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Original article

The effect of socio-economic inequalities and dietary diversity on the food insecurity levels of urban households: a case study of Niğde province, Turkey

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Abstract. This study provided a deep insight to what extent the socio-economic, demographic, and nutritional characteristics of the households were related to different degrees of food insecurity by using the generalized ordered logit model. The cross-sectional data was collected from 391 urban households in Niğde province of Turkey by conducting face-to-face interviews. According to the study results, the households that were found to be more likely to exposure the food insecurity include households with unemployed and less educated household heads, households with low monthly income and low food expenditure per capita and households with a large size and with children. The study also provided new insights about nutritional adequacy of households in the context of food security. It was found that individuals who consumed protein-containing foods ever day had a 90% less risk of becoming food insecure than those who never or only sometimes consumed these foods. Similarly, it was found that individuals who sometimes consumed iron-containing foods had a 67% less risk of being food insecure than those who never consumed these foods. Policies for poverty reduction, enhancing employment opportunities, reducing of the cost of nutrient-rich foods along food supply chain and diversification of nutritious foods production could contribute to improve the food security status of households.

Keywords: Socio-economic characteristics, generalized ordered logit model, nutritional adequacy, Household Food Security Survey Module, Food Consumption Score.

Introduction

Food insecurity is recognized as a serious social and public health problem around the world. Adequate and balanced food consumption is one of the most basic needs and rights of all human beings. The declaration of the World Food Summit in 1996 illustrated an evolution in the discussion on food security issues over several decades and the growing political commitment at an international level to eradicate hunger. Yet despite the progress in our understanding of how to guarantee this basic human right and how to conceptualize and monitor it, hunger continues to affect hundreds of millions throughout the world (1). According to the FAO (2019) report, a little over 820 million people suffer from hunger, which corresponds to about one in every nine people in the world (2). In addition, the root of the problem is the social inequalities from the household to the international level. There is no doubt that this problem has become much worse with the emergence of new challenges such as rapid urbanization, high population density, unemployment, poor health and nutrition status, food crises and Covid-19.

Food security has multi dimensions and can be affected by an entire mix of factors related to food availability, accessibility and utilization. However, the problems of malnutrition, hunger and food insecurity in the last half-century are more likely to be due to the problem of redistribution and the lack of access on the household level rather than the problem of food availability on the global and national levels. In the global context, agriculture currently produces sufficient nutrients and

calories to ensure the entire world with productive and healthy lives; however, food is not distributed equally among regions, countries, households or individuals (3). The availability of food does not assure access to it (4). Hence, the food insecurity problem is principally based on distribution, which is the process of ensuring available food to people who need it, when they need it, and ensuring they have affordable and regular access to food. Besides, having adequate energy consumption in the nutrition does not mean to be intaken the sufficient amounts of nutrients essential for the functioning of the body. Suboptimal nutrition or excessive but unbalanced nutrition, often termed hidden hunger, is the one of determinants of food insecurity, as well. Therefore, the understanding of the determinants of accessing to food and nutritional adequacy at household level is very crucial ensuring food security.

Many of countries in the world are mostly considered a food secure country in terms of food availability since they produce either sufficient staple foods or imports nutritional food for its population. However, these countries are perceived as being able to ensure food security at a national level, when in reality this issue is still a serious problem at a micro level, especially for some urban households. Food security on a household level can be mainly specified by socio-economic status, and adequate and balanced dietary status.

Studies conducted in the literature on food security have generally tried to respond to questions such as who should get, when, how, how much, and what kind of food? (5). Since food insecurity consists of a variety of determinants, a number of studies have been carried out in order to comprehend household food security around the world. Various researchers have investigated food security from different aspects by using different methodologies and variables. (3, 4, 6-10). Understanding the status of food security in household level and its determinants could enable the comprehension of that how this information may contribute to ensuring food security and social welfare. Much of the studies on this topical issue have focused on rural households (5, 7,11,12). Little has been done to target urban households considering the socio economics inequalities of food security highlighted above (8, 13, 14). Moreover, diet diversity is a good indicator of food security at the household level (15). However, there is not sufficient study to evaluate the food insecurity levels at household level by taking into consideration of not only socio-economic and demographic factors but also dietary diversity of households. The present study aimed to fill this particular gap. Hence, the novelty of the study lied in relatively more encompassing the determinants of food security, combining two dimensions of food security which are accessibility and utilization. Another distinct feature of the study is the application of generalized ordered logit model which provided a deep insight to analyse to what extent the determinants of food insecurity were related to varying cumulative estimates at four levels of households' food security. This study may be helpful for guiding policy makers in developing appropriate food security and balanced nutrition strategies.

