Progress in Nutrition 2020; Vol. 22, N. 4: e2020079 DOI: 10.23751/pn.v22i4.10024

Original article

The prevalence of food insecurity among young adults in faculty of agriculture: a cross-sectional case study of Northwest Turkey

Özge Can NİYAZ[1]*

[1] Çanakkale Onsekiz Mart University, Faculty of Agriculture, Department of Agricultural Economics, 17100, Çanakkale/Turkey.

Abstract

Food insecurity is a lack of safe and reliable access to an adequate supply of nutritious food on a daily basis. This pilot study aimed to determine the prevalence of food insecurity and related socio-demographic factors among Turkish agricultural engineering students. A cross-sectional survey design was used, involving a self-reported questionnaire with 388 agricultural engineering students at Çanakkale Onsekiz Mart University, Turkey. The National Nutrition Survey and the Household Food Security Survey Module were used in the questionnaire in addition to the students' demographic attributes. Chi-square Independence Tests were used to identify any relationship between sociodemographic characteristics and the food insecurity status of the students. The reported prevalence of food insecurity among Turkish agricultural engineering students is one-third (33.0 %) of the total. It was found that there are significant relationships between food insecurity status and students' year of study, employment status, grant/credit status and living arrangements. Living and eating conditions for students on campus need to be improved by the provision of low-cost meals, accommodation with basic cooking facilities and food banks.

Key words: Agricultural engineering, food insecurity, Household Food Security Survey Module, National Nutrition Survey, university students, young adults.

1. Introduction and Background

1.1. Food Security Concept

The following definition was issued by the Food and Agriculture Organization (FAO) for the 1996 World Food Summit in Rome: "Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life". It can be divided into four main dimensions: food availability (i.e. the availability of sufficient quantities of food); food access (i.e. access to adequate resources for a nutritious diet), and food utilization (i.e. utilization of food through adequate diet and health care and stability (1-3).

Five methods are commonly used in national surveys to estimate the level of food insecurity. These can be listed as follows: the FAO method, the household expenditure survey, dietary intake assessment and anthropometry and experience-based food insecurity scales (1). The first four methods can be categorized as indirect or derivative measures of food insecurity (4). On the other hand, experience–based food insecurity scales are the only methods which provide a direct measure of food insecurity. The House-

hold Food Security Survey Module (HFSSM) is an experience-based food insecurity scale approved by the United State Department of Agriculture (USDA). It is a component part of the Food Security Supplement which specifically focuses on food sufficiency. HFSSM is a widely-used method in food insecurity studies on adults (5-6) and on young adults (7-10).

1.2. Food Security Concern

Food security is a socio-economic problem and is a major concern around the World (11-14). According to FAO data, more than 820 million people around the world do not have enough food to eat (1). This equates to one in nine people in the world struggling with malnutrition and hunger. According to the United Nations Development Programme (UNDP), the worldwide population will reach 9.3 billion in 2050 (15). This scenario shows that if action is not taken now to alleviate food insecurity, then more and more people will suffer in future.

Most people who have food insecurity problems live in developing countries (1-16). This shows the economic significance of food security. Food price volatility, unfair distribution of income and the effects of climate change on the food system (16-18) are some of the reasons postulated to explain the growth of food insecurity problems in developing economies. Though Africa is the region of the world where the problems are most pronounced (19-20), the Mediterranean region is also experiencing food insecurity to a high degree (21-22).

1.3. Previous Research

Food insecurity is a significant issue among young adults throughout the world (23-27). Food insecurity problem could be a barrier of college students' pyschical, mental and academic development (28). Food insecurity may obstacle academic performance among college students by pressure of obtain a job to get food (27). Food insecurity prevalence among university students is a common theme in the literature and there has been a substantial amount of research on this subject across different cultures (23-26, 28-40). Young adults in Turkey are often faced with the problems of food insecurity, both during and after college life (41). There have been a few studies on food consumption and eating habits among young adults in the Mediterranean Region (42-44). However, only one could be found which focused on food insecurity problems in young adults (26). Moreover, it appears that there have been no studies conducted in Turkey on this topic. The aim of this study, therefore, is to address this gap in the literature and to quantify the prevalence of food insecurity among agricultural engineering students in Çanakkale Onsekiz Mart University.

1.4.Research Area

Turkey is a Mediterranean country and a developing economy in the European Zone. Food insecurity is still a major public concern in Turkey, as in many countries of the world (45). The country has very high potential to produce a wide variety of agricultural products due to its geographical location and the advantages of climate (41-46). However, as a consequence of general agricultural policies at a national level, an importer structure was recently introduced, particularly in relation to animal products (47-48). Furthermore, the problem of high general inflation (20.3% in 2018) and food inflation (25.1% in 2018) in recent years has led to serious issues with regard to income distribution and food prices in Turkey. Another factor is that the youth unemployment rate is around 25.0 % among young adults graduating from university (41).

