



Food Insecurity in Obese Adolescent Females in Tehran Schools: An Examination of Anthropometric and Socio-Economic Factors

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Abstract

Background

Obesity and its complications affect much of the population of the world today. In addition to physical complications, psychological complications also increase with increasing obesity. It has always been important to pay attention to the growing trend of childhood obesity, which is a factor in adulthood obesity and future chronic illnesses. Today, one of the factors that has been identified as effective in weight gain and obesity in urban communities is food insecurity, which is not merely a lack of food, but also includes related factors such as upbringing, behavior, psychosocial adaptation, and physical activity. Therefore, the purpose of this study was to investigate the effects of food insecurity on anthropometric indicators and other relevant factors in obese girls aged 11 to 14 years.

Method

In this study 452 obese female students aged 11 to 14 years, who had BMI more than 2SD above the WHO 2007 reference point, were randomly selected from several schools in three areas of Tehran. After obtaining written consent, demographic information and food security information were collected using a General and the United States Department of Agriculture (USDA) questionnaire. Anthropometric indices and fat percentage were also measured, based on skin fold and by calipers. Finally, the data were analyzed using SPSS software.



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Keywords

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Results

There were significant differences between the level of father's education ($p = 0.004$), mother's education ($p < 0.001$), family economic status ($p < 0.001$), and home ownership ($p < 0.001$) in the two groups, food secure and insecure. There were also significant differences between height ($p = 0.02$) and weight ($p = 0.03$) in both groups. Also, according to an alternative 4 - group food security categorization (secure, insecure without hunger, insecure with mild hunger, and severe hunger), significant differences were observed only in terms of father's job ($p = 0.004$), father's education ($p = 0.001$), mother's education ($p < 0.001$), family economic status ($p < 0.001$) and home ownership ($p < 0.001$).

Conclusion

There were significant associations between parents' occupation and education status, home ownership, household economic status, height and weight of children, and household food security status.

Introduction

According to current statistics, the prevalence of obesity ($BMI > 2SD$) in children is increasing. In Iran, which, like other developing countries, faces the phenomena of urbanization and industrialization, the prevalence of obesity and overweight is increasing. According to statistics, at least 10 percent of the world's children are overweight or obese.¹ The prevalence of obesity in Iranian children aged 7 to 12 has been reported at 5 - 10 %.² Additionally, obesity increases the risk of chronic diseases such as type 2 diabetes, insulin resistance, increased blood pressure, increased cardiovascular disease, some cancers, and even premature death. It also causes psychosocial problems.³ Childhood obesity not only causes obesity in adulthood, but also causes physical and psychological problems at an early age.⁴ Therefore, the prevention of obesity is a vital World Health Organization (WHO) goal.⁵

One of the factors that is known today to be an effective factor in weight gain and obesity in urban communities is food insecurity.⁶ According to the United Nations in 1986, food security exists when all members, at all times, have access to enough food for an active, healthy life. According to this definition, the availability of food, access to food and the stability of food intake are the three most important elements. The final report of the 1996 states that food security "exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life".⁷

Food insecurity has drawn the attention of many health professionals and politicians as one of the

most serious problems facing the international community over the past two decades. More than 852 million people globally suffer from food insecurity, of whom a large part live in developing countries.⁸ The prevalence of food insecurity in Iran in 2016 was reported as 49 %, with the highest prevalence rate being among preschool children (67 %), then the elderly (67 %), mothers (61 %), and adolescents 11-16 years old (49 %).⁹

Given this general view, food insecurity is assumed to lead to lower food intake and changes in the type of food consumed, due to underlying reasons such as low economic status. Therefore, food diversity is reduced and the consumption of high-caloric and poor quality nutritional foods is increased. These dietary patterns are the basis for the development of obesity and overweight and associated risks. In general, food insecurity is associated not only with food deficiency, but also with various factors such as child education, behavior, and the psychosocial, physical and motor factors (10 - 12), which overall form the lifestyle of the child and the household.