The outline of the paper is as follows: the next section presents material and methodology followed by results and discussion. The last section presents conclusions and policy implications.

Materials and Methods

Primary data were obtained by conducting face-to-face interviews with 391 households in an urban area of the province of Niğde in Turkey between February and March 2020. In Niğde province, the share of urban population increased from 32% to 60% for last three decades (16). Based on Malhotra (2004) (17), Simple Random Sampling Method was used to determine sample size at 95% confidence level and 5% acceptable error.

In this study, the US Household Food Security Survey Module (HFSSM), which is used as the approach for the experience-based insecurity measurement scale in diverse countries around the world, was preferred to determine households' food insecurity. The HFSSM has created a great interest in the developing world, and has already been adapted as a national food security tool in various countries (18). The HFSSM has been used to observe household food security in the U.S. from 1965. The HFSSM focuses on the self-reports of insufficient, inadequate or uncertain food availability, utilization and access because of limited financial resources, and the compromised food consumption and eating patterns that may occur as a result (19). The

HFSSM includes eighteen questions over the previous twelve months. Each question identifies the ability to afford food or a lack of money as the reason for the behaviour or condition. The questions vary in severity from worrying about running out of food, to children not eating for a whole day (19). Ten questions in adult scale are based on the adults' experiences in the household or general, while eight questions in child scale are based on the experiences of children under the age of 18 years in the household. The HFSSM classifies the household as "Food secure," "Food secure at risk", "Food insecure without hunger," "Food insecure with hunger-moderate," or "Food insecure with hunger-severe". The validity of this survey instrument has been demonstrated worldwide.

Variable Description

In order to determine the factors affecting the food security status of households, food security was used as the dependent variable. Many factors can affect food security. In this study depending on the goodness of fit of the model, mainly explanatory variables such as age, gender, education, employment status of the head of the household, variables related to the characteristics the households and variables related to the nutritional status of the households (Table 1).

As the behaviour of consumers can differ according to income, the monthly average incomes of the households were ranked from low to high and divided into three income groups. From the lowest to the highest these were: Group I (low income - 178 households), Group II (middle income - 145 households) and Group III (high income - 68 households). According to the income groups, the monthly average income of the households ranged between 650 Turkish Lira[1] (102.5 USD) and 10000.0 Turkish Lira (1576.9 USD) and the average was determined as 3054.0 Turkish Lira (481.6 USD).

The variable of nutritional adequacy of the households was also added to the model in order to assess the frequency of the consumption of nutrient rich foods. This variable was a proxy indicator on the diversity and frequency of food groups, as well. For this purpose, the

1 - 1 USD= 6.34 Turkish Lira (TL) at the time of the study

Table 1 Variable Description

Variables	Explanation
Dependent variables	
FoodSec	Food Security Status (0: Food secure; 1: Food secure at risk; 2: Food insecure without hunger; 3: Food insecure with hunger-moderate or Food insecure with hunger-severe)
Independent variables	
Household Head Characteristics	
Agehh	Age of household head (Years)
Genderhh	Gender of household head (1 if female of head of HH; 0 otherwise)
Edu_pl	1 if the household head has primary or literate education; 0 otherwise
Edu_hs	1 if the education level of household head has high school; 0 otherwise
Edu_uni	1 if the household head has university or higher education; 0 otherwise
Employed	1 if the household head is employed; otherwise: 0
Unemp	1 if the household head is unemployed; otherwise: 0
Emp_oth	1 if the employment status of household head is retired, student or homemaker; otherwise: 0
Households Characteristics	
Hsize	Number of household members
DepenRat	Dependency ratio (The share of inactive members (aged under 15 and over 65) in a household)
Child	Children status (1 if household with children; 0 otherwise)
Inc_low	Low-income group: 1; otherwise: 0
Inc_middle	Middle income group: 1; otherwise: 0
Inc_high	High income group: 1; otherwise: 0
FoodExp	Average monthly food expenditure per household member (TL/per month)
Nutritional Adequacy Status of Households	
Protein_Everyday	1 if the frequency of protein rich foods consumption per week is every day; 0 otherwise (never or sometimes)
VitA_Everyday	1 if the frequency of Vitamin A foods consumption per week is every day; 0 otherwise (never or sometimes)
Iron_Sometimes	1 if the frequency of hem Iron foods consumption per week is sometimes (1-6 days);0 otherwise (never)