In research conducted by the Economist Intelligence Unit, 113 countries that are important for the world economy were compared according to their scores on the Global Food Security Index (GFSI). Countries with a score of 39.9 and below in GFSI calculations are classified as "bad" in terms of food security, between 40-59.9 "moderate", between 60-79.9"good", and above 80 "very good". Turkey's general GSFI ranking score of 69.8 (good) gives a ranking of 41 out of 113 countries. According to the GSFI benchmark, 16 countries were placed in the 'very good' category, including Singapore, Ireland and the U.S.A. Turkey, Russia and Mexico were among 52 countries included under 'good'. The 'moderate' category comprised a total of 36 countries, including Ukraine, Pakistan and Kenya. The final group, labelled as 'bad' based on their

GFSI scores, contained nine countries and included Venezuela, Mozambique and Yemen (49).

Northwest Turkey is a key region of the country with its strategic location between Marmara and the Aegean Sea (50). Çanakkale province is located here, linking the land masses of Asia and Europe together via the Çanakkale Bosphorus (See Figure 1). One-third of the population of Northwest Turkey– more than half a million people- live in Çanakkale province (52). Many kinds of Mediterranean products (fresh fruits and vegetables, olives etc.) are grown in the region and consumers in the city benefit from access to fresh agricultural products all the time (53-54). Also Çanakkale is recognized as having a relatively well-educated population (52). The city is the home of one state university - Çanakkale Onsekiz Mart University - which plays an important role in the socio-economic activity of the province. There are three other state universities in the Northwest of Turkey. Çanakkale Onsekiz Mart University is the most important of these due to its location and number of students. Çanakkale Onsekiz Mart University has four higher education institutes, seventeen faculties and eighteen technical colleges, with a total of over 53.000 students (55).

2. Material and Methods

2.1. Sample of the Study

This cross-sectional study was conducted on a total sample of 388 undergraduate agriculture engineering students at a state university (Çanakkale Onsekiz Mart University) in Turkey, during the spring semester of the academic year 2018-2019. According to data from the faculty's Student Affairs Department, approximately 1020 undergraduate students were registered in the spring term of 2018-2019. A probability sampling method was used to determine the sample size. In the target group, with 95 % confidence bounds, where α=0.05 and t=1.96, the sample size was calculated to be at least 383. Four hundred questionnaires were conducted with volunteer students, of which twelve were found not to be of acceptable quality for evaluation. Young adult students aged 18 to 25 years were targeted for interview in this study, and after scrutiny of the completed questionnaires, 388 were considered suitable for evaluation. This number is equal to 38 % of students in the Faculty of Agriculture. The distribution of the questionnaires across departments was as follows: Plant Protection (80),

References: *51.*

Figure 1. Cities map of Turkey and Çanakkale's strategic location in Turkey

Horticulture (68), Field Crops (64), Biotechnology (62), Agricultural Economics (61), Zootechnics (34) and other departments (19). Agricultural engineering students in the Faculty of Agriculture, Çanakkale Onsekiz Mart University, receive many lessons on food science, safety and security and therefore can be expected to have a sound basic knowledge of food security and related issues.

2.2. Design of the Questionnaire and Data Collection

A self-administered questionnaire was prepared which focused on sociodemographic characteristics and food security status. Food security status was investigated under two headings: single item and multiple items (8, 57).

Table 1 shows the format of the items used to assess food security prevalence in this study. The single item question used was: "In the last 12 months, were there any times when you ran out of food and couldn't afford to buy any more?", with its scale (Yes/No). This is based on the format used by the National Nutrition Survey (NNS) (56). Students were divided into two groups, based on their responses: food insecure (Yes) or food secure (No).

The relative severity of food insecurity (food insecurity without hunger and food insecurity with hunger) was based on the Household Food Security Survey Module (HFSSM) (2-57). These multi-items were used previously in student food insecurity studies to provide better understanding of the issue (8-9). Students were categorized as 'food insecure without hunger' if they answered 'often true' or 'sometimes true' to any of the multi-items of 'food insecurity without hunger' (Table 1). Students were classified as 'food insecure (with hunger)' if, in addition to answering affirmatively (often true or sometimes true) to 'food insecure without hunger' items, they also answered 'yes' to any of the items in the 'food insecure with hunger' group.