Materials and Methods

In this study 452 obese female students aged 11 to 14 years with similar general characteristics who had BMI greater than 2SD above the defined WHO level were randomly selected from several schools in three areas of Tehran (south, south - east, south - west). After obtaining written consent, a general information questionnaire was completed. Student's height and weight information was accurately recorded by trained experts. Body weight was measured to the nearest 0.1 kg using a Seca scale with subjects wearing light clothing (i.e. no sweaters, jackets, or

belts) and no shoes. Height was measured to the nearest 0.1 centimeter using a Seca stadiometer, in a standing position and with shoes removed. Body mass index (BMI) was calculated from the height and weight data; $BMI = kg/m^2$.

Obese people with z score > 2 were selected using standard BMI curves determined by the WHO. To determine the percentage of body fat, the skin fold was measured by calipers in the triceps of the arm. Skinfold calipers are used in the measurement of skinfold thickness and the estimation of total body fat. Skinfold measurements are generally taken at specific sites on the right side of the body. The tester pinches the skin at the location site and pulls the fold of skin away from the underlying muscle so only the skin and fat tissue are being held. Special skinfold calipers are then used to measure the skinfold thickness in millimeters.

To determine the household food score, the USDA Food Security Questionnaire (18 items) was used, which was carried out by trained experts who obtained the data from the students' mothers. The USDA household food security questionnaire, which was used in this study, has been evaluated and validated in a study on households in Isfahan¹³ and, in another study on households in Shiraz, has been moderated.¹⁴ This questionnaire examines household food security over the past 12 months. The questionnaire has two parts: the first part is for all households, and the second part is for families with children under the age of 18. The scoring of this questionnaire, according to Bickel *et al.*,¹⁵ is that for options of "often correct", "sometimes correct", "almost every month", "some months," and "yes", a score of 1 is awarded, whereas the answers "not true," "only 1 or 2 months," and "no" are awarded a score of 0. The maximum score of this questionnaire, when completed in both parts, is 18. To determine the state of food security, households are ranked into food secure, food insecure without hunger, food insecure with moderate hunger, and severe starvation.

Statistical Analysis

After data collection, data were analyzed using SPSS 17 software. Comparison within groups was done using independent t-test. By using a covariance test, confounders effects were examined

and eliminated as far as possible. Before performing the above analyses, the normal distribution of variables was examined. If variables were non-normal, a nonparametric test was used (School Grade, Head of the Family, Father's Occupation, Mother's Occupation, Father's Education, Mother's Education, Residential Region, Economic Status, House Ownership, House Type). Results with p - value < 0.05 were considered significant.

Results

Based on the findings of this study, the samples were divided into two groups of food secure and food insecure. As shown in Table 1, there was a significant correlation between father's level of education ($p = 0.004$), mother's level of education ($p < 0.001$), household economic status ($p < 0.001$) and house ownership ($p < 0.001$) between the two groups, based on the chi - square test. In another analysis conducted within the context of food security, samples were divided into four categories: secure food group, insecure food group without hunger, insecure food group with mild hunger, and severe hunger. The association of these four groups with all quantitative and qualitative features was analyzed statistically. According to the independent t test, there was a significant difference in height ($p = 0.02$) and weight ($p = 0.03$) between the two groups. According to Table 2, the only significant differences were observed in father's job ($p=0.004$), father's education ($p=0.001$), mother's education ($p < 0.001$), family economic status ($p < 0.001$) and home ownership ($p < 0.001$) between all four groups, based on the chi-square test. However, no significant difference was observed between anthropometric indices and the 4 groups of food security, according to the ANOVA test.

Discussion

In the present study, there was a significant relationship between the education level of parents and the state of food insecurity, while in a study by Simon *et al.*, the level of education in people with food insecurity was lower. Alson *et al.* (1996) found in their study that those who experienced food insecurity had lower levels of literacy. Other studies conducted in Iran have also shown a significant relationship between food insecurity and education level (Ramesh *et al.*, Mohammadzadeh *et al.*, Dane-sh *et al.*).¹⁶

Table 1: Quantitative and Qualitative Characteristics of Participants Based on Food Insecurity^a.