Food Consumption Score (FCS) method, which is the main institutional indicator of World Food Program (WFP) to measure food insecurity and used to identify categories of household food insecurity, was used in this study by a derived from WFP –WAM (2008). FCS supplies a rich data that can be used to provide information about the nutrient-rich foods consumed by the household. The FCS covers nine food groups, namely pulses, staples, vegetables, fruits, meats and fish, milk, oil, sugar and condiments, based on nutritional value and focuses on three key nutrients, namely protein as a macronutrient, Vitamin A and Iron (hem iron) as micronutrients, according to their nutritional importance. The Vitamin A rich foods group is comprised of six-food items: organ meat, dairy, eggs, green vegetable, orange vegetable and orange fruits. The protein rich foods group is comprised of six food items: pulses, flesh meat, dairy, fish, eggs and organ meat. The hem iron rich foods group consists of three food items: organ meat, flesh meat and fish.

The frequency of consumption is based on five discrete intervals: (1) daily, (2) 3-5 times per week, (3) 1-2 times per week, (4) 1-3 times per month and (5) not at all. By applying the FCS module (20), the value of each key nutrient category was acquired by aggregating the weekly consumption frequencies of the food sub-groups belonging to that group. Moreover, the aggregated frequencies for each food category were grouped into three subcategories. If the sum of the consumption frequencies of any food category was zero, the value of this category was recoded as never consumed. Similarly, if the sum of the consumption frequency was between one and six, the value was recorded as consumed sometimes and when it was seven or more, the value was recorded as consumed at least daily. This procedure was carried out separately for each food category in each household.

In this study, apart from calculating the nutritional adequacy of the households, their food consumption profile scores were also calculated by using the FCS-N module. The scores were obtained by summing the weighted consumption frequency for the nine food groups consumed by a household during the seven days. The weights for each group of food were taken from the World Food Programme-Vulnerability Analysis and Mapping (21) and are based on the nutrient density analysis. The higher (lower) weights are assigned to the best (worst) quality food groups according to micro and macro nutrient content, and caloric density (20). For each household, the FCS was used to create a hierarchical ranking of the households according to their food security status, namely poor, borderline and adequate food consumption (22). In this study, an FCS of 28 or less was considered poor, while 42 and above was considered adequate. Scores between 28 and above and 42 and below were considered borderline FCS. These cut-off scores were taken from the World Food Programme (23).

Generalized Ordered Logit Model

Ordinal regression models are based on proportional odds assumption or the parallel lines assumption. However, in this study, as the parallel line assumption was violated for five of the variables, instead of the ordered logit model, generalized ordered logit model was used to analyse the association between food security status and various characteristics of households.

The generalized ordered logit model allows the assumption of the proportional odds model to be flexible for individual sets of coefficients. In the generalized model, each independent variable has a different impact on different categories (cut-points) of the ordinal outcome variable. Therefore, this ensures the flexibility for the model.

A generalized ordered logit predicts for a number of models like a binary logit. If the dependent variable has three categories labelled "*a*", "*b*", and "*c*" and where the value of the dependent variable label increases from "*a*" to "*c*", the generalized ordered logit estimates two set model: the first model being "*a*" versus "*b* and *c*" and the second model being "*a* and *b*" versus "*c*". The generalized ordered logit is distinct from the ordered logit as the β's can be estimated for all *j* categories of the dependent variable, instead of them being the same for all values of *j*. Using Williams's (24) notation, the generalized ordered logit can be written as follows:

$$P(Y_i > j) = g(X\beta_j) = \frac{\exp(\alpha_j + X_i\beta_j)}{1+\{\exp(\alpha_j + X_i\beta_j)\}}, \quad j = 1,2,\ldots,M-1 \quad (1)$$

where *M* indicates the number of categories in the ordinal dependent variable, *X* is a matrix of explanatory variables, β is a vector of slope coefficients and αj is a constant for the *j-th* category of the dependent variable.