Pretests were carried out with 30 volunteer students and necessary adjustments were made in the light of their comments. The main data were collected after classes in the Faculty of Agriculture, with the prior approval of the course coordinator and the various lecturers involved. Students from all classes in the agricultural engineering department were approached in the classroom after lectures and asked if they were willing to participate in the study. The objectives and benefits of the research were fully explained to prospective respondents orally and in a printed form at-

Table 1. Estimating food security prevalence

Questions	Response
Single item[a]	
In last 12 months, were there any times that you ran out of food and couldn't afford to buy any more?	Yes/No
Multi-item[b] ***- Food Insecurity without Hunger***	
I worried whether my food would run out before I got money to buy more.	Rarely/Sometimes/Often
The food that I bought just didn't last, and I didn't have money to get more.	Rarely/Sometimes/Often
I couldn't afford to eat balanced meals.	Rarely/Sometimes/Often
Did you or other adults in the household ever cut the size of your meals because there wasn't enough money for food?	Yes/No
Multi-items[b] ***- Food Insecurity with Hunger***	
Did you ever eat less than you felt you should because there wasn't enough money for food?	Yes/No
Were you ever hungry but didn't eat, because there wasn't enough food?	Yes/No
Did you lose weight because there wasn't enough food?	Yes/No
Did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?	Yes/No

Reference: [a]56, [b]57.

tached to the questionnaire. Assurances were given that all information obtained would be confidental and that their participation would not adversely affect their course progress.

2.3. Data Analysis

Socio-demographic characteristics are shown as categorical variables with their frequencies in Table 2. Body Mass Index (BMI) was used to assess students' weight status. This is calculated as weight in kilograms divided by height in square metres (kg/m²). Students' weights and heights were requested in the questionnaire in order to calculate BMI in line with 2019 World Health Organization (WHO) guidelines. These stipulate that weight status can be classified into six main categories: Underweight (BMI ≤ 18.5), Normal Weight (BMI 18.5 - 24.9), Pre-obesity (BMI 25.0 - 29.9), Obese Class I (BMI 30.0 - 34.9), Obese Class II (BMI 35.0 - 39.9), and Obese Class III (BMI ≥40) (3). In our sample, there were no students in Obese Classes II and III. So, for the purposes of the study, we chose to regard Obese Class I as the Obese Class.

All data were analysed using the software Statistical Package for Social Science (SPSS) 19.0. Chi-square Independence Analysis is a method designed to show the relationship between two categorical variables (58-59). It was used here to reveal any relationship between food security status (single item) and the sociodemographic characteristics of the students (8, 10). The hypotheses of the present study, derived from the literature, are given below as measured by the chi-square hypothesis test:

H1: There are relationships between the single item food security scale and ***gender*** (8-10).

H2: There are relationships between the single item food security scale and the ***year of study*** (8).

H3: There are relationships between the single item food security scale and ***age*** (8-10).

H4: There are relationships between the single item food security scale and ***BMI*** (8).

H5: There are relationships between the single item food security scale and ***monthly income*** (8-10).

H6: There are relationships between the single item food security scale and ***employment status*** (8-10).

H7: There are relationships between the single item food security scale and ***grant/credit status*** (8-10).

H8: There are relationships between the single item food security scale and ***living arrangements*** (8-10).

3. Results

Table 2 summarises the demographic characteristics of the students and the prevalence of food insecurity using single and multi-item measures. One third of the sample (33.0 %) reported that they are food insecure, using the single-item measure derived from the NNS. A large part (79.6 %) of the sample reported experiencing food insecurity without hunger and 39.9 % food insecurity with hunger.

The Chi-square test of independence was used to compare single item food insecurity status against each sociodemographic factor within the sample at Çanakkale Onsekiz Mart University (Table 2). It was found that there is a significant correlation between single item food security status and year of study, employment status, grant/credit status and living arrangements ($p<0.1$).

Food security status is significantly asssociated with number of years of study ($\chi2 = 6.547$, $p=0.088$). The 2nd year agricultural engineering class is fuller than other classes as can be seen from Table 2. As a result, single item food insecurity is higher in the case of these students. However, when we look at multi-items of food insecurity without hunger, it is evident that freshmen (1st year- 82.4 %) and junior (3rd year -81.7 %) classes have a higher percentage than the other classes. On the other hand, 'food insecurity with hunger' (as a multi-item) has a higher score for the sophomore class (2nd year) with a rate of 48.5 %.

Table 2 shows a significant association between food insecurity and employment status ($\chi2 = 2.296$, $P=0.082$). A greater percentage of students who are not working (part-time or full-time) (70.6 %) reported food insecurity without hunge r (79.2 %) and with hunger (39.0 %), compared with those students who are working (29.4 %; 80.7 % without hunger and 42.0 % with hunger).

Fewer than half of the students (40.5 %) who are receiving grants or credit reported higher levels of food insecurity without hunger (86.0 %) and with hunger (45.9 %), compared with those who are not receiving them (59.5 %; 75.3 % and 35.9 % respectively).