		Secure		Insecure without Hunger		Insecure with Mild Hunger		Insecure with Severe Hunger		P-Value**
		Mean or N	% or SD	Mean or N	% or SD	Mean or N	% or SD	Mean or N	% or SD	
School	7th	94	17.9	36	6.9	20	3.8	14	2.7	0.118
Grade	8th	116	22.1	42	8.0	27	5.2	13	2.5	
	9th	108	20.6	29	5.5	14	2.7	11	2.1	
Head of the Family	Father	300	57.3	98	18.7	57	10.9	33	6.3	0.124
	Mother or other	18	3.4	9	1.7	4	0.8	5	1.0	
Father's Occupation	Unemployed	2	0.4	2	0.4	9	1.7	5	1.0	0.004
	Self-employed	207	39.9	59	11.4	37	7.1	21	4.0	
	Retired or workman	23	4.4	17	3.3	7	1.3	3	0.6	
Mother's Occupation	Clerk or manager	85	16.4	28	5.4	8	1.5	6	1.2	
	Housekeeper	253	48.4	91	17.4	52	9.9	33	6.3	0.128
Father's Education	Employed	64	12.2	16	3.1	9	1.7	5	1.0	
	Illiterate or primary school	44	8.5	14	2.7	12	2.3	11	2.1	0.001
Mother's Education	High school or diploma	201	38.7	81	15.6	40	7.7	21	4.0	
	Academic education	72	13.8	11	2.1	9	1.7	4	0.8	
Residential Region	Illiterate or primary school	35	6.7	21	4.0	14	2.7	13	2.5	<0.001
	High school or diploma	230	43.9	72	13.7	40	7.6	23	4.4	
Economic Status	Academic education	53	10.1	14	2.7	7	1.3	2	0.4	
	Region 9	42	8.0	21	4.0	9	1.7	8	1.5	0.336
	Region 14	107	20.4	26	5.0	16	3.1	8	1.5	
	Region 16	76	14.5	18	3.4	13	2.5	9	1.7	
	Region 17	30	5.7	18	3.4	9	1.7	1	0.2	
House Ownership	Region 18	63	12.0	24	4.6	14	2.7	12	2.3	
	Weak	5	1.0	20	3.8	31	5.9	30	5.7	<0.001
House Type	Mild	264	50.4	85	16.2	30	5.7	8	1.5	
	Good	49	9.4	2	0.4	0	0.0	0	0.0	
Age (years)	Owner	157	30.0	45	8.6	15	2.9	4	0.8	<0.001
	Tenant, organizational or other	161	30.7	62	11.8	46	8.8	34	6.5	
Weight (kg)	House Apartment	291	55.5	92	17.6	53	10.1	35	6.7	0.417
	House Villa	27	5.2	15	2.9	8	1.5	3	0.6	
Height (cm)	Age (years)	13.863	0.865	13.776	0.877	13.843	0.810	13.821	0.896	0.84
	Weight (kg)	82.011	10.055	80.200	8.706	81.343	9.421	78.913	7.732	0.13
Body Mass Index (kg/m ²)	Height (cm)	159.422	6.016	158.496	5.999	158.515	5.013	157.092	6.053	0.08
	Body Mass Index (kg/m ²)		32.168	2.406	31.858	2.131	32.361	3.438	31.946	2.156
Thickness of Skinfold (mm)	Thickness of Skinfold (mm)		44.241	5.788	43.028	5.745	43.869	6.616	43.982	6.108
	Number of Sisters and Brother									
Number of People Living in Household	Brother	1.20	0.864	1.38	1.271	1.13	0.763	1.37	0.883	0.21
	Number of People Living in Household	4.04	0.880	4.22	1.127	3.97	0.632	4.18	0.926	0.19

** presented as Mean (SD) for quantitative variables and frequency (%) for qualitative variables

** calculated by Chi-Square or one-way ANOVA test; Significant at the 0.05 level

According to the results of this study, there was a significant relationship between food insecurity and the employment status of the participant's

father. In the studies of Mohammadzadeh *et al.* and Dastgiri *et al.*,¹⁷ there was a meaningful relationship between employment status and food

Table 2: Quantitative and Qualitative Characteristics of Participants Based on Food Insecurity a.