From Equation 1, the probabilities of *Y* for 1,2,…, *M* can be determined in three ways;

$$P(Y_i = 1) = 1 - g(X_i\beta_1)$$
$$P(Y_i = j) = g(X_i\beta_{j-1}) - g(X_i\beta_1) \quad j = 2, \dots, M-1 \qquad (2)$$
$$P(Y_i = M) = g(X_i\beta_{M-1})$$

The parallel lines model is often violated for one or more coefficients. Thus, Peterson and Harrell (25) suggested the partial proportional odds model, a different type of the generalized ordered logit model, to overcome these limitations. It suggests that some of the β coefficients can be the same for all values of *j*, while others can differ. For example, in Equation 4, β1 and β2 for X1 and *X2* are the same for all values of *j* but β3 for *X3* can vary.

$$P(Y_i > j) = \frac{\exp(\alpha_j x1_i\beta1 + x2_i\beta2 + x3_i\beta3_j)}{1+\{\exp(\alpha_j X1_i\beta1 + X2_i\beta2 + X3_i\beta3_j)\}}, \quad j = 1,2, \dots, M-1 \qquad (3)$$

In this study, the partial proportional odds model was used because the coefficients of some independent variables differed across the categories of the dependent variable. All analyses were conducted by using STATA Version 15.

Table 2 Descriptive Statistics for Explanatory Variables

Variables		Food secure	Food secure at risk	Food insecure without hunger	Food insecure, moderate or severe hunger
Household Head Characteristics					
Age (years)		39.6	44.7	42.4	42.1
Gender (%)	Male	27.98	**30.95**	29.17	11.90
	Female	30.94	27.35	**31.84**	9.87
Education (%)	Primary or literate	18.12	**35.51**	31.16	15.22
	High school	17.65	30.72	**41.18**	10.46
	University or higher educated	**64.00**	17.00	14.00	5.00
Employment status (%)	Employed	**41.62**	23.78	25.95	8.65
	Unemployed	0.00	20.00	0.00	**80.00**
	Other	19.40	33.83	**35.82**	10.95
Households Characteristics					
Size of HH		3.14	3.60	3.83	4.24
Dependency ratio (%)		15.57	19.71	**31.08**	25.99
Children status (Yes:1; No:0) (%)		23.92	30.20	**32.55**	13.33
Income (%)	Low income group	5.62	34.27	**40.45**	19.66
	Middle income group	**40.00**	22.07	33,10	4.83
	High income group	**70.59**	29.41	0.00	0.00
Monthly food expenditure per capita (TL)	(Equivalent USD)	**323 (50.93)**	205 (32.33)	172 (27.12)	113 (17.82)
Nutritional Status of Households (%)					
Weekly protein consumption frequency	Never	0.00	0.00	33.33	**66.67**
	Sometimes (1-6 days)	46.58	**80.82**	63.01	46.58
	Every day (7 days)	**38.14**	25.12	33.95	2.79
Weekly vitamin A consumption frequency	Never	9.09	22.73	**36.36**	31.82
	Sometimes (1-6 days)	26.89	**32.35**	26.89	13.87
	Every day (7 days)	**38.17**	23.66	36.64	1.53
Weekly Iron consumption frequency	Never	11.33	31.33	**37.33**	20.00
	Sometimes (1-6 days)	**41.08**	27.39	26.56	4.98
	Every day (7 days)	0.00	0.00	0.00	0.00

Results and Discussion

Description of Model Variables

Table 2 presents the model variables used in this study according to the food security status of the households. As based on the sample data, the average age of the head of the households was 42.2, which represents an economically active age group. The majority of those responsible for the food shopping of the households consisted of females (57%). Food security was more prevalent in households where the education level of the head of the household was of a university or higher education level (64%), in households in which the head of the household was employed (42%), in households that were among the high-income group (71%), and in households who consumed protein everyday (38%), vitamin A everyday (38%) and iron sometimes (41%). Food insecurity with moderate or severe hunger was more prevalent in households in which the head of the household was unemployed (80%), in larger households (4.24 members), in households with higher dependent members (26%) and in households with the least monthly food expenditure per capita (113 Turkish Lira (17.8 USD)).

Figure 1 shows the comparison of the food security status of the households according to the presence of children. More than half of the households were found as in food secure group (29.7%) and in food secure at risk group (28.9%). Figure 1 indicates that the households with children were in the food insecure without hunger group (32.5%) while a high proportion of households without children (40.4%) were in the food secure group.