Living situation and food insecurity status are found to be significantly correlated ($\chi 2$ =3.489, P=0.062). The vast majority of students (93.6 %) live apart from their families. Food insecurity with regard to single items (34.1 %) and multi-items (food insecure without hunger 80.9 %. and 45.9 %- with hunger) is higher for these students, compared to those who live with their family (See Table 2).

Table 3 summarizes the results of the hypotheses according to the results set out in Table 2. Food security status is not found to vary according to gender, age, BMI and income among agricultural engineering students at Çanakkale Onsekiz Mart University.

4. Discussion

The prevalence of food insecurity among young adults is a major concern, just as it is in the case of the adult population. However, no study has been conducted into university students' food insecurity as part of food security modules in Turkey. In this light, the purpose of this study was to determine the status of food insecurity using single items (NNS) and also to reveal further insights through use of the multi-item tool (food security with and without hunger) developed by USDA for international research.

This study established that the prevalence of food insecurity is 33.0 % as a single item for Çanakkale Onsekiz Mart University Agricultural Engineering students. This is comparable to previous results in the literature. It is higher than the result found in a study based on a sample of 441 non-freshmen in Hawaii (21.0 %) (7) and higher too than the findings from a study of 399 Australian university students (12.7 %) (8). However, the result is lower than those found in two other studies - one conducted with 1882 university students in the USA (35.0 %) (9) and one with 399 Australian university students (52.4 %) (8). These variations may be explained by a number of different factors such as cultural differences, locations and sample size (7-10). However, it is evident that food insecurity in young adults can still be a significant problem even in developed economies today.

There was found to be a significant relationship in this study between food insecurity and year of study, employment status, grant/credit status and living arrangements. In comparison, another study found a significant correlation for Australian university students only with year of study and living arrangements (8).

As indicated, the importance of year of study was common to both this research study and another one (8). Year of study proves to be an important factor with regard to the food insecurity of university students, as indicated in this study and other one (8). Food insecurity (single item) is more prevalent among sophomore (2nd year) students in this study (39.4 %) than in the other (23.1 %). However food insecurity without hunger, in this study, is found to be more prevalent among freshmen (82.4 %), while it was more prevalent among senior students (52.4 %) in the other study (8).

Food insecurity features more frequently among working students (38.6 %; 80.7 % without hunger and 42.0 % with hunger) compared to non-working students (30.6 %; 79.2 % without hunger and 39.0 % with hunger). This indicates that students with food insecurity problems need to find ways to combine work with their studies. Two other studies in the literature also found that the incidence of food insecurity is higher in the case of working students than those who do not work (8-10).

Food insecurity is also more prevalent among students (37.6 %; 86.0 % without hunger and 45.9 % with hunger) who need to obtain grants or credit for their education and life expenses, compared to other students (29.8 %; 75.3 % without hunger and 35.9 % with hunger). A relationship was found between students' food insecurity and receipt of government benefits (10). In this study also, students who receive goverment benefits (20.7 % without hunger and 39.7 % with hunger) are found to be more food insecure than those who do not receive assistance (i.e. grants, credit etc.)

Another factor significantly affecting food insecurity among students is their living arrangements. In our study, the vast majority of students (93.6 %) live

Table 2. Socioeconomic and demograhic attributes and food insecurity prevalence of student sample

			Food insecurity measure (%)			
				Multi-item[b]		
Factor	*Total (n)*	*(%)*	*Single-item[a,c,d]*	*Without hunger[b,c,d,e]*	*With hunger[b,c,d,e]*	*χ2 by single-item*
Total students	388	100	33.0	79.6	39.9	-
Gender [c,d,e]						
-Female	157	40.5	31.2	82.8	40.8	χ2 =0.378
-Male	231	59.5	34.2	77.5	39.4	P=0.539
Year of study [c]						
-1st	57	14.7	31.6	82.4	29.8	
-2nd**	165	42.5	39.4	79.4	48.5	χ2 =6.547
-3rd	82	21.1	30.5	81.7	35.4	P=0.088
-4th	84	21.6	23.8	76.2	34.5	*
Age [c,d]						
20≤	207	53.4	35.3	78.7	41.0	χ2 =1.040
>20	181	46.6	30.4	80.7	38.7	P=0.308
BMI [c]						
-Underweight	34	8.8	23.5	91.2	41.2	
-Normal weight	246	63.4	35.0	77.6	41.5	
-Overweight	95	24.5	32.6	80.0	52.3	χ2 =2.392
-Obese	13	3.4	23.1	84.6	38.5	P=0.495
Monthly income [c,d,f]						
Low (≤127						
Middle	139	35.8	33.0	76.9	42.4	χ2 =3.068
(128-254 $)	183	47.2	36.0	82.5	39.3	P=0.216
High (≥255$)						
	66	17.0	24.2	77.3	36.4	
Employment status [c,d]						χ2 =2.296
-Working						P=0.082
-Not working	114	29.4	38.6	80.7	42.0	*
	274	70.6	30.6	79.2	39.0	
Grant/credit status [c,d]						χ2 =2.513
-Taking	157	40.5	37.6	86.0	45.9	P=0.070
-Not taking	231	59.5	29.8	75.3	35.9	*
Living arrangements [c,d,e]						
-With others/independent						χ2 =3.489
-With parents	363	93.6	34.1	80.9	41.8	P=0.062
	25	6.4	16.0	60.0	12.0	*

