Predictors of Household Food Insecurity and Outcomes among Rural Egyptian Children

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Abstract

Background: Food insecurity is a public health concern and a key social determinant of health. It is closely linked to poverty and adversely associated with the physical and mental health especially children. **Aim of the study:** To assess household food insecurity (HFI) and its association with negative impacts on children in rural Minia. **Research methodology:** Children (n=497) aged 24–59 months were recruited in a community-based cross-sectional survey. Household Food Insecurity Access Scale (HFIAS) and anthropometry were administered. **Results:** Nearly 70% of households were food insecure. The prevalence of stunting, underweight, and wasting among children were 19.1%, 1.6%, and 1.8%, respectively. By logistic regression analysis, income, socioeconomic status and family size predicted HFI. **Conclusion:** The findings revealed a high HFI prevalence (69.6%) that was associated with poor income and lower socioeconomic status. HFI was associated with stunting. **Recommendations:** The study highlights the need for policies and public health interventions to decrease poverty and programs for screening and addressing food insecurity.

Key words: Household food insecurity, Children, Stunting, Rural Minia.

Introduction

Food insecurity is defined as existing "when people lack secure access to sufficient amounts of safe nutritious food for normal growth and development, and an active meanwhile, healthy life" (FAO, 1996).

Child malnutrition is a major public health problem in LMICs especially among marginalized populations (Elsayed et al., 2018). Food insecurity can lead to hunger or poor nutrition and strongly correlated with negative health outcomes. Children who do not have appropriate nutrition may become more vulnerable to illness (Reis, 2012), increased hospitalization (Cook et al., 2004), anemia (Levy et al., 2015), and a higher incidence of behavioral, emotional, and academic problems for children (Shankar et al., 2017).

Stunting (short stature for age) is the most commonly used indicator of chronic malnutrition (Lenters et al., 2016), and is assessed by anthropometric measures of the child's height-for-age (De Onis and Branca, 2016). According to EDHS 2014, One in five Egyptian children under age 5 was stunted (short for their age) (Elsayed et al., 2018). Wasting (low weight for height) is acute malnutrition often observed in developing countries with chronic or acute periods of food insecurity and is exacerbated by infectious disease (Abdullah, 2015).

When food is available, many low-income households consume monotonous diets which are of low quality, cereal based and lacking in vegetables, fruit, and animal-source foods. Monotonous diets are closely associated with food insecurity resulting in malnutrition (Chakona and Shackleton, 2017).

The aim of this study:

Is to assess household food insecurity (HFI), associated risk factors, the nutritional status of children in rural Minia, and to identify the relationship of food insecurity with nutritional status.

Subjects and methods

Study design:

This is a community-based cross-sectional study which was carried out in Qulubba village, Mallawi, Minia Governorate during the period from November 2017 to March 2018. A total of 497 children aged 2-5 participated in the study. Children having chronic diseases or taking medications that may affect their dietary intake and/or the overall nutritional status were excluded. In households with more than one

child aged 2–5 years, the youngest child was selected.
The required sample size was calculated based on the statistical software EPI-INFO 7.2.2.6, confidence level 97%, and a maximum acceptable error of 5%, with added 10% to guard against non-response. A total of 497 households were recruited. The response rate was 95.9%.

Data collection
Data collection:
Face-to-face interviews with study participants were conducted in the household setting using a multi-component questionnaire. The questionnaire covered information on socio-demographic characteristics, household food security status, and anthropometric measurements. The aim of the study was explained. Each interview took approximately 20 minutes.

Socioeconomic status: was done according to El-Gilany, et al., (2012), a modification of the old scoring system of Fahmy and El-Sherbini (1983).

Anthropometric measurements:
were assessed according to the standard procedure (WHO, 2008). Weight was measured using digital scale to the nearest 0.1 kg. Height was measured using a stretch-resistant measuring tape and was measured to the nearest 0.5 cm. Body mass index (BMI) was calculated by dividing weight (in kilograms) on squared height (in meters). Each child's height-for-age *Z* score (HAZ), weight-for-age *Z* score (WAZ), weight-for-height *Z* score (WHZ) and BMI-for-age Z score for age and sex were calculated based on World Health Organization Child Growth Standards software WHO Anthro (version 3.2.2, January 2011) (WHO, 2011).

Food insecurity status: the Household Food Insecurity Access Scale (HFIAS) was used to evaluate the food insecurity of participants' families. The HFIAS has developed by The US Agency for International Development (USAID) and funded Food and Nutrition Technical Assistance (FANTA) Project (Coates et al., 2007). The Arabic version of the HFIAS was tested for validity in in Lebanon and was found to be a valid and reliable tool to assess HFIS (Naja et al., 2014).

The HFIAS consists of nine questions. The score is a continuous measure of the degree of food insecurity (access) in the household in the past four weeks (30 days).