Looking at the FCS-N analysis of the food consumption groups, it can be said that the households classified as food insecure (both poor and borderline) are at risk of deficiency in terms of every nutrients. According to the distribution of the food consumption groups, 30.95% of the households were facing inadequate food consumption, 6.65% of them showed poor food consumption and 24.3% of them showed borderline food consumption. Most of the households with poor or borderline food consumption had a very limited frequency of consuming vitamin A rich foods and protein rich foods, and hence were likely to not be consuming enough to meet their nutrient needs. The consumption of iron rich foods, on the other hand, was not adequate among all of the food consumption groups (Figure 2).

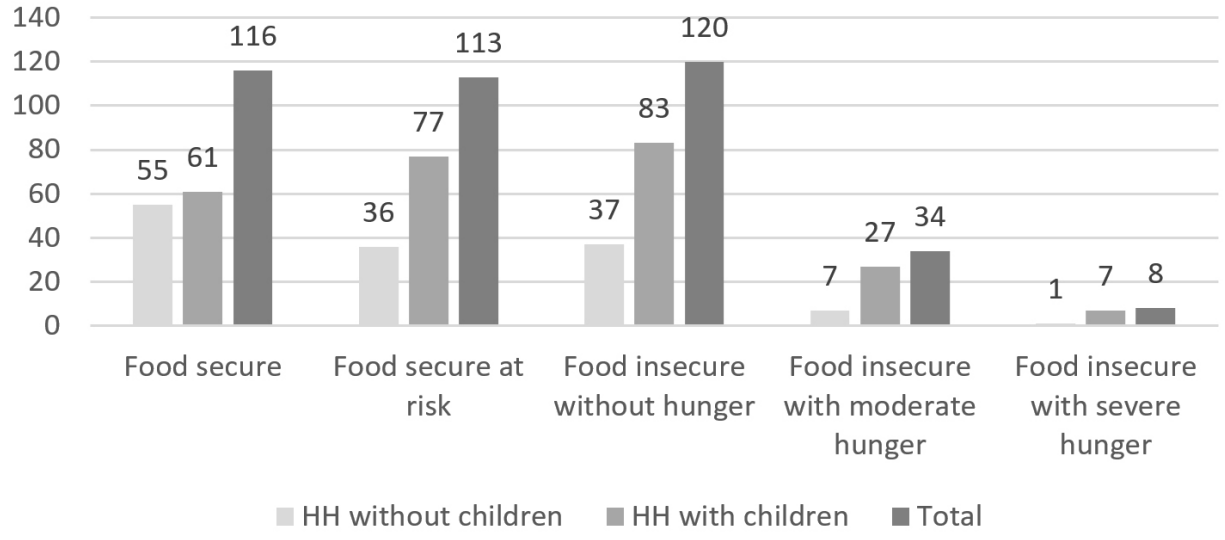

Figure 1. The Distribution of Households' Food Security Levels According to HFSSM (no. of households). Figure 1 shows the comparison of the food security levels which were determined by using HFSSM method, for the sample households based on the presence of children.