[a]56, [b]57, [c]8, [d]10, [e]7, [f]60, [f]Note: American Dollar Exchange Rate (Avarage of January-July 2019) is equal to 1 $=5.9 TL.,

* Significant at level of 10.0 %, ** Second class students' classes are more crowded than other classes. This is because associate degree program students can complete their education to bachelor degree level from the second class.

Table 3. Hypothesis of the present study and the results

Hypothesis	Results
H_1: There are relationships between single item food security scale and ***gender*** (8-10).	Rejected
H_2: There are relationships between single item food security scale and ***year of study*** (8).	Accepted
H_3: There are relationships between single item food security scale and ***age*** (8-10).	Rejected
H_4: There are relationships between single item food security scale and ***BMI*** (8-10).	Rejected
H_5: There are relationships between single item food security scale and ***monthly income*** (8-10).	Rejected
H_6: There are relationships between single item food security scale and ***employment status*** (8-10).	Accepted
H_7: There are relationships between single item food security scale and ***grant/credit status*** (8-10).	Accepted
H_8: There are relationships between single item food security scale and ***living arrangements*** (8-10).	Accepted

apart from their families. Food insecurity is more prevalent among students in those circumstances (34.1 %; 80.9 % without hunger and 41.8 % with hunger) than among students living with their families (16.0 %; 60 % without hunger and 12.0 % with hunger). Also, other studies found a high correlation between food insecurity and the type of accommodation in which students live (7-8).

Table 4 summarizes the comparative results of the hypotheses for the present study and the two main studies in the literature. The variables of ***gender, age*** and ***income*** were not found to be significant while ***living arrangements*** were significant in relation to the food insecurity status of the students in the three studies. On the other hand, the ***year of study*** and ***employment status*** variables were shown to have a relationship with students' food insecurity in this study.

4.1. Limitations and Implications for Future Research

As expected, the results of this study closely replicate those of previous studies. It also shares some of the limitations of these studies. The main limitations are the small sample size and the self-reporting assessment method used as a measure of food insecurity. A self-reported survey is always open to possible criticism due to issues with the honesty and accuracy of responses. The small sample of students also limits the scope to generalize the results to students in other departments and, more widely, to other colleges. This study was focused on a population with multiple risk factors for food insecurity, so it was always possible that the results would show different degrees of food security. The author recommends that future studies should ideally involve a much larger sample group.

Another important factor relates to the variables used in this study. Though ***BMI*** and ***income*** variables did not prove to have a significant relationship with students' food insecurity status in this and previous studies, there is a strong case for further investigation of these relationships. For example, "why exactly were the researchers not able to find a relationship between food insecurity status and BMI?". A lower BMI for food insecure students could be expected because of the problem of hunger (61). But, equally, malnutrition could be the key factor here. Carbohydrate-based eating habits may be the cause of higher BMI (62) and it is often the case that these foods are more economically accessible (63). Therefore perhaps the question which should be investigated among students at different colleges is whether they are eating more carbohydrates in their normal diet, rather than proteins.

Author indicate that income is an important influence on food insecurity (64). Further research is

Table 4. Comparison of the hypothesis results with other fundemantal studies in the literature

Variables looking for relationship with food insecurity	Present Study	Reference (8)	Reference (10)
Gender	Rejected	Rejected	Rejected
Year of study	Accepted	-	Rejected
Age	Rejected	Rejected	Rejected
BMI	Rejected	-	Rejected
Income	Rejected	Rejected	Rejected
Employment Status	Accepted	Rejected	Rejected
Grant/Credit Status	Accepted	Accepted	Rejected
Living Arrangements	Accepted	Accepted	Accepted

needed to investigate the effect of income on food security with other variable groups and using different methods of statistical analysis.

The chi-square hypothesis test is widely used in studies of this kind (7-8-10-23) to examine the relationship between food insecurity and socio-economic variables. But the results with regard to BMI and income variables indicate that this test is not sufficient for all variables, and it is recommended that model-based analysis should be used in future studies to better understand the relationships.

4.2. Implications for policy makers and university managers

Policy makers and university managers have a responsibility to prevent the food insecurity of college students for both social and economic reasons. To succeed in this, the aim should be to ensure effective living conditions and to supply food aid when necessary. The results from this study will serve to highlight the variables which cause students' food insecurity for the benefit of future research.

