Original Article

Association of Socioeconomic Status and Food Security with Anthropometric Indices Among 2–5-year-old Urban Children in Eight Different cities in Iran

Mina Minaie, Ariyo Movahedi[1], Ahmadreza Dorosty Motlagh[2], Zahra Abdollahi[3], Abolghasem Djazayery[2]

Department of Community Nutrition, School of Nutritional Sciences and Dietetics, International Campus, Tehran University of Medical Sciences (IC-TUMS), Tehran, Iran, [1]Department of Nutrition, Science and Research Branch, Islamic Azad University, Tehran, Iran, [2]Department of Community Nutrition, School of Nutritional Sciences and Dietetics, Tehran University of Medical Sciences, Tehran, Iran, [3]Department of Community Nutrition, Deputy of Health, Ministry of Health and Medical Education, Tehran, Iran

Address for correspondence:
Dr. Zahra Abdollahi, Community Nutrition Department, Deputy of Health, Ministry of Health and Medical Education, Tehran, Iran.
E-mail: abdollahi_z@yahoo.com

Abstract

Introduction: Child nutrition status is very important in all societies, which is influenced by the interaction of multiple factors including food security and socioeconomic status in both genders. The aim of this study was to examine the relationship between food security and socioeconomic status with anthropometric indices among 2–5-year-old urban children in eight different cities in Iran. **Materials and Methods:** In this cross-sectional study, anthropometric *Z* scores of 7028 children of urban area were measured by using World Health Organization (WHO) Anthro software based on WHO 2007 standards. Family food security was assessed by using HFIAS 9-item questionnaire. Socioeconomic status as well as health factors were analyzed using the SPSS. **Results:** Based on the present study, significant correlation was observed between sleep time, birth weight, and food security ($P < 0.05$) with body mass index (BMI), while the rest of the variables including age, family size, number of children, parents' education, breastfeeding duration, watching TV, playing computer games, playing outdoors, number of main eating, and number of snacks showed no significant relation ($P > 0.05$). **Conclusion:** It was shown that 2–5 years old children's life are the most vital and vulnerable to the hazards of undernutrition or overweight and obesity, which could affect the whole health of the person. As food security affects BMI, it is important to focus more on this issue in order to improve child's health status.

Keywords: *Body mass index, malnutrition, obesity, overweight, thinness*

Introduction

Obesity has become one of the major risk factors for many chronic diseases, which makes it as foremost epidemiologic challenges of today around the world. Numerous comorbid conditions have been connected with obesity, including type 2 diabetes, hypertension, hyperlipidemia, and non-alcoholic fatty liver disease.[1] According to the World Health Organization (WHO), among children younger than 5 years of age, 41 million were obese or overweight in 2017, and if the present trend remains unchanged the number of overweight or obese infants and young children globally will increase to 70 million by 2025.[2] In Iran, based on the National Integrated Micronutrient Survey 2012 (NIMS-2), overweight and obesity among 15–23 months and 6 years old children are 5.6% and 13.5%, respectively. Moreover, in some regions like Gilan and Mazandaran, the north of Iran, the rate of obesity and overweight is much higher than national average.[3] There is much evidence showing that the incidence of obesity and overweight has been significantly enlarged among children in recent years. Overweight or obese children are at risk for high blood pressure, dyslipidemia, and type 2 diabetes and may become overweight or obese adults at the end.[4]

Many factors could be involved in child's weight status. Among these factors, food security is quite interesting issues these days, which might affect as a double sword on child's body mass index (BMI).[5,6] Food security is the product of food availability, food access, stability of supplies, and biological utilization.[7] In a very basic meaning it is regularly having enough food to eat for all time.[8] It could also be affected by socioeconomic status.[9] Due to worldwide studies, food security has a strong connection with human health especially among children and could affect anthropometrical indices.[10,11]

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The aim of this study was to examine the relationship between food security and socioeconomic status with anthropometric indices among 2–5-year-old urban children in eight different cities in Iran.