		Secure		Insecure		P-Value**
		N	%	N	%	
School Grade	7th	94	17.9	70	13.3	0.085
	8th	116	22.1	83	15.8	
	9th	108	20.6	54	10.3	
Head of the Family	Father	300	57.1	189	36.0	0.216
	Mother or other	18	3.4	18	3.4	
Father's Occupation	Unemployed	2	0.4	16	3.1	0.108
	Self-employed	207	39.8	117	22.5	
	Retired or workman	23	4.4	28	5.4	
	Clerk or manager	85	16.3	42	8.1	
Mother's Occupation	Housekeeper	253	48.3	177	33.8	0.104
	Employee	64	12.2	30	5.7	
Father's Education	Illiterate or primary school	44	8.4	37	7.1	0.004
	High school or diploma	201	38.6	143	27.4	
	Academic education	72	13.8	24	4.6	
Mother's Education	Illiterate or primary school	35	6.7	48	9.1	<0.001
	High school or diploma	230	43.8	136	25.9	
	Academic education	53	10.1	23	4.4	
Residential Region	Region 9	42	8.0	39	7.4	0.370
	Region 14	107	20.4	50	9.5	
	Region 16	76	14.5	40	7.6	
	Region 17	30	5.7	28	5.3	
	Region 18	63	12.0	50	9.5	
Economic Status	Weak	5	1.0	81	15.4	<0.001
	Mild	264	50.3	124	23.6	
	Good	49	9.3	2	0.4	
House Ownership	Owner	157	29.9	65	12.4	<0.001
	Tenant, organizational or other	161	30.7	142	27.0	
House Type	Apartment	291	55.4	181	34.5	0.14
	Villa	27	5.1	26	5.0	
Age (years)	13.86	0.86	13.80	0.85	0.43	
Weight (kg)	82.01	10.05	80.27	8.74	0.03	
Height (cm)	159.42	6.01	158.25	5.72	0.02	
Body Mass Index (kg/m ²)		32.16	2.40	32.01	2.58	0.47
Thickness of Skinfold (mm)		44.24	5.78	43.44	6.05	0.13
Number of Sisters and Brother		1.20	0.86	1.31	1.07	0.21
Number of People Living in Household		4.04	0.88	4.14	0.97	0.20

** presented as Mean (SD) for quantitative variables and frequency (%) for qualitative variables

** calculated by Chi-Square or independent sample t-test; Significant at the 0.05 level

insecurity. Food insecurity has shown a significant relationship with employment status in other studies on Canadian households, low-income households in Los Angeles, rural households in Malaysia, and women in California.¹⁸ These studies are consistent with the present results.

Significant relationships can be attributed to the fact that higher education increases the chances of earning more paid jobs and improving the nutritional attitude of parents in relation to food needs and, as a result, reducing the level of household insecurity.

In this study, there was also a significant relationship between household economic status and food insecurity. Other studies have similarly shown that food insecurity has a meaningful relationship with economic status.¹⁹ In the studies by Ghasemi *et al.*²⁰ and Dastgiri *et al.*,¹⁷ food insecurity showed an inversely significant relation with income. The prevalence of food insecurity in US, Canadian, Malaysian, Mongolian and Georgian households had an inversely significant relationship with high income levels.¹⁸ The results of these studies are consistent with the present study. Income is a crucial determinant of food security, and is a critical factor in access to food in the community. Higher-income households and better economic conditions have wider food choices and can spend more on their food.

In a study by Andy Bukasa *et al.*, there was a significant relationship between "overweight" children, based on "weight for height" in terms of the Household Food Insecurity Access Scale (HFIAS). Also, in this study, there was a significant

relationship between "height " and "mild family food insecurity". On the other hand, "weight for age" and "weight for height" were not statistically related to HFIAS categories. The relationship between anthropometric indices, in particular "overweight", "height for age" and "weight for height" on the one hand, and poverty and HFIAS indicators on the other, shows that anthropometric indices of children can be good indicators of household food security. However, their measurements should be combined with other indicators. In the present study, a significant relationship was only observed in the weight and height of children with food security.

Conclusion

Today, food insecurity is a major public health problem, and food security is considered as a household and individual health indicator. Food insecurity and hunger can have adverse social and psychological effects in addition to their health effects. In this study, factors such as father's occupation and education, mother's education, and household economic status had a significant relationship with the level of food security. Also, from anthropometric indices in this study, only the height and weight of children showed a relationship with household food security.