The key finding of this study is that relationships were found between students' food insecurity and their year of study, employment status, grant/credit status and living arrangements. Therefore, it is necessary for agricultural engineering students to obtain a job or to secure a grant or credit if they are to avoid the threat of food insecurity. Living arrangements too are another important factor with regard to food insecurity.

Policy makers and university managers need to implement with solutions such as: "low-cost main meals for students; economically accessible accommodation with cooking facilities; ensuring food banks are available on campus to satisfy students' basic food needs; and ensuring appropriate job opportunities for students on campus which allow sufficient time for study".

5. Conclusion

Food security is a significant problem for one in three agricultural engineering students at Çanakkale Onsekiz Mart University. Moreover, the 'food security without hunger' ratio is approximately four in every five students. Students are forced to combine work with their studies in order to maintain themselves. This situation may have a negative impact on their success in course work. Also students who need to obtain credit or grant assistance have a greater food insecurity problem. Living arrangements too can have a major influence on students' food insecurity.

The author believes that this study makes a useful contribution to the current understanding of food insecurity among university students. It highlights the factors which affect food insecurity and makes recommendations which may help to alleviate some of the associated problems.

It can be concluded that students' living and eating conditions on campus need to be improved for the

simple reason that hungry students are unlikely to be capable of studying effectively and participating fully in scientific studies. Therefore, solutions such as the provision of accommodation with cooking facilities, economic accessibility of main meals on campus, availability of food banks and suitable job opportunities on campus are required to sustain students through college life.

Acknowledgements

I would like to thank the course coordinators and lecturers for their assistance in collecting the data during the classes and the students at Çanakkale Onsekiz Mart University-Faculty of Agriculture for their cooperation.

References

1. Food and Agriculture Organization (FAO), 2019. Retrieved on May 23, 2019 from: http://www.fao.org/wfs/index_en.htm
2. United States Department of Agriculture (USDA), 2019. Retrieved on May 8, 2019 from: https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/
3. World Health Organisation (WHO), 2019. Retrieved on June 7, 2019 from: http://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy lifestyle/body-mass-index-bmi
4. Perez-Escamilla R, Segall-Correa AM. Food insecurity measurement and indicators. Rev. de Nutr. 2008; 21.
5. Melgar-Quinonez HR, Zubieta AC, MkNelly B, Nteziyaremye A, Gerardo MFD, Dunford C. Household food insecurity and food expenditure in Bolivia, Burkina Faso, and the Philippines. Nutr. J. 2006; 136(5):1431S–1437S.
6. Willows ND, Veugelers P, Raine K, Kuhle S. Prevalence and sociodemographic risk factors related to household food security in Aboriginal peoples in Canada. Public Health and Nutr. 2009; 12(8):1150–1156.
7. Chaparro MP, Zaghloul SS, Holck P, Dobbs J. Food insecurity prevalence among college students at University of Hawaii at Manoa. Public Health Nutr. 2009; 12: 2097–2103.
8. Hughes R, Serebtyanikova I, Donaldson K, Leveritt M. Student food insecurity: the skeleton in the University closet. Nutr. Diet. 2011; 68:27–32.
9. Morris LM, Smith S, Davis J, Null DB. The prevalence of food security and insecurity among Illinois University students. J. Nutr. Educ. Behav. 2016; 48(6):376–382.
10. Micevski DA, Thornton LE, Brockington S. 2014. Food insecurity among university students in Victoria: a pilot study. Nutr. Diet. 2014; 71:258–264.
11. Ssewanyana SN, Ahmadi-Esfahani FZ. Household food security in rural Uganda: a statistical analysis. Ecol. Food Nutr. 2001; 40:2, 93–125.
12. Msaki MM, Hendirks SL. Measuring household food security using food intake indicators in Rural Kwazulu Natal, South Africa. Ecol. Food Nutr. 2014; 53(2):193–213.
13. Ekhlaspour P, Foroumandi E, Ebrahimi-Mameghani M, Jafari-Koshki T, Arefhosseini SR. Household food security status and its associated factors in Baft-Kerman, IRAN: a cross-sectional study. Ecol. Food and Nutr. 2019; 58(6):608–619.
14. Khakpour M, Iqbal R, GhulamHussain N, Engler-Stringer R, Koc M, Garcea J, Farag M, Henry C, Vatanparast H. Facilitators and barriers toward food security of Afghan refugees residing in Karachi, Pakistan. Ecol. Food Nutr. 2019; 58(4):317–334.
15. United Nations Development Programme (UNDP), (2014). Sustaining human progress: reducing vulnerabilities and building resilience. Human Development Report. US.
16. Chavas JP. On food security and the economic valuation of food. Food Policy 2017; 69:58–67.
17. Gouel C. 2013. Optimal food price stabilisation policy. Eur. Econ. Rev. 2013; 57:118–134.
18. Nelson GC. 2014. Advancing global food security in the face of a changing climate. Chicago Council on Global Affairs, 2014; Chicago.
19. Fawole WO, Ozkan B. Food insecurity risks perception and management strategies among households: implications for zero hunger target in Nigeria. New Medit 2018; 2:29–42.
20. Impliglia A, Lewis P. Combatting food insecurity and rural poverty through enhancing small-scale family farming in the Near East and North Africa. New Medit 2019; 1:109–112.
21. Prosperi P, Allen T, Padilla M, Peri I, Cogill B. Sustainability and food and nutrition security: a vulnerability assessment framework for the Mediterranean Region. Sage Open 2014; (April-June) 1–15.
22. Lacirignola C, Adinolfi F, Capitanio F. Food security in the Mediterranean countries. New Medit 2015; 4: 2–10.
23. Davidson AR, Morell JS. Food insecurity prevalence among university students in New Hampshire. J. Hunger Environ. Nutr. 2018; 15:118–127.
24. Martinez SM, Webb K, Frongillo EA, Ritchie LD. Food insecurity in California's public university system: what are the risk factors? J. Hunger Environ. Nutr. 2018; 13(1): 1–18.
25. Nazmi A, Martinez S, Byrd A, Robinson D, Bianco S, Maguire J, Crutchfield RM, Condron K, Lorrene R. 2018. A systematic review of food insecurity among US students in higher education. J. Hunger Environ. Nutr. 2018.
26. Theodoridis X, Grammatikopoulou MG, Gkiouras K, Papadopoulou SE, Agrorastou T, Gkika I, Maraki MI, Dardavessis T, Chourdakis M. 2018. Food insecurity and Mediterranean diet adherence among Greek university students. Nutr. Metab. Cardiovas. 2018; 28:477-485.
27. Camelo K, Elliott M. Food insecurity and academic achievement among college students at a public university in the United States. J. Coll. Stud. Dev. 2019; 60(3): 307–318.

