects of three potential mediators (i.e., disordered eating, depression and anxiety) in this relationship.

Disordered eating, depression and anxiety as mediators

Despite the wide range of studies correlating FI to pernicious health effects, the implication of FI on disordered

eating has only recently come to light [20, 21]. In fact, disordered eating are associated with higher suicidal rates, psychosocial issues and mental health problems, making them a major public health concern [22, 23]. Cross sectional studies done on adolescents have linked compensatory behaviors (i.e. using food substitutes, skipping meals, fasting, cigarette smoking, laxative use, volitional vomiting) to FI [24]. Moreover, household FI has been linked to greater binge-eating symptoms [25, 26], and a higher prevalence of bulimia nervosa, particularly among adults [27]. Evidence also links FI during early adolescence (ages 9–14) to higher odds of developing binge-eating behaviors later in life [28].

Mental health is a key factor in children's overall quality of life, with conditions such as depression and anxiety playing a major role in shaping their quality of life. For instance, a study by O'Loughlin et al. [29] found that children with clinical levels of mental health symptoms exhibited poorer quality of life compared to those with physical health issues, emphasizing the detrimental impact of mental health on overall quality of life. Additionally, research indicates that children and adolescents with disordered eating behaviors experience a marked decline in quality of life compared to their peers. Indeed, a systematic review by Wu et al. highlights that disordered eating is associated with lower quality of life, indicating that these conditions can severely affect various aspects of life, including physical health, emotional well-being, and social functioning [30].

In light of this, depression, anxiety, and disordered eating may play an intermediate role in the relationship between FI and children's overall quality of life. FI can exacerbate these mental health conditions and disordered eating behaviors [20, 24–26, 31, 32]. In turn this directly impact children's emotional, social, and physical health [29, 30]. This means that the negative impact of FI on children's quality of life is partially driven by its influence on mental health and eating patterns; addressing these intermediary factors is crucial for improving the overall health outcomes of food-insecure children (see Fig. 1).

The present study

FI is a primary topic in Lebanon given the current situation, where the ongoing economic collapse, rising poverty, and political instability, compounded by the aftermath of the 2020 Beirut explosion, the COVID-19 outbreak and the Israel-Gaza-Lebanon war, have left families struggling to meet basic needs [4, 33–36]. The country's medical sector is also facing unprecedented challenges, with healthcare access dwindling due to shortages of medicine and resources, exacerbating the health crisis [37–39]. These circumstances have created a dire environment, where FI is rampant and the quality of life of children is at significant risk. In this context, studies have shown a high prevalence of anxiety and depression among Lebanese children, with 64% screened positive for probable anxiety and 33% for depression following the Beirut blast [40]. Additionally recent reports indicated a surge in mental health problems due to instability and poverty, where 1 in 3 Lebanese children and adolescents screened positive for at least one psychiatric disorder [41]. UNICEF reported in 2021 that almost half of Lebanese families have cut back on food, and children are experiencing rising levels of stress, anxiety, and depression due to these hardships [42]. Furthermore, disordered eating have become increasingly prevalent as children adopt maladaptive coping mechanisms in response to food scarcity and psychological distress [42, 43]. Moreover, no studies to date have examined the
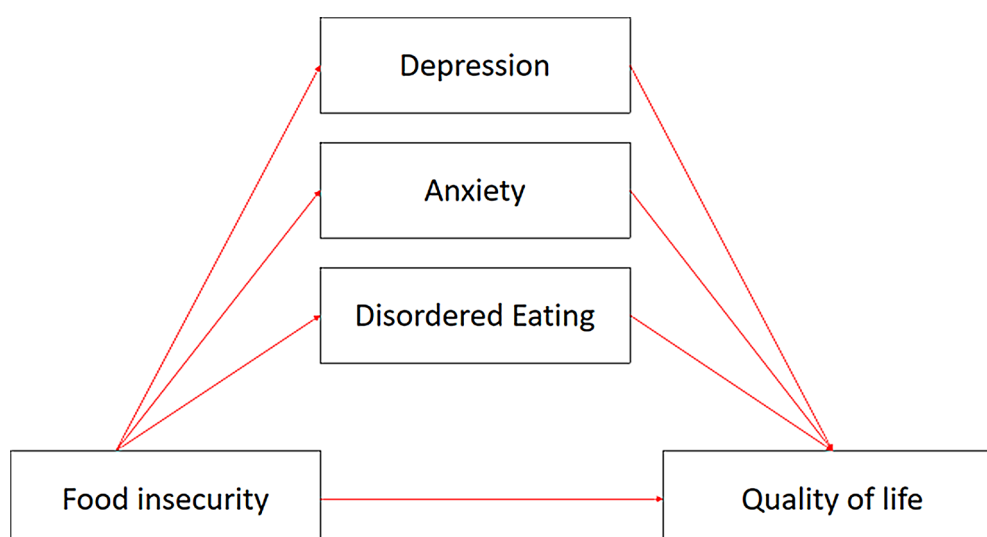