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References

1. Wang Y. and Lobstein T. Worldwide trends in childhood overweight and obesity. *Int Pediatr Obes.* 2006;1(1):11-25.
2. Hajiyani K. Sajadi P. and Rezvani A. Prevalence of overweight and underweight among primary school children aged 7-12 years. *Journal of Babol University of Medical Sciences.* 2009;10:81-93. (in Persian).
3. Veldhuis L., Struijk M.K., Kroeze W. and Oenema A. Be active, eat right. *BMC Public Health.* 2009;9:177-88.
4. Hering E. Pritsker I. Gonchar L. and Pillar G. Obesity in children is associated with increased health care use. *Clin pediatr (phila).* 2009;48(8):812-8.
5. Hardy L.R., Harrell J.S. and Bell R.A. Over weight in children: definition, measurements, confounding factors and health consequences. *J Pediatr Nurs.* 2004;19(6):376-8.
6. Eisenmann J.C., Gundersen C., Lohman B.J., Garasky S. and Stewart S.D. Is food insecurity related to overweight and obesity in children and adolescents? A summary

- of studies, 1995–2009. *Obesity Reviews*. 2011;12:e73–e83.
7. FAO. 1996. Rome Declaration on World Food Security and World Food Summit Plan of Action. World Food Summit 13-17 November, Rome.
 8. FAO. 2007. The State of Food insecurity in the World. Food and Agriculture Organization of the United Nations. Rome, 47.
 9. Behzadifar M., Abdi S., Malekzadeh R., Arab Salmani, Ghoreishinia M., Falahi E., Mirzaei M., Shams Biranvand N. and Sayehmiri K. Prevalence of food insecurity in Iran: A systematic review and meta-analysis. *Arch Iran Med*. Apr. 2016;19(4):288-294.
 10. To Q.G., Frongillo E.A., Gallegos D. and Moore J.B. Association of food insecurity and physical activity in U.S. children and adults. *J Nutr*. 2014;144:1797–802.
 11. NRC. 2006. Food insecurity and hunger in the United States: an assessment of the measure. Washington. The National Academies Press.
 12. Slack K.S. and Yoo J. Food hardship and child behavior problems among low-income children. *Soc Serv Rev*. 2005;79:511–36.
 13. Rafiei M., Nord M., Sadeghizadeh A. and Entezari M. Assessing the internal validity of a household survey based food security measure adapted for use in Iran. *Nutr J*. 2009;8(28):1186-1197.
 14. Ramesh T. 2009. The Prevalence of food insecurity and some associated factors among Shirazian households in 2009. (dissertation), Tehran. Shahid Beheshti University, M.C. (in Persian).
 15. Bickel G., Nord M., Price C., Hamilton W.L. and Cook J. 2000. Guide to measuring household food security, Revised 2000. USDA, Food and Nutrition Service, Office of Analysis, Nutrition and Evaluation, Alexandria Alexandria VA.
 16. Dorosty A. and Naeini A.M.A. Correlation of elderly nutritional status with cardio-vascular disease and diabetes. *IC Journal Master List. Tehran University Medical Journal (TUMJ)*. 2007;65(3):68-71.
 17. Dastgiri, Soltanali, Totonchi, Ostadrahimi.. Influencing factors on food insecurity: a cross sectional study in Tabriz years 2004-2005. *Journal of Ardabil University of Medical Sciences*.
 18. Azizi S., Sadrzadeh, Hosseini S., Ahmadi A., Daneshi Maskooni M, Safarpour *et al*. Food insecurity and some socioeconomic factors affecting women with metabolic syndrome. *Armaghane Danesh*. 2013;18(2):95-106.
 19. Payab M. Dorosty Motlagh A.R., Eshraghian M.R., Siassi F. and Karimi T. The association between food insecurity, socio-economic factors and dietary intake in mothers having primary school children living in Ray 2010. *Iranian Journal of Nutrition and Food Technology*. 2012;7(1): 0-0.
 20. Ghasemi H. 2004. Food Security & Nutrition & Future Challenges of Country. The Articles Collection of the First Seminar of Agriculture & National Development Planning Surveys. *Agricultural Economics Institution Publication*.