28. Haskett ME, Kotter-Grühn D, Majumder S. Prevalence and correlates of food insecurity and homelessness among university students. J. Coll. Stud. Dev. 2020; 61(1):109–114.
29. Kassier S, Veldman F. Food security status and academic performance of students on financial aid: the case of University of Kwazulu-Natal. Alternation 2013; (9): 248–264.
30. Cady CL. Food insecurity as a student issue. J. Col. Character 2014; 15 (4):265–271.
31. Gaines A, Robb CA, Knol LL, Sickler S. Examining the role of financial factors, resources and skills in predicting food security status among college students. Int. J. Consum. 2014; 38:374–384.
32. Patton-Lopez MM, Lopez-Cevallos DF, Cancel-Tirado DI, Vazquez L. 2014. Prevalence and correlates of food insecurity among students attending a midsize rural university in Oregon. J. Nutr. Educ. Behav. 2014; 46(3): 209–214.
33. Maroto ME, Snelling A, Linck H. Food Insecurity among community college students: prevalence and association with grade point average. Community Coll. J. 2015; 39 (6): 515–526.
34. Whitehead-Dominguez Y. Students' food acquisition struggles in the context of South Africa: the fundamentals of student development. J. Coll. Stud. Dev. 2015; 56(3):292–308.
35. Bruening M, Brennhofer S, Woerden I, Todd M, Laska M. Factors related to the high rates of food insecurity among diverse, urban college freshmen. J. Acad. Nutr. Diet. 2016; 116(9): 1450–1456.
36. Farahbakhsh J, Hanbazaza M, Ball GDC, Farmer AP, Maximova K, Willows ND. Food insecure student clients of a university-based food bank have compromised health, dietary intake and academic quality. Nutr. Diet. 2017; 74: 67–73.
37. Knol LL, Robb CA, McKinley EM, Wood M. Food insecurity, self-rated health, and obesity among college students. Am. J. Health Educ. 2017; 48 (4): 248–255.
38. McArthur HL, Ball L, Danek AC, Holbert D. A high prevalence of food insecurity among university students in Appalachia reflects a need for educational interventions and policy advocacy. J. Nutr. Educ. Behav. 2017; 50(6):564–572.
39. Watson TD, Malan H, Glik D. College students identify support for basic needs and life skills as key ingredient in addressing food insecurity on campus. Calif. Agr. 2017; 71(3):130–138.
40. Allen CC, Alleman NF. A private struggle at a private institution: effects of student hunger on social and academic experiences. J. Coll. Stud. Dev. 2019; 60(1):52–69.
41. Turkish Statistic Institute (TSI), (2019). Retrieved on August 28, 2019 from www.tuik.gov.tr
42. Bertsias G, Mammas I, Linardakis M, Kafatos A. Overweight and obesity in relation to cardiovascular disease risk factors among medical students in Crete, Greece. BMC Public Health 2013; 3:3.
43. Karam W, Maalouf L, Ghandour LA. Alcohol use among university students in Lebanon: prevalence, trends and covariates: the IDRAC University substance use monitoring study (1991 and 1999). Drug Alcohol Depend. 2004; 76(3):273–286.
44. Forleo MB, Tamburro M, Mastronardi L, Giaccio V, Ripabelli G. 2017. Food consumption and eating habits: a segmentation of university students from Central-South Italy. New Medit 2017; 4:56–65.
45. Anonymous, 2001. National Food and Nutrition Strategy Report. Turkish Republic Ministry of Development, Ankara/Turkey. Retrieved 19 September 19, 2019 from http://www.sbb.gov.tr/