Fig. 1 Theoretical model of the mediating relationship between household Food Insecurity and Quality of life among children

mediating effects of disordered eating and mental health on the relationship between FI and children's quality of life. Therefore, this study aims to assess the mediating effects of disordered eating, anxiety, and depression between FI and quality of life among Lebanese children aged 7–13 years.

Methods

Study design and participants

This cross-sectional study involved 504 Lebanese parents from all governorates of Lebanon, recruited between July and August 2024. An online link was distributed to both private and public schools across the country, encouraging parents of children aged 7 to 13 years to visit a website. There, they could access the consent form, an information sheet outlining the study's purpose, anonymity, and voluntary participation, and the survey questionnaire. All participants voluntarily completed the survey, with no fees required for participation. The questionnaire exclusively comprised parent-rated scales. Therefore, all responses were provided directly by parents. Parents who chose not to complete the survey were excluded from the study.

Minimal sample size calculation

The minimal sample size was calculated using the Fritz and MacKinnon formula [44], using an L of 7.85 for a 5% α error, a power of 80%, with an effect size of 0.14 (small), and k = 6 variables included in the model. Therefore, the minimum required sample size for the current study was determined to be 408.

Questionnaire and variables

The questionnaire was anonymous, and self-administered in Arabic. It took about 15 min to fill out, and was organized into various sections. The first section included a consent form, which verified the participants' willingness to take the survey at their own discretion, in addition to a basic description of the study. The second section gathered socio-demographic data including child's gender, age, type of school, parental education level, marital status, employment status, monthly income, and the Household Crowding Index (HCI). The HCI was used to assess the family's socioeconomic status, and was determined by dividing the number of occupants by the number of rooms in the home [45]. Regarding financial burden, respondents were asked to answer the question "How much pressure do you feel with regard to your personal financial situation in general?" on a scale from 1 to 10, with 10 referring to overwhelming pressure [46].

The third section included the following scales:

FI was measured using the *Arab Family Food Security Scale*, validated for use in Lebanon and Arabic-speaking populations [47]. The scale consists of 7- items that evaluate various dimensions of food security, including access to food, availability of nutritious food, and the ability to afford food without compromising other essential needs. This scale includes yes/no questions, with higher scores indicating increased levels of FI. Households were categorized based on their total score: 0–1 signified FI, 2–4 moderate FI, and 5–7 severe FI (Cronbach's α in this study = 0.94).

Children's health-related quality of life was evaluated using the *KIDSCREEN-10*, a widely used and cross culturally validated tool [48, 49], with previous studies suggesting its validity and consistency when used to test populations of the middle-east as was suggested by an Iranian study conducted by Nik-Azin et al. [50]. The Arabic version, provided by the KIDSCREEN group was used and it consists of 10 items that measure key aspects of quality of life of children as reported by their parents, including various dimensions related to physical, psychological, social, and cognitive well-being [51]. Each item is rated on a 5-point Likert scale. Items 1 and 9 use the response categories: not at all, slightly, moderately, very, and extremely. The remaining items use the categories: never, seldom, quite often, very often, and always. Higher scores indicate better quality of life [51, 52] (Cronbach's α in this study = 0.90).

First, physical quality of life is measured by evaluating the child's energy levels, physical activity, and overall fitness. Psychological quality of life covers emotional states, including feelings of depression and stress. Social and leisure activities are explored through questions about the child's participation in activities and structured social interactions. Parent relations focus on the quality of the relationship with parents and the availability of social support. The child's relationship with peers is assessed by examining interactions with other children or adolescents. Finally, cognitive capacity and school environment are evaluated by assessing the child's perception of their cognitive abilities and satisfaction with school performance.