Households were categorized into four levels of food insecurity (food secure, mildly, moderately or severely food insecure) depending on the number of positive responses to questions related to severe conditions. HFIS was later recoded into two variables (food secure vs food insecure).

24-hour dietary recall: Food consumption was assessed by the 24-hour dietary recall method applied on the past 24-hours during a personal interview. In this method mothers were asked to recall the exact foods and beverages her child consumed during the previous 24 hours period (Salvador Castell et al., 2015). Quantities of food and beverages were estimated using cups and household utensils commonly used then converted into grams.

Ethical consideration:
Data were collected from participants after explaining the nature of the study and taking a verbal consent from each of them. The study protocol was approved by the research ethical committee of Minia University. Approval of the Ministry of Health and Population beside approval of the manager of the rural health unit in the previously mentioned village were taken.

Statistical analysis:
The analysis of the data was carried out using the IBM SPSS 20.0 statistical package software. A *P*-value of 0.05 or less was considered significant, whereas values 0.01 and 0.001 were considered highly significant.

Results
The total number of enrolled children was 497 children, their age ranged between 24 and 60 months with a mean of 40.1 months (SD = 11.1), the ratio of males to females was almost fifty-fifty. Table (1) shows the food insecurity status of the studied households.

Table (1): Food security status of the studied households, rural Minia, 2018.

Food insecurity status	Total (n=497)	
	Mean ±SD	Range
HFIAS score (0-27)	7.9 ± 6.5	0 − 25
Food security classification, n (%)	**n**	**%**
Food secure	151	30.4
Mildly food insecure	71	14.3
Moderately food insecure	189	38
Severely food insecure	86	17.3

As shown in table (1), the mean HFIAS score was 7.9±6.5. Among the total 497 households in the studied sample, 30.4% were food secure, while 69.6% were classified as food insecure: 14.3%, 38% and 17.3% reported mild, moderate and sever food insecurity respectively.

Table (2): Distribution of socioeconomic characteristics by food security status, rural Minia, 2018.

Household characteristics	Food secure (n=151)	Food insecure† (n=346)	p value
	Mean±SD	Mean±SD	
Age of children (mon.)	38.54±10.73	40.81±11.22	**0.036**
Gender Male Female	82 (54.3) 69 (45.7)	166 (48) 180 (52)	0.194
Household size	5.43±1.76	6.19±2.84	**0.003**
Crowding index	1.74±0.71	2.32±0.91	**<0.001**
Household income Able to save money Meet routine expenses and emergencies Just meet routine expenses In debt	 100 (66.3) 34 (22.5) 15 (9.9) 2 (1.3)	 74 (21.4) 150 (43.4) 70 (20.2) 52 (15)	**<0.001**
Socio-economic quartiles Very low (<35) Low (35-41) Middle (42-47) High (≥48)	 15 (9.9) 11 (7.3) 37 (24.5) 88 (58.3)	 104 (30.1) 97 (28) 99 (28.6) 46 (13.3)	**<0.001**
Education level of mother, n (%) Illiterate Below secondary Secondary/Intermediate institutes University / Postgraduate	 19 (12.6) 19 (12.6) 84 (55.6) 29 (19.2)	 98 (28.3) 63 (18.2) 176 (50.9) 9 (2.6)	**<0.001**
Working status of mother, n (%) Housewife Working	 121 (80.1) 30 (19.9)	 324 (93.6) 022 (6.4)	**<0.001**
Education level of father, n (%) Illiterate Below secondary Secondary/Intermediate institutes University / Postgraduate	 9 (6) 11 (7.3) 87 (57.6) 44 (29.1)	 68 (19.7) 80 (23.1) 178 (51.4) 20 (5.8)	**<0.001**
Working status of father, n (%) Not working Unskilled manual worker Skilled manual worker Trades/business Semiprofessional/clerk	 0 (0) 16 (10.6) 66 (43.7) 26 (17.2) 17 (11.3)	 7 (2) 81 (23.4) 2 (57.8) 22 (6.4) 28 (8.1)	**<0.001**

Professional	26 (17.2)	8 (2.3)	

Table (2) shows that children's age in food insecure households was higher (40.81±11.22) than in food secure households (38.54±10.73) (p =0.036). The mean household size and crowding index were higher in food insecure than food secure families and the difference was statistically significant (p=0.003 and <0.001 respectively). Regarding household income, households able to save money accounts for 66.3% of food secure versus 21.4% of food insecure households and a total of 15% were in debt compared to 1.3% of food secure households (p <0.001).