Materials and Methods

After getting approval from the ethical committee, in a cross-sectional study data of 7028 children aged 2–5 years from eight different cities of Iran was gathered through healthcare centers. The sampling method was randomized cluster sampling, and 47 clusters and 15 sub clusters in each cluster were studied. After briefing and training sessions for the questioning teams and checking for their activities accuracy, the team addresses were announced to the members. Later by finding each cluster, the child was studied after having the consent of the mother. After filling the consent form by the mothers, the questionnaires including general information, socioeconomic status, food security, physical activity, and child feeding were completed. A comprehensive questionnaire is used for determining socioeconomic status, physical activities, and child feeding. The questions included were family size, parents' job and education, the gender of the head of family, playing time of child in the yard or street around his/her, child TV hours, child playing computer hours, child sleeping hours, the duration of child breastfeeding, the number of child feeding meals and snacks, eating child breakfast, mothers perception on child's weight, child physical activity, and chubby child. Food security status was performed based of Iranian Household Food Insecurity Access Scale (HFIAS).[12] The HFIAS is a national food security tool for determining food insecurity in some countries. It includes nine questions for distinguishing food security status among families that adapted for Iranian people. The weight and height of the child were measured using standard methods. Weight and height of all registered kids were measured. The weight was measured using the Seca weighing scale to the nearest 0.1 kg. The height was measured using the Seca Bodymeter to the nearest 0.1 cm in order to find the relationship between food security and anthropometric indices, *Z* score of these indices, including weight-for-age (WAZ), height-for-age (HAZ), and BMI for age (BAZ) were calculated using Anthro V.3.2.4 software of the WHO. All the results were categorized based on WHO child growth standards guideline.[13]

Statistical analysis

Data were expressed as means ± SD and frequencies, using IBM SPSS Statistics Software (V.24, Chicago, IL, USA). Normality of all the results was tested by the Kolmogorov–Smirnov test. Statistical differences between genders were determined using independent sample t-test and Mann–Whitney U test based on the data. Correlation between factors was tested by using Pearson and Spearman Rho regarding quantitative or qualitative variables. Multiple regression was also analyzed in order to find better conclusion on associated factors to BMI among children. Statistical differences of anthropometric indices between food security groups were determined using one-way repeated measures analysis of variance (ANOVA) followed by Tukey's multiple comparison test. Differences between groups were considered significantly different when the *P*-value was <0.05.

Results

As Table 1 shows, significant differences were revealed on anthropometric indices between different levels of food security in children. As it illustrated, secured groups had much better healthy indices as compared to mild, moderate, and severe unsecured group. Moreover, it was found that boys as compared to the girls have anthropometric indices except in HAZ index. As Table 2 shows, no significant difference was observed on mother's perception on child activity ($P = 0.130$), eating breakfast ($P = 0.132$), number of main food ($P = 0.202$), number of snacks ($P = 0.643$), body weight of their children ($P = 0.447$), and their idea on chubby child ($P = 0.609$) between genders. No differences were observed on food security between genders as well and about 70% of children were food secure and about 9% in both genders were insecure [Figure 1]. As Table 3 shows, there was a significant difference in playing computer games, outdoor play time, sleep time, birth weight, present weight, height, BMI, WAZ, HAZ, BAZ, and weight-for-height among genders ($P < 0.01$). The other components did not show any significant difference between the genders ($P > 0.05$). As Figures 2 and 3 illustrated, the slope of BAZ and HAZ curves in both sexes indicating a shortage relative proportions to the WHO standard.

As Table 4 demonstrates, significant correlation was observed between sleep time, birth weight, and food security ($P < 0.05$), while the rest of the variables including age, family size, number of children, parents' education, playing computer games, and playing outdoors showed no significant relation ($P > 0.05$).

Discussion

The present study revealed, food security has significant effect on both genders. Food security as one of the main

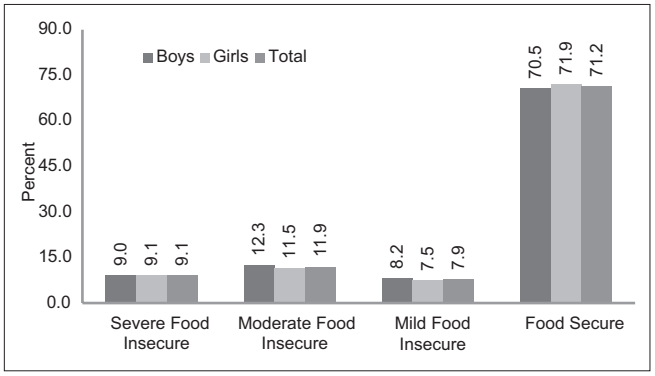

Figure 1: Gender-based comparison of food security among children

Table 1: Comparison of the anthropometric indices based on food security between girls and boys