Disordered eating was assessed using the *Eating Disorder Examination-Questionnaire Short Parent version (EDE-QS-P)*, an instrument for identifying disordered eating behaviors in children and adolescents as assessed and perceived by parents [53]. Validated in Arabic [54], the scale consists of 11 items designed to assess core symptoms of disordered eating, evaluating behaviors related to restrictive eating, such as attempts to limit food intake to influence body shape or weight. It also addresses weight and shape concerns, including items focusing on desires to lose weight and dissatisfaction with body image. Additionally, the scale examines binge eating behaviors, using questions targeted on actions taken to compensate for overeating, like vomiting, to control weight or shape. Responses are provided on a

4-point Likert scale, where 0 = "no days", 1 = "1–2 days", 2 = "3–4 days", and 3 = "every day", with higher scores indicating more severe symptoms (Cronbach's α in this study = 0.93).

Anxiety levels were measured using the Arabic brief version of the *Spence Children's Anxiety Scale for Parents (SCAS-P-8)* [55]. This is a parent-rated tool designed to capture various aspects of anxiety, including: two items for social anxiety, with items that address fears of social situations; two for separation anxiety, focusing on distress related to being away from caregivers; one for panic/agoraphobia, which involves sudden fear and avoidance of certain places; and three for generalized anxiety, addressing excessive worry and apprehension across different situations. Responses are rated on a 4-point Likert scale with 0 = "never", 1 = "sometimes", 2 = "often", and 3 = "always", with total scores ranging from 0 to 24, with higher scores indicating greater anxiety [56] (Cronbach's α in this study = 0.90).

Table 1 Characteristics of the sample (*n* = 504)

Children Gender	
Male	232 (46.0%)
Female	272 (54.0%)
Type of school	
Public	194 (38.5%)
Private	310 (61.5%)
Parents' education	
Primary	53 (10.5%)
Complementary	130 (25.8%)
High school	37 (7.3%)
University	284 (56.3%)
Parents' employment	
Unemployed	182 (36.1%)
Employed	322 (63.9%)
Parental marital status	
Single	79 (15.7%)
Married	425 (84.3%)
Monthly income	
< 300 USD	262 (52.0%)
300–1000 USD	87 (17.3%)
>1000 USD	155 (30.8%)
Food insecurity categories	
Food secure	262 (52.0%)
Moderate food insecurity	87 (17.3%)
Severe food insecurity	155 (30.8%)
Children Age (years)	9.59 ± 1.77
Household crowding index (person/room)	1.97 ± 1.67
Financial burden	6.36 ± 2.75
Quality of life	34.81 ± 8.32
Food insecurity	2.60 ± 2.80
Anxiety	6.66 ± 5.44
Depression	5.88 ± 5.01
Disordered eating	4.21 ± 6.41

Depression was measured using *the Short Mood and Feelings Questionnaire-Parent version (SMFQ-P)*, which assesses core depressive symptoms in children and adolescents as rated by their parents [57, 58]. Validated in Arabic [59], the scale consists of a brief 13-item scale including descriptive phrases with a focus on affective and cognitive symptoms such as low mood, irritability, lack of interest, and feelings of worthlessness, on which parents rate their child's behavior and emotional state over the past two weeks on a 3-point Likert scale: 0 = "not true", 1= "sometimes", 2= "true". The total SMFQ-P score is obtained by summing all the responses, with higher scores reflecting more severe depressive symptoms [57, 58] (Cronbach's α in this study = 0.93).

Statistical analysis

The SPSS software v.25 was used for the statistical analysis. The quality of life score was considered normally distributed since the skewness and kurtosis values varied between – 1 and + 1. To know which variables should be included in the mediation model, we conducted a bivariate analysis; the student t-test was used to compare a continuous variable and a dichotomous one and the Pearson test to correlate two continuous variables. The mediation analysis was conducted using PROCESS MACRO (an SPSS add-on) v3.4 model 4, with the number of bootstrap samples set at 5000 and 95% confidence interval; four pathways derived from this analysis: pathway A from the independent variable to the mediator, pathway B from the mediator to the dependent variable, Pathways C and C' indicating the total and direct effects from the independent to the dependent variable. Covariates were variables that showed a $p < 0.25$ in the bivariate analysis. We considered the mediation analysis to be significant if the Boot Confidence Interval did not pass by zero. $P < 0.05$ was deemed statistically significant.