Nearly 28% of mothers and 19.7% of fathers in food insecure household were illiterates compared to 12.6% and 6% respectively in food secure households (p <0.001). University graduates and postgraduates accounted for 19.2% of mothers and 29.1% of fathers in food secure households which were higher than 2.6% and 5.8% respectively in food insecure households (p <0.001). Nearly 20% of food secure mothers were working compared to 6.4% in food insecure households (p <0.001).

The percent of families with very low and low SES are higher in food insecure (30.1% and 28%) respectively than food secure (9.9% and 7.3%) respectively, while the percent of high socioeconomic families is higher in food secure (58.3%) than food insecure (13.3%) (p <0.001).

Table (3): Anthropometric measurements of children by household food security groups, rural Minia, 2018.

Variable	Total (n=497)	Food secure (n=151)	Food insecure (n=346)	p value
	Mean±SD	Mean±SD	Mean±SD	
HAZ	-1.03±1.15	-0.64 ± 0.10	-1.2 ± 1.13	**<0.001**
< -2 (Stunting)	95 (19.1%)	12 (7.9%)	83 (24%)	**<0.001**
WHZ	0.62±1.06	0.59 ± 1.06	0.63 ± 1.06	0.700
< -2 (wasting)	8 (1.6%)	3 (2%)	5 (1.4%)	0.704
WAZ	-0.15±0.86	0.07 ± 0.85	-0.24 ± 0.85	**<0.001**
< -2 (Underweight)	9 (1.8%)	2 (1.3%)	7 (2%)	0.729
BAZ	0.74 ± 1.1	0.66 ± 1.12	0.77 ± 1.11	0.351
> +2(Overweight/obese)	70 (14.1%)	18 (11.9%)	52 (15%)	0.360

WAZ Weight-for-age Z score, *HAZ* Height-for-age Z score, *WHZ* Weight-for-height Z score, *BAZ* BMI for age Z score

Table (3) shows that, a total of 19.1% of the studied children were stunted. Food insecurity was significantly associated with stunting among children. In food insecure households, 24% were stunted compared to 7.9% in food secure households (p < 0.001).

Table (4): Univariate and multiple logistic regressions of predictors of household food insecurity, rural Minia, 2018.

		HFI			
		Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Income					
Able to save money		1.00 (reference)		1.00 (reference)	
In debt		35.14 (8.29-148.9)	<**0.001**	17.23 (3.59-82.7)	<**0.001**
Just meet routine expenses		6.31 (3.35-11.88)	<**0.001**	3.28 (1.52-7.08)	**0.003**
Meet routine expenses and emergencies		5.96 (3.7-9.62)	<**0.001**	3.75 (2.11-6.66)	<**0.001**
SES	High	1.00 (reference)		1.00 (reference)	
	Very low	13.26 (6.94-25.36)	<**0.001**	3.08 (0.65-14.57)	0.156
	Low	16.87 (8.23-34.6)	<**0.001**	5.86 (1.9-18.07)	**0.002**
	Middle	5.12 (3.05-8.61)	<**0.001**	2.25 (1.11-4.57)	**0.025**
Crowding index		2.51 (1.88-3.34)	<**0.001**	1.68 (1.18-2.38)	**0.004**
Household size		1.16 (1.05-1.28)	**0.003**	1.15 (1.01-1.32)	**0.041**
Father education		0.78 (0.73-0.84)	<**0.001**	0.88 (0.78-0.99)	**0.029**
Father occupation		0.54 (0 .45-0.64)	<**0.001**	0.79 (0.62-1.01)	0.063
Mother education		0.84 (0.79-0.89)	<**0.001**	1.1 (0.98-1.24)	0.120
Mother work	**Yes**	1.00 (reference)		1.00 (reference)	
	No	3.65 (2.03-6.58)	<**0.001**	1.87 (0 .85-4.13)	0.123

N.B. Dependent variable HFI, OR odds ratio, CI confidence interval R^2= 0.449

The results of multiple logistic regression in table (4) showed that, Food insecurity was inversely related to household income. The results showed that households in debt and those could meet routine expenses were nearly 17 times and 3.28 times more likely to be food insecure compared to households who were able to save money.

The result also showed that household size and crowding index were statistically associated with food insecurity (AOR=1.15, 95% CI= 1.01-1.32) and (AOR= 1.68, 95% CI= 1.18-2.38) respectively. High father education was protective from food insecurity (AOR= 0.88, 95% CI= 0.78-0.99).

Discussion

Food insecurity was measured by 9-question HFIAS categorizing households into four levels of food insecurity. Out of the 497 households, 346 (69.6%) reported certain levels of food insecurity with 71 (14.3%), 189 (38%), and 86 (17.3%) categorized as mildly, moderately and severely food insecure households respectively.