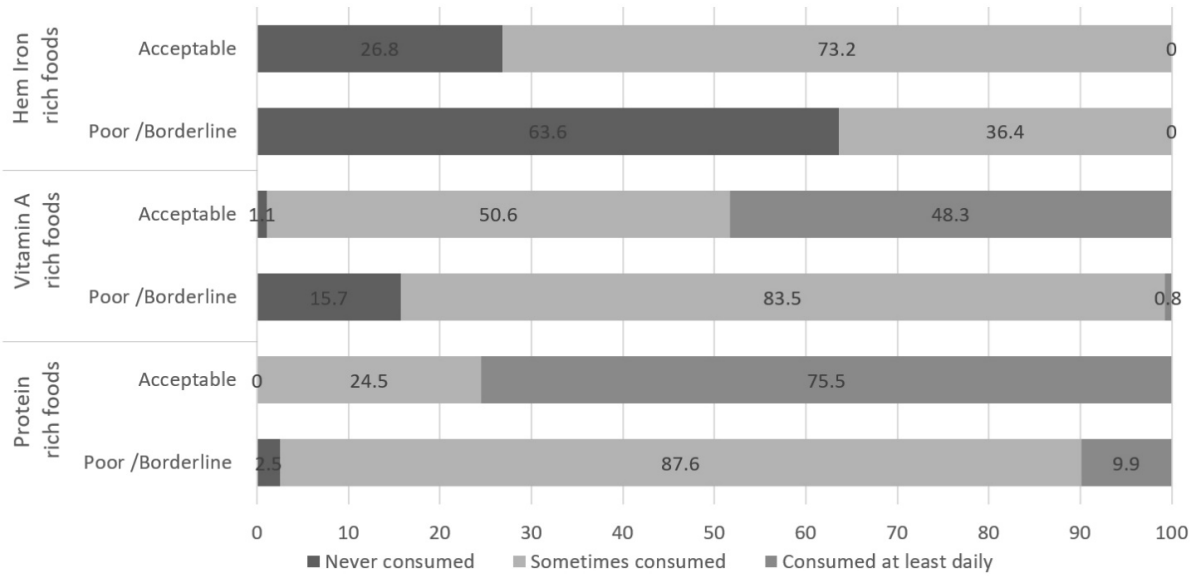

Figure 2. Food Security Status According to NCS (%). Figure 2 shows the average share of the consumption frequencies of each food group among the households classified as food insecure (both poor and borderline) and food secure (acceptable).

Generalized Ordered Logit Model Results

The results of the generalized ordered logit model are presented in Table 3. The model was significant at 1% recording a Chi-square of 336.98 (df=25), p-value=0.000 and Pseudo R2 = 0.326. The score test for the proportional test assumption was insignificant at 5% in the model with a Chi-square of 27.40 and with p-value of 0.072. The partial proportional odds model estimated 15 explanatory variables (Table 3). Five of these variables, namely education level for the head of the household with university or higher degree attainment (p-value:0.009), household with middle income (p-value:0.000), daily protein consumption frequency (p-value: 0.000), household with children (p-value:0.035) and households' monthly food expenditure per capita (p-value:0.008), were found to violate the parallel lines assumption in the Wald test. Thus, the model allowed the coefficients of these five variables to vary across thresholds. The coefficients and odds ratios that did not vary across thresholds were equal to those in the first thresholds. When interpreting the results of each model in Table 3, the current and lower coded groups were taken as the reference group. Therefore, odds ratios greater than one or positive coefficients implied that higher values of an explanatory variable increased the probability of a households' food insecurity status exacerbating than the current status or vice versa.

According to analysis results in Table 3, it was found that higher education levels of the head of the households was significantly related to better food security status. Those who were high school graduates were 2.09 times more likely to have food insecurity compared to the others. This probability was the same of all thresholds. However, as opposed to the households in which the head had a primary level education or literate, the risk of food insecurity decreased by 51.3% in households which the head had a university or higher degree level of education in the first model and this risk decreased to 74% in the third model. The results of previous studies showed that the lower level of education of the head of the household, the higher the likelihood of food insecurity in the household (11, 26, 27). Education affects food security status in terms of economic and social aspects. Individuals equipped with the skills and knowledge that are demanded by the labour market can take advantage of employment opportunities (14). Earlier studies also indicated the significance of education in affecting not only the opportunities of getting employment (28, 29) but also the quality of jobs individuals is deal with and the returns