Results

Five hundred and four parents filled the survey; the mean age of their children was 9.59 ± 1.77 years and 54.0% females. In total, 30.8% of parents reported severe levels of household FI. All other details are shown in Table 1.

Bivariate analysis of factors associated with quality of life

Higher quality of life was significantly found in children in private schools vs. public, in those whose parents have a university education level, employed, married and with high income (Table 2). In addition, higher household crowding index, financial burden, anxiety, disordered eating, depression and FI were significantly associated with lower parent-rated quality of life (Table 3).

Numbers in bold indicate significant *p* value.

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Table 2 Bivariate analysis of factors associated with quality of life

Variable	Mean ± SD	t / F	df / df1,df2	p
Children Gender		1.22	502	0.222
Male	35.30 ± 8.48			
Female	34.39 ± 8.17			
Type of school		-13.97	502	**< 0.001**
Public	29.25 ± 6.70			
Private	38.28 ± 7.28			
Parents' education		79.48	3, 500	**< 0.001**
Illiterate	25.66 ± 6.49			
Complementary	30.45 ± 6.46			
High school	33.46 ± 6.54			
University	38.68 ± 7.14			
Parents' employment		-5.69	502	**< 0.001**
Unemployed	32.09 ± 8.25			
Employed	36.34 ± 7.97			
Parental marital status		-3.97	502	**< 0.001**
Single	31.44 ± 7.08			
Married	35.43 ± 8.39			
Monthly income		90.51	2, 501	**< 0.001**
Low (< 300 USD)	28.83 ± 7.00			
Intermediate (300–1000 USD)	36.53 ± 7.13			
High (> 1000 USD)	38.70 ± 7.28			

Mediation analysis

Table 3 Pearson correlation matrix

	1	2	3	4	5	6	7	8
1. Quality of life	1							
2. Children's Age	− 0.04	1						
3. Household crowding index	− 0.44***	− 0.02	1					
4. Financial burden	− 0.21***	0.05	0.29***	1				
5. Anxiety	− 0.42***	0.07	0.41***	0.23***	1			
6. Disordered eating	− 0.19***	0.13**	0.16***	0.20***	0.46***	1		
7. Depression	− 0.48***	0.07	0.40***	0.22***	0.74***	0.44***	1	
8. Food insecurity	− 0.52***	0.05	0.71***	0.44***	0.45***	0.22***	0.51***	1

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

All assumptions were met before performing the mediation analysis; (1) the dependent, independent and mediator variables are all continuous, (2) the data did not show multicollinearity, and (3) the variables followed a normal distribution. The mediation analysis taking quality of life as the dependent variable, was adjusted over the following covariates: children gender, type of school, parents' education, parents' employment, parents' marital status, parents' monthly income, household crowding index and financial burden. The results of the mediation analysis showed that disordered eating (indirect effect: Beta = − 0.11; BootSE = 0.05; Boot CI − 0.21; − 0.03), depression (indirect effect: Beta = − 0.42; BootSE = 0.09; Boot CI − 0.61; − 0.27) and anxiety (indirect effect: Beta = − 0.27; BootSE = 0.07; Boot CI − 0.42; − 0.14) fully mediated the association between FI and quality of life. Higher FI was significantly associated with higher disordered eating/depression/anxiety, whereas higher disordered eating/depression/anxiety were significantly associated with lower quality of life. Finally, FI was not associated with quality of life (Figs. 2, 3 and 4).

Discussion

This study is set to showcase the mediating effect of disordered eating, depression and anxiety between FI and parent-rated quality of life in children aged 7–13 years.
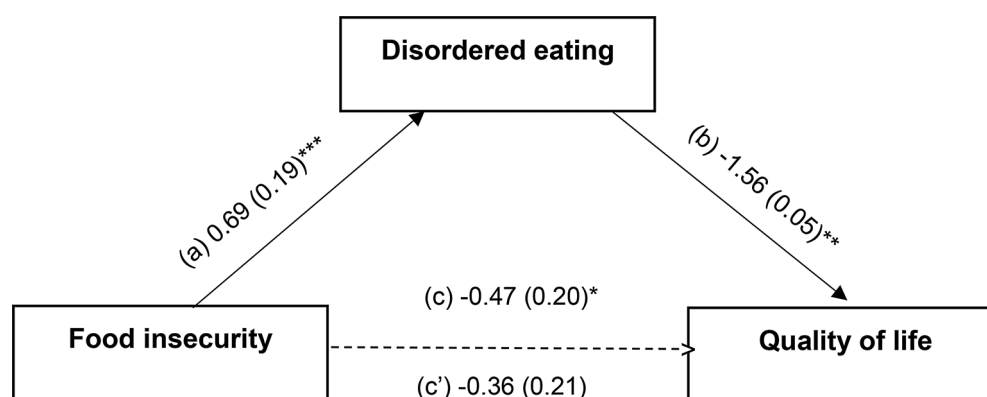