The state of HFI (69.6%) identified in this study is higher than 40% in Minia and 35.1% poor dietary diversity of all Egyptians, but slightly lower than 80% in Assuit, using poor dietary diversity as an indirect indicator for food insecurity (WFP, 2013) However, in this study food insecurity is substantially higher than 17.2% which represented combined food insecurity (poor food consumption in terms of inadequate dietary diversity, calorie deficiency, or both) and income poverty (WFP, 2013).

The prevalence of household food insecurity in this study is, to some extent, consistent with that in previous studies of rural Malaysia (83.9%) (Ihab et al., 2013), and in urban Ecuador (81%) (Weigel et al., 2016). In High Income Countries (HIC), the prevalence of food insecurity was, much less, 14.3% in US (Coleman-Jensen et al., 2014), and 16.9% in Canada (Faught et al., 2017).

A potential explanation for the higher prevalence of HFI reported in the present study could be attributed to the high rate of poverty as demonstrated by WFP (2013), Minia Governorate had the highest rate of extreme multi-dimensional poverty especially rural areas. Poverty in rural Upper Egypt accounted for 49.4% (CAPMAS, 2013). Another important factor to consider regarding variations is the difference in measurement instruments used,

with HFIAS yielding the highest household food insecurity (Saaka and Osman, 2013).
The prevalence of food insecurity varied considerably among households with different demographic and economic characteristic. In this study, household income was found to be the strongest predictor of food insecurity, low income households were at a greater risk of food insecurity than high income households even after adjusting for other covariates. This was in agreement with various previous studies (Ghattas et al., 2013; Ihab et al., 2013; Weigel et al., 2016; Abraham et al., 2017). This association was also reported even in HIC with higher food insecurity rates with incomes near or below the national poverty line (Coleman-Jensen et al., 2014). Generally, the more money the household has, the more access it has to better food in terms of quality or quantity.

In the current study, SES was inversely associated with food insecurity. Similar finding was reported by (Shinsugi et al., 2015). Additionally, Saaka and Osman, (2013) investigated HFI using three different indicators and found that all food access indicators were related to SES. In the current study, a lower household income and increased family size tend to worsen household food insecurity. The same finding was reported by several previous study (Ihab et al., 2013; Abraham et al., 2017). However, a study conducted in Vietnam by (Vuong et al., 2015) found no association between family size and food insecurity. The difference could be due to lack of variation in family size across the sample.

In the current study, there was a significant association between HFI with educational level and working status of mothers and their husbands. This finding is consistent with Weigel et al., (2016). This association may be explained by the fact that high education means better chance of having better occupation, good income and better living conditions. Furthermore, working mothers are expected to have better access to food and food security conditions.

This study found that working status of mothers was associated with higher prevalence of food security. Generally, working mothers are expected to have better access to food and food security conditions. This association is consistent with Weigel et al., (2016).

A multiple regression analysis for food insecurity among the studied households was done in the current study and showed that the significant set predicting food insecurity were household income, SES, crowding index, family size and education of the household head respectively. Collectively this set of predictors can explain (45%) of the variability in food insecurity. The findings are comparable with the findings from a study done in South Ethiopia who found that monthly income and household size were among the predictors of food insecurity (Abraham et al., 2017).

Regarding the studied children, current results showed that 19.1% of the studied children were. This was consistent with 2014 EDHS which reported that 21% of children under age five were stunted (Elzanaty and Associates, 2015). Another similar finding was reported in Minia, where 20.3% of children (age 6-24 months) were stunted (El-Amin et al., 2014). Contrary to the results of this study, a study conducted by Ghattas et al., (2013) in Lebanon, found no association between stunting and food insecurity which may be explained by the buffering effect of continued food production practices.

In the current study, wasting and underweight were not common among the studied children, 1.6% and 1.8% respectively. Regarding BAZ score, 14.1% of the studied children were obese similar to EDHS finding of 14.9% (Elzanaty and Associates, 2015). Food insecurity was, however, not associated with wasting and underweight, the same as reported by previous studies (Saaka and Osman, 2013; Schlüssel et al., 2013). The reason why food insecurity affected height but not weight status may be the fact that stunting indicates long term growth impairment, in times of food insecurity, parents protect their children from reduced food intake to maintain caloric requirement but chronic long lasting low quality food leads to micronutrient deficiency required for linear growth (Ghattas et al., 2013; Saaka and Osman, 2013).

Conclusion

Based on the finding of this study, it can be concluded that high percentage of rural

households in the study area (69.6%) experienced some degree of food insecurity. The results showed that household income was the strongest predictor of household food insecurity. Household food insecurity was associated with stunting in children.

Recommendations

Policymakers should improve poverty status which is positively associated with food access. Fundamental reform of the existing economic system is required. Enhancement of national food security policies and public health intervention programs that provide access to sufficient, safe and nutritious food, financial aids and health education are strongly recommended. Furthermore development of programs for screening of food insecurity and malnutrition is required.

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