Table 3 Generalized Ordered Logit Model Results

Dependent variable: Food secure: 0, Food secure at risk: 1, Food insecure without hunger: 2, Food insecure with moderate or severe hunger:3		**Coef. (Std.Err.)**	**Z (p>|z|)**	**Odds Ratio**
Model 1 (0 vs 1+2+3)	Constant	-1.383 (0.983)	-1.41 (0.159)	0.251
	Agehh	0.013 (0.010)	-1.37 (0.172)	0.987
	Genderhh (ref:female)	0.205 (0.242)	0.85 (0.397)	1.228
	Edu_pl	-		
	Edu_hs	0.736 (0.256)	2.87 (0.004)***	2.087
	Edu_uni	-0.719 (0.409)	-1.76 (0.079)*	0.487
	Employed	-		
	Unemp	2.203 (1.209)	1.82 (0.069)*	9.050
	Emp_oth	0.071 (0.252)	0.28 (0.779)	1.073
	Inc_low	4.668 (0.556)	8.40 (0.000)***	106.51
	Inc_middle	1.052 (0.402)	2.62 (0.009)***	2.863
	Inc_high	-		
	Protein_Everyday (ref:sometimes or never)	-0.230 (0.368)	-0.62 (0.533)	0.795
	VitaminA_Everyday (ref:sometimes or never)	0.186 (0.313)	0.59 (0.552)	1.205
	Iron_Sometimes (ref: never)	-1.100 (0.255)	-4.32 (0.000)***	0.333
	Child (ref: with children)	0.821 (0.348)	2.36 (0.018)**	2.274
	Hsize	0.528 (0.117)	4.53 (0.000)***	1.696
	DepRat	0.002 (0.003)	0.66 (0.508)	1.002
	FoodExp	-0.003 (0.002)	-1.93 (0.053)*	0.997
Model 2 (0+1 vs 2+3)	Constant	-5.557 (1.059)	-5.25 (0.000)***	0.004
	Edu_uni	-0.208 (0.403)	-0.52 (0.606)	0.812
	Inc_middle	3.754 (0.555)	6.76 (0.000)***	42.695
	Prot_Everyday	0.165 (0.331)	0.50 (0.619)	1.179
	Child	0.008 (0.306)	0.03 (0.979)	1.008
	FoodExp	0.000 (0.001)	-0.15 (0.882)	1.000
Model 3 (0+1+2 vs 3)	Constant	-6.125 (1.199)	-5.11 (0.000)***	0.002
	Edu_uni	-1.357 (0.666)	2.04 (0.042)**	0.257
	Inc_middle	3.844 (0.693)	5.55 (0.000)***	46.733
	Prot_Everyday	-2.294 (0.590)	-3.89 (0.000)***	0.101
	Child	0.257 (0.486)	0.53 (0.596)	1.293
	FoodExp	-0.010 (0.004)	-2.72 (0.006)***	0.990
Number of observations: 391; LR chi^2 (25) = 336.98; Prob>chi^2 = 0.000; Log likelihood = -348.181; Pseudo R^2 = 0.326				

*** p<0.01, ** p<0.05, * p<=0.1

obtained from them (13,27). Furthermore, education creates social opportunities such as knowledge related to the nutritional requirements of individuals, having a large social network to get assistance from to reduce vulnerability during shock periods, increasing individual's ambitions and self-confidence thereby promoting access to food through other means (13).

In this study, the impact of the employment status of the head of the household on food security status of the household did not change across the cut-points. The risk of food insecurity in households where the household heads were unemployed was found to increase. This result was consistent with the findings of previous studies (30, 31). Households in which the

head of household was unemployed had 9.05 times greater risk of having worse food insecurity status compared with all employment status categories (employed, retired, student or housewife). The effect of unemployment in aggravating food insecurity is partly related to poverty. Kedir and McKay (14) showed that the probability of unemployment was significantly higher among households whose heads were chronically poor. Rudolph et al. (32) determined a correlation between food security, employment and income, while Sekhampu (33) found that full-time employment was associated with increased chances of being food secure.

The monthly food expenditure per capita variable varied for all categories of the dependent variable. This variable was found to be statistically significant for model 1 and 3 at a 10% and 1% level, respectively. From Table 3, it is clear that one unit increase in monthly food expenditure of the households per capita had a positive impact in ensuring food security. The monthly incomes of the households were significantly associated with the food security status of the households. Households with low income were found to be 106.5 times at a greater risk of food insecurity and this variable was seen to have the same effect at 1% significant level for all categories of the food security status. Moreover, the impact of income on the food security status increased for middle-income households as the level of food insecurity exacerbated. The odds of being food insecure for middle-income households was 46.7 times higher for model 3 (the level of food insecurity with moderate or severe hunger) compared to other income groups. The root problem of inadequate access to food among low-income households was considered to be poverty. Poor household members are unable to sustain food security and adequate resources due to their lower socio-economic status (4). As would be expected, the increasing income level of a household facilitated the allocation of more resources to food. Higher food expenditure amount also influenced food security status. It was thought that the low income of a household may affect access to food. These results were consistent with the findings of Arene and Anyaeji (34) and Kuku-Shittu et al. (35).