Fig. 2 (**a**) Relation between food insecurity and disordered eating (R^2 =.091); (**b**) Relation between disordered eating and quality of life (R^2 =.377); (**c**) Total effect of food insecurity on quality of life (R^2 =.364); (**c'**) Direct effect of food insecurity on quality of life. Numbers are displayed as regression coefficients (standard error). *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$
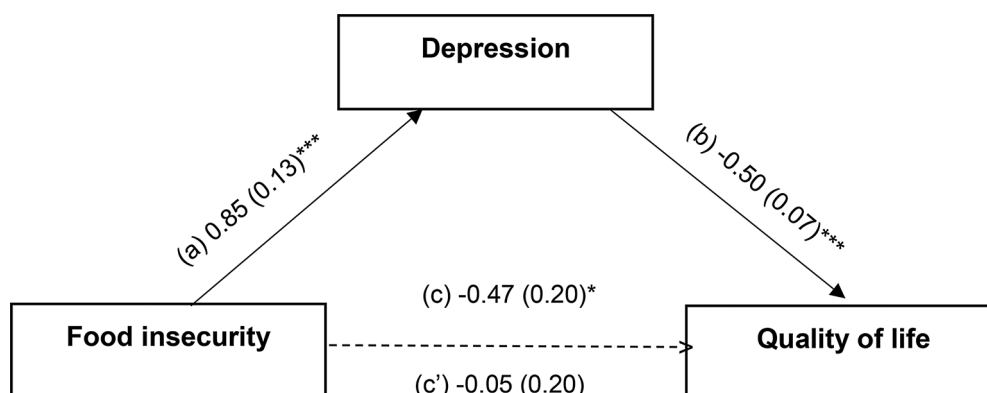
Fig. 3 (**a**) Relation between food insecurity and depression (R^2 =.288); (**b**) Relation between depression and quality of life (R^2 =.428); (**c**) Total effect of food insecurity on quality of life (R^2 =.364); (c′) Direct effect of food insecurity on quality of life. Numbers are displayed as regression coefficients (standard error). ***$p < 0.001$

Fig. 4 (**a**) Relation between food insecurity and anxiety (R^2 =.271); (**b**) Relation between anxiety and quality of life (R^2 =.411); (**c**) Total effect of food insecurity on quality of life (R^2 =.364); (c′) Direct effect of food insecurity on quality of life. Numbers are displayed as regression coefficients (standard error). ***$p < 0.001$
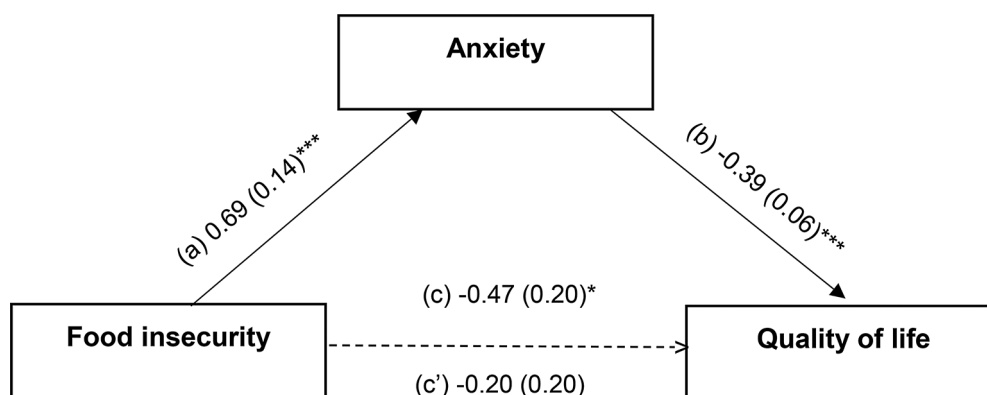
The mediation analysis revealed that disordered eating, depression, and anxiety fully mediated the relationship between FI and quality of life. Higher levels of FI were linked to increased disordered eating, depression, and anxiety, which in turn were associated with lower quality of life. However, FI itself was not directly related to quality of life.