Index	Severe insecure				Moderate insecure				Mild insecure				Secure			
	Girls	Boys	*p*	Total	Girls	Boys	*p*	Total	Girls	Boys	*p*	Total	Girls	Boys	*p*	Total
BMI	15.15±1.89	15.44±2.09	0.06	15.30±2.00[a]	15.05±1.76	15.42±1.66	0.002*	15.25±1.71[a]	15.03±1.60	15.52±1.71	0.001*	15.30±1.68[a]	15.34±1.80	15.67±1.86	0.001*	15.51±1.84[b]
WAZ	-0.51±1.13	-0.42±1.20	0.33	-0.46±1.16[a]	-0.42±1.01	-0.37±1.07	0.55	-0.39±1.04[a]	-0.52±1.01	-0.24±1.16	0.03*	-0.37±1.10[a]	-0.23±1.10	-0.10±1.17	0.001*	-0.16±1.14[b]
HAZ	-0.54±1.25	-0.49±1.35	0.60	-0.52±1.30[a]	-0.33±1.18	-0.41±1.32	0.37	-0.37±1.26[a]	-0.50±1.31	-0.31±1.36	0.09	-0.40±1.34[a]	-0.28±1.35	-0.20±1.37	0.02*	-0.24±1.36[b]
BAZ	-0.29±1.37	-0.15±1.57	0.22	-0.22±1.47[a]	-0.34±1.26	-0.18±1.31	0.07	-0.25±1.29[a]	-0.37±1.19	-0.07±1.28	0.004*	-0.21±1.25[a]	-0.17±1.24	0.01±1.36	0.001*	-0.08±1.30[b]
WHZ	-0.29±1.32	-0.21±1.51	0.45	-0.25±1.42[a]	-0.35±1.24	-0.22±1.25	0.12	-0.28±1.24[a]	-0.37±1.18	-0.10±1.26	0.009*	-0.22±1.23[ab]	-0.15±1.24	-0.01±1.34	0.001*	-0.08±1.29[b]

*[ab]Values in the same column with different superscripts are significantly different at $P<0.05$ based on one-way ANOVA and Tukey's comparison multiple *post-hoc* test

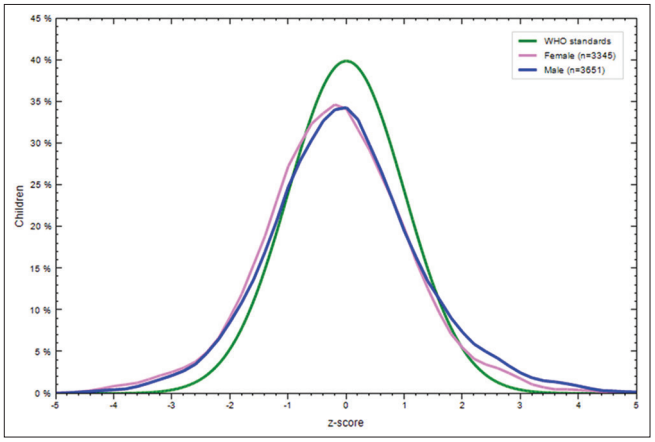

Figure 2: Gender-based comparison of BAZ *Z*-score with WHO standard

key factor has an important role in both children and adult health. It is strongly related to household income and can affect both physical and mental health of family.[14] Previous studies showed that one of the main food insecurity consequences is its effects on anthropometrical indices of children,[15] which is also noted in the present study as well. Along with previous studies, in the present study it showed, child's BMI had positive correlation with household food security status.[16–18] Unfortunately, food insecurity works as a double blade sword. It not only can decelerate height of children, but also can increase their weight in a noteworthy proportion of preschool-aged children as the literature has explored.[15] Even though the present study showed about 70% food security among studied population, some important factors should be noted. First of all, food security questionnaire has many challenges which under/over reporting is one of the common problem.[19] For example, some over reporting might exist due to Persians' family pride, which is related to Iranian culture.[20] Therefore, it is good to note these facts to have better conclusion.

Nutritionally-related health patterns in the Middle East have changed significantly during the last two decades. These changes are mirrored in nutritional and health upshots. Rising obesity rates and high levels of chronic and degenerative diseases are observed. While several countries of the region have obesity rates exceeding 30%, rates of undernutrition, particularly stunting, among under-five children in low- and middle-income countries remain high.[21] The present study, likewise global data, stunting was the major risk. Payandeh *et al*.[22] found high risk of stunting in Iranian children. Prevalence estimations for stunting and overweight are relatively robust. It is, therefore, possible to track global and regional changes in these two conditions over time.[23] A key indicator of chronic malnutrition is stunting based on the WHO child growth standards. Weight and height both reflect the size of the individual. However, weight by itself is a poor indicator of thinness or obesity. Moreover, despite the benefits of BMI in this issue, due to the effect of height on BAZ of