When the nutritional consumption frequencies of the households were examined, it was seen that the impacts of the vitamin A and iron consumption variables were the same across all categories of food security. However, the consumption of iron was only statistically significant at a 1% level. The odds ratio for this variable was found as 0.33. This means that individuals who sometimes consumed iron-containing foods had a 67% less risk of being food insecure than those who never consumed these foods. Similarly, the variable of daily protein consumption did not meet the parallel lines assumption and therefore, the coefficient of this variable differed across the thresholds. However, this variable was only statistically significant for model 3 at a 1% level. From Table 3, it can be said that individuals who consumed protein-containing foods ever day had a 90% less risk of becoming food insecure than those who never or only sometimes consumed these foods. All macronutrients, namely proteins, carbohydrates and lipids, and all micronutrients, namely minerals and vitamins, are important for a healthy life, and for a balanced diet all nutrients should be taken in a sufficient quantity (21). Long-time deficiencies in nutrients can lead to chronic undernutrition. The increase in the consumption of staple foods has led to a reduction of quality as well as quantity of consumption (36). Inadequate dietary intake starts with the lack of the consumption of expensive food items, which are comprised of higher-quality animal-based foods such as meat, fish, poultry, milk, and eggs. Then, proportion size and frequency of meals eaten decrease. Total expenditures on relatively expensive food items such as animal products, which are rich in protein and hem iron, are lower among low-income households when compared to higher income households.

Similar to the other variables mentioned, the increase of household members and the increase of economically inactive household members had a negative impact on food security status. However, only the household size variable was found to be statistically significant at a 1% level. This finding was in line with the findings of Molano et al. (37); Zalilah and Khor (12) and Farhadian et al. (7). On the other hand, the variable of households with children, which did not meet the parallel lines assumption, varied across the categories of food security status and was only statistically significant in the first model. The households with children were found to be 2.27 times more likely to be food insecure than those without children.

Conclusion

In this study, the households' food insecurity levels were investigated and the association of the food insecurity levels of urban households in Niğde and their demographic, social, economic and nutritional characteristics were determined by using generalized ordered logit model. According to the study result, 41.4% of households in the study area were food insecure, 30.7% of them were food insecure without hunger, 8.7% of them were food insecure with moderate hunger, and 2% of them were food insecure with severe hunger. According to the results, the food insecurity levels of the households were found to be related to low socio-economic status and poor nutritional status. The low socio-economic status of a household was defined as unemployment, having low educational status, low monthly income, low food expenditure per capita and a large household size. Additionally, it was noted that income was a major factor that influenced food security. Another important component of food security was found to be dietary diversity. People in Turkey have adequate calorie intake. However, this does not assure a healthy and nutritional diet. Inadequate dietary intake means that food consumption is limited in both quality and quantity, which can lead to deficiencies in nutrients. In the context of this study, it was found that the increase in protein and Iron consumption frequency positively affected the food security status. However, about one third of the households faced inadequate food consumption. It was determined that two thirds of the households with poor or borderline nutritional consumption had never consumed hem iron which is found in animal-based foods.

Food insecurity was found to be more intensive in large sized households and those that had children. This was also related to income level, as households of larger sizes and limited income reduce meal size or skip the main meal to balance and ensure enough food regardless of the quality of the diet.

In conclusion, the new challenges in the world such as food crisis, rapid urbanization, high population density and lastly the novel pandemic have increased more the socioeconomic inequalities across many households, especially in developing and less developed countries. As a result of these challenges, poor access to food have aggravated the poor nutritional status of people. Therefore, policies are needed to focus on more protecting of the groups with socioeconomic vulnerability. Concerning of this matter, policies for poverty reduction with alternative livelihoods to increase household income should be designed to ensure food security. The unemployment insurance measures, minimum wage rates and the social security systems of developing countries are not as strong as those of developed countries. For this reason, enhancing employment opportunities by means of propoor measures and vocational training programs may lead to ensure food security by helping the improvement of the economic status and human capital of households. Additionally, poverty lines should be adjusted by including the cost of healthy diets in order to link between food security policies and anti-poverty programmes. Government programmes that aim to distribute various nutrients and give information related to nutritious food consumption to households with children could contribute to the recovery of the food security status of households. Therefore, it is strongly recommended to implement training programmes related to food preparing and consumption in order to make the awareness of adequate and balanced nutrition for parents as well as children. The topic of nutrition and food should be included as a part of syllabus education programs at different levels of education for healthy future generations.

In addition, regarding the food production dimension, the systematic changes in the food production are needed to being able to access of socio economically disadvantaged people to affordable healthy diets. To achieve this transformation, firstly the incentives of the diversification in agriculture are important. Poor diet has an impact on health; therefore, dietary diversity is an important indicator for policy makers and researchers. Moreover, the agricultural incentives and policies should focus on the agricultural production planning by supporting of nutrient-dense food production, especially protein rich plant based and animal source foods. Food and agricultural policies should focus more on supporting research and development making healthy diets cheaper along food supply chain.

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