FI and quality of life

Our results suggest that disordered eating, anxiety and depression acted as full mediators between FI and quality of life of children. As such, FI by itself was no longer the direct influencer of the child's quality of life once psychological problems were accounted for. Contradictory to our results Cook et al. and Casey et al. highlighted that FI had a direct effect on the child health and quality of life [7, 15]. However, these studies may have overlooked important covariates that could further clarify the mediating relationships we observed in our results. While Cook et al. targeted a younger population than ours, involving toddlers and infants under 36 months, which

could impact this observed difference in outcomes, Casey et al. examined a broader age range, typically involving individuals age 3 to 17 years, which partially includes the age group of our study, therefore partly contributing to the differences in outcomes [7, 15]. Nevertheless, other studies emphasized that the main factor affecting negatively the child's quality of life is the psychological effects that FI has on the child rather than the food deprivation [12]. According to Slack and Yoo [12], FI creates a stressful environment resulting in poor behavioral and mental health and therefore overall lower quality of life. In a comparable manner, Weinreb emphasized that the way FI impacts quality of life is through mental and physical stressors [10]. These results can be also integrated within the Lebanese population, as previous research has highlighted similar patterns. In fact, Itani et al. showed evidence that FI acts as a chronic stressor, promoting uncertainty about reliable access to food, increasing the likelihood of anxiety and depression [60]. They also demonstrated that FI unfavorably impacts mental health and overall quality of life, aligning with our study's

observation of similar mediating effects of anxiety and depression. However, while Itani et al.'s research mainly targeted college students, whose mental health challenges are influenced by academic pressures and transitional life stages, our study highlights these effects in a younger, more developmentally vulnerable population [60]. This contrast emphasizes the more widespread impact of FIacross age groups, with its effects shaped by age-specific vulnerabilities and developmental challenges.

Disordered eating as a mediator

According to our results, FI was positively linked to disordered eating, in line with the previous literature; studies showed that FI is linked to disordered eating due to the unhealthy relationship with food caused by the inconsistent access to nutrition [10, 54, 60]. Similarly, Becker et al. (2019) reported a strong correlation between malnourishment and eating disorder pathology. According to this study, binge eating and food hoarding behaviors are the consequences of food scarcity [26]. Particularly in the Lebanese population, Itani et al. demonstrated that food scarcity affects 74% of households and often results in reduced meal frequency and limited access to basic and essential food supplies, which may contribute to coping mechanisms including binge eating and food hoarding in response to the uncertainty surrounding reliable food access [60].

Additionally, disordered eating fully mediated the association between FIand quality of life. This suggests that FI by itself did not directly influence the child's quality of life but rather indirectly affect the quality of life by increasing the risk of disordered eating which in turn will lower the child's quality of life scores. Upon reviewing the literature, a few studies have explored the bivariate correlations between FI and ED on one hand, and ED and quality of life on the other, supporting the validity of the associations highlighted in our study. In 2020, Hooper et al. [24] demonstrated that adolescents from food insecure households were more likely to develop stress-related eating disorders. As a continuation, a study by Jenkins et al. showed that disordered eating impacted adolescents' health-related quality of life by contributing to poorer mental quality of life through disordered attitudes, binge eating, and compensatory behaviors, and poorer physical quality of life through body dissatisfaction [61]. Overall, body image dissatisfaction, feelings of guilt, frustration and constant stress about food and weight, all disrupt normal daily functioning, lower self-esteem and create emotional distress, contributing significantly to a reduced quality of life [62, 63]. Thus, disordered eating serves as a critical pathway through which FI negatively impacts children's overall quality of life.

Depression as a mediator

As for depression, results showed that it was strongly correlated to FI. Correspondingly, a study done in low- and middle-income countries showed a dose-dependent correlation between FI and higher risk of depressive symptoms, in fact there was an increase of 36 – 80% of the probability of depressive symptoms for moderate and severe FI respectively [64]. In the same line, Slack et al. [12] also demonstrated that children from low-income homes suffering from FI, had depression as the main psychological consequence.