Table 2: Mother's idea about eating and activity of their children

Variable	Boys (*n*=3674)	Girls (*n*=3354)	Total (*n*=7028)	*p*
Overeating foods				
Over eating	206 (5.6)	143 (4.3)	349 (5.0)	0.016*
Normal eating	3453 (94.0)	3199 (95.4)	6652 (94.6)	
Not sure	15 (0.4)	12 (0.4)	27 (0.4)	
Picky eating				
Yes	1764 (48.0)	1570 (46.8)	3334 (47.4)	0.360
No	1897 (51.6)	1779 (53.0)	3676 (52.3)	
Not sure	13 (0.4)	5 (0.1)	18 (0.3)	
Child activity				
Low	168 (4.6)	180 (5.4)	348 (5.0)	0.130
Normal	3498 (95.2)	3167 (94.4)	6665 (94.8)	
Not sure	8 (0.2)	7 (0.2)	15 (0.2)	
Eating breakfast				
Regular	2879 (78.4)	2578 (76.9)	5457 (77.6)	0.132
Irregular	795 (21.6)	776 (23.1)	1571 (22.4)	
Number of main food (*n*)				
1	18 (0.5)	33 (1.0)	51 (0.7)	0.202
2	571 (15.5)	543 (16.2)	1114 (15.9)	
3	2961 (80.6)	2667 (79.5)	5628 (80.1)	
4	96 (2.6)	77 (2.3)	173 (2.5)	
5	28 (0.8)	34 (1.0)	62 (0.9)	
Number of snacks (*n*)				
0	155 (4.2)	115 (3.4)	270 (3.8)	0.643
1	801 (21.8)	781 (23.3)	1582 (22.5)	
2	1890 (51.4)	1710 (51.0)	3600 (51.2)	
3	578 (15.7)	535 (16.0)	1113 (15.8)	
4	150 (4.1)	141 (4.2)	291 (4.1)	
5	100 (2.7)	72 (2.1)	172 (2.4)	
Mother's perception of her child weight status				
He/she is thin	1218 (33.2)	1144 (34.1)	2362 (33.6)	0.447
He/she is normal	2363 (64.3)	2122 (63.3)	4485 (63.8)	
He/she is overweight	44 (1.2)	49 (1.5)	93 (1.3)	
He/she is obese	19 (0.5)	20 (0.6)	39 (0.6)	
Not sure	30 (0.8)	19 (0.6)	49 (0.7)	
Mother's idea on chubby child				
It is sign of health	122 (3.3)	98 (2.9)	220 (3.1)	0.609
It is not sign of health	3507 (95.5)	3220 (96.0)	6727 (95.7)	
Not sure	45 (1.2)	36 (1.1)	81 (1.2)	

*Based on Mann–Whitney U test.

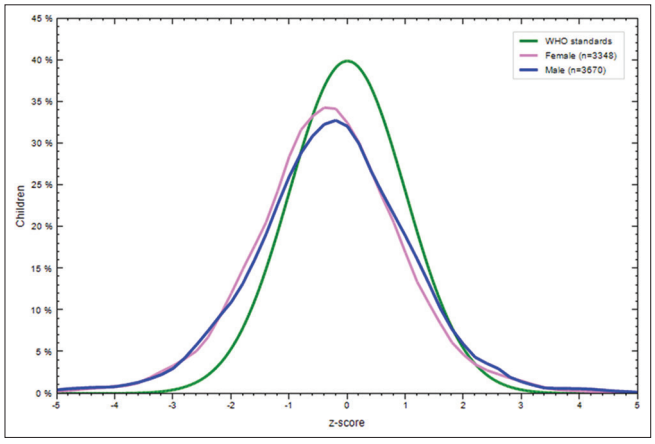

Figure 3: Gender-based comparison of HAZ *Z*-score with WHO standard

children, reports about obesity and overweight could be a false alarm in some of studies due to low HAZ. Even in normal WAZ for children, low HAZ lead to higher BAZ.

Concerning the differences between mothers' belief on their child nibbling, it should be noted that in traditional communities still we could see parents treat boys and girls differently which might explain this result as it was seen in previous studies as well which follows gender schema theories.[24–28] Even though about 53% of mothers of the girls believe that their daughter has nibbling, while 51% of boys' mothers have similar idea, no significant difference was observed. This finding was similar to the Southampton Women's Survey (SWS) as one of the largest study in this area.[29] Moreover,