46. Keskin B, Demirbaş N. An evaluation on food security and it's calculation methods: limitations and suggestions (Gıda güvencesi ve hesaplama yöntemleri üzerine bir değerlendirme: kısıtlar ve öneriler), 10. National Agricultural Economics Congress, 5-7 September 2012, Konya/Turkey, pp. 900-908. (in Turkish)
47. Saygın Ö, Demirbaş N. The current situation of red meat sector in Turkey and solution recommendations. Journal of Animal Production 2017; 58(1): 74–80.
48. Saygın Alparslan Ö, Demirbaş N. Red meat and processed red meat consumption behaviour of healthcare professionals: do they participate in the World Health Organization's view of red meat carcasses or red meat carcinogens? Public Health Nutr. 2019; 27:1–7.
49. The Economist Intelligence Unit (EIU), 2020. Retrieved on July 30, 2020 from https://foodsecurityindex.eiu.com/Resources
50. Anoymous, 2017. Turkey Research and Development Policy Handbook; Strategic Information and Regulations. Volume 1. International Business Publications. Washington DC, USA.
51. Wikipedia, 2020. Retrieved on June 1, 2020 from www.wikipedia.org
52. Turkish Statistical Institute (TSI) (2018) National population statistics. Retrieved on February 28, 2018 from http://tuik.gov.tr/UstMenu.do?metod=temelist
53. Turkish Republic of Canakkale Governorship (TRCP), (2019). Retrieved on March 13, 2019 from www.canakkale.gov.tr
54. Turkish Republic Ministry of Foreign Affairs (TRMFA), (2019). Retrieved on March 13, 2019 from www.mfa.gov.tr
55. Canakkale Onsekiz Mart University (COMU), 2020. Retrieved on January 21, 2020 from www.comu.edu.tr
56. Rychetnik L, Webb K, Story L, Katz T. Food security options paper: a planning framework and menu for policy and practice interventions. Sydney: NSW Center for Public Health Nutrition, University of Sydney. 2003, Retrieved on May 21, 2020, from: https://www.health.nsw.gov.au/heal/Publications/food-security.pdf
57. Cohen B, Andrews M, Kantor LC. Community food security assessment toolkit. Food Assistance & Nutrition Research 2002. Washington DC: United States Department of Agriculture. Retrieved on May 18, 2019 from: https://www.ers.usda.gov/publications/pub-details/?pubid=43179
58. Sokolove PS, Bushell WN. The chi square periodogram: its utility for analysis or circadian rhythms. J. Theor. Biol.1978; 72(1):131–160.
59. Sattora A, Bentler PM. 2001. A scaled difference chi-square test statistic for moment sturcture analysis. Psychometrika 2001; 66(4)507–514.

60. Turkish Republic Central Bank (TRCB), 2019. Retrieved on July 21, 2019 from https://www.tcmb.gov.tr/
61. Gulliford MC, Mahabir D, Rocke B. Food insecurity, food choices, and body mass index in adults: nutrition transition in Trinidad and Tobago. Int. J. Epidemiol. 2003; 32(4):508–516.
62. Merchant AT, Vatanparast H, Barlas S, Dehghan M, Shah SMA, Koning L, Steck SE. Carbohydrate intake and overweight and obesity among healthy adults. J. Am. Coll. Nutr. 2009; 109(7):1165–1172.
63. Drewnowski A. The carbohydrate-fat problem: can we construct a healthy diet based on dietary guidelines? Adv. Nutr. 2015; 6(3): 318S–325S.
64. Asghar Z, Ahmed M. Socio-economic determinants of household food insecurity in Pakistan. Munih Personal RePEc Archive, Paper no: 21510. 2013, Munich, Germany.

* Corresponding author:
E-mail: ozgecanniyaz@comu.edu.tr,
Phone: 00902862180018, Adress: Çanakkale Onsekiz Mart University, Faculty of Agriculture, Department of Agricultural Economics, Çanakkale/Turkey.