Furthermore, depression was found to be another mediator between quality of life and FI. Food-insecure households potentiate depression and its symptoms, negatively affecting the quality of life. Our findings were supported by Weinreb et al. [10] who found that long-term food scarcity created emotional insecurity and stress, often expressed as depression. This suggests that FI creates a state of insecurity and chronic stress that can contribute to the development of depression. In turn, depression is well-known to lower overall quality of life, as it negatively impacts emotional, social, and physical health. Thus, this relationship suggests that the psychological burden induced by FI can serve as a major factor through which FI diminishes children's health-related quality of life.

Anxiety as a mediator

Similarly, our findings showed that anxiety was strongly correlated to FI, in concordance with the literature, where a meta-analysis conducted on U.S. adults by Arenas et al. showed that FI increased the risks for both depression and anxiety in a remarkable manner, suggesting that anxiety and depression from FI may be interconnected in their mechanism or predisposing factors [14]. In line with our results, a recent study showed that malnourished children often experience frustration, worry, and sadness about their food situation, which negatively impacts their mental health [65]. This heightened anxiety can further reduce their quality of life by affecting multiple areas of their well-being. Anxiety can lead to difficulty concentrating, sleep disturbances, and social withdrawal, making it harder for children to engage in daily activities, perform well in school, and build healthy relationships [66, 67]. Over time, this emotional distress can create a cycle of negative thoughts and behaviors that diminishes both their mental and physical health, thereby explaining how FI, through anxiety, reduces children's overall quality of life.

Clinical implications

Incorporating mental health support aiming to alleviate the impact of depression, anxiety and eating disorder should be an essential part of FI rescue missions.

Healthcare providers must investigate symptoms of depression, anxiety and disordered eating, as well as mitigate the negative impact on their physical and mental health. By screening for these psychological disorders alongside FI assessments, clinicians can better identify at-risk children and implement targeted interventions. This calls for a multidisciplinary approach requiring clinicians to collaborate with nutritionists, psychologists, and social workers to create comprehensive care plans that address both nutritional needs and mental health concerns. Particularly in Lebanon, the healthcare providers should tackle the combined impact of economic instability and mental health stigma, specifically when targeting FI. The integration of mental health screening methods into food assistance programs as the well as the collaboration with local or regional non-governmental organizations (NGOs) can provide targeted support, mainly for children. Hence, there is an imminent need for more dedicated interventions that address both nutritional and psychological needs, to ultimately enhance the quality of life [60, 46].

Furthermore, this study highlights the beneficial role of an educational program for families that emphasize the importance of mental health, healthy eating practices, and coping strategies to manage stress related to FI. Moreover, literature around this subject is still lacking, emphasizing the importance of supporting further research to explore the long-term effects of FI and associated mental health issues on children's development, informing future clinical practices and interventions.

Limitations
When interpreting the findings and conclusions of this study, certain limitations should be taken into account. First, the sample was obtained through snowball sampling, meaning that a small group of individuals who filled the questionnaire referred others to participate, which may restrict the generalizability of the findings. The cross-sectional design of our study limits our ability to establish causality, and reliance on self-reported data may be biased. Acknowledging this limitation is important not only to interpret the current results, but also to determine the direction of future research. Furthermore, the sample is not fully representative of all socio-economic and geographic regions thereby limiting the ability to generalize of the results to broader populations. Information bias, where participants tend over- or underestimate the answer to a question, is definitely present like in all observational studies. Finally, the reliance on self-reported data poses possible recollection and social desirability bias, affecting the accuracy and reliability of the responses.

Conclusion
Our study is consistent with the body of research whose main objective is to highlight how anxiety, disordered eating and depression play a significant role as mediators between FI and child quality of life. FI acts indirectly on child's quality of life by causing psychological disorders which in turn will have a negative impact on quality of life. Further interventions should focus on treating psychological problems in children residing in food insecure homes and on improving food security, while involving families in the development of these interventions to ensure that they are culturally relevant and tailored to the specific needs of these children. Finally, future research should explore the effectiveness of integrated interventions that simultaneously address FI and mental health issues, assessing their impact on child quality of life outcomes.

Data availability
All data generated or analyzed during this study are not publicly available due the restrictions from the ethics committee. Reasonable requests can be addressed to the corresponding author (SH).

Declarations

Ethics approval and consent to participate
The study protocol was approved by the ethics committee of the Notre Dame des Secours University Hospital. An electronic informed consent was obtained from each participant when submitting the online form. All methods were carried out in accordance with the Declaration of Helsinki.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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