Table 3: Comparison of influenced factors on BMI between girls and boys

	Boys (*n*=3674)	Girls (*n*=3354)	Total (*n*=7028)	*p*
Age	41.72±10.16	41.96±10.36	41.83±10.25	0.334
Breastfeeding duration (month)	19.67±9.13	19.57±8.58	19.62±8.87	0.656
Watching TV (min)	135.18±101.81	132.81±99.45	134.05±100.69	0.326
Playing computer games (min)	38.95±64.35	33.72±59.21	36.45±62.00	0.001*
Playing outdoors (min)	142.94±121.48	127.08±114.63	135.37±118.52	0.001*
Sleep time (hours)	10.89±1.57	10.96±1.52	10.92±1.55	0.074
Birth weight (kg)	3.26±0.54	3.16±0.52	3.22±0.53	0.001*
Present weight (kg)	15.10±2.85	14.44±2.69	14.79±2.79	0.001*
Height	98.22±7.89	97.13±7.73	97.70±7.83	0.001*
BMI	15.61±1.85	15.26±1.79	15.44±1.83	0.001*
Weight-for-age	−0.17±1.17	−0.30±1.09	−0.23±1.13	0.001*
Height-for-age	−0.26±1.36	−0.33±1.32	−0.29±1.34	0.030*
BMI-for-age	−0.04±1.37	−0.22±1.25	−0.12±1.32	0.001*
Weight-for-height	−0.06±1.34	−0.20±1.24	−0.13±1.30	0.001*

*Based on independent sample t-test.

Table 4: Comparison of the correlation/regression of BMI and affected factors between girls and boys

Variables	Unstandardized coefficients		Standardized coefficients		t		*R*		Sig.		Correlations			
	B		Beta								Zero-order		Partial	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Age	0.002	0.0001	0.031	0.0001	1.827	−0.021	0.036	0.005	0.068	0.983	0.036	0.005	0.030	0.0001
Family size	−0.016	−0.017	−0.025	−0.029	−1.405	−1.587	0.021	0.031	0.160	0.113	−0.022	−0.031	−0.023	−0.027
Number of children	0.011	0.024	0.006	0.014	0.338	0.784	0.009	0.007	0.736	0.433	−0.009	−0.007	0.006	0.014
Mother education	−0.002	0.009	−0.005	0.027	−0.246	1.208	0.008	0.015	0.806	0.227	0.011	0.035	−0.004	0.021
Father education	0.004	-0.003	0.009	−0.009	0.454	−0.432	0.018	0.005	0.650	0.666	0.016	0.018	0.008	−0.007
Breastfeeding Duration (month)	−0.002	−0.001	−0.037	−0.023	−2.204	−1.319	0.024	0.011	0.028	0.187	−0.024	−0.011	−0.036	−0.023
Watching TV (min)	0.0001	0.0001	0.0001	−0.003	0.0001	−0.186	0.014	0.005	1.000	0.852	0.014	0.005	0.000	−0.003
Playing computer games (min)	0.0001	0.0001	0.023	0.025	1.376	1.423	0.034	0.030	0.169	0.155	0.034	0.030	0.023	0.025
Playing outdoors (min)	0.0001	0.0001	0.023	0.017	1.339	0.979	0.025	0.018	0.181	0.328	0.025	0.018	0.022	0.017
Sleep time (hours)	−0.007	−0.018	−0.019	−0.056	−1.109	−3.182	0.022	0.054	0.268	0.001*	−0.022	−0.054	−0.018	−0.055
Birth weight (kg)	0.093	0.095	0.091	0.103	5.384	5.828	0.085	0.099	0.0001*	0.0001*	0.086	0.099	0.089	0.100
Number of main eating	0.002	0.013	0.002	0.013	0.122	0.742	0.004	0.007	0.903	0.458	−0.004	0.007	0.002	0.013
Number of snacks	0.020	0.005	0.035	0.011	2.096	0.608	0.039	0.016	0.036*	0.543	0.039	0.016	0.035	0.011
Food security	0.018	0.020	0.034	0.042	2.047	2.405	0.034	0.042	0.041*	0.016*	0.034	0.042	0.034	0.042

*Correlation analysis based on Pearson and Spearman Rho regarding quantitative or qualitative variables. *R* was calculated using multiple regression test.

this fact should not be forgotten that many studies confirmed that many parents did not even identify that their children were overweight and, as shown in other studies, tended to be unconcerned about the issue.[30,31] A parent's awareness about their child's overweight status is a chief herald or determinant of preventative actions. Acknowledgment of and fear for, overweight may be vapid by the parent's own weight status, whereas engaging in healthy behaviors at home may promote healthy weight status.[32]

In conclusion, it should be noted that preschool children are most vital and vulnerable to the hazards of undernutrition or overweight and obesity, which could affect the whole health of the person. All efforts should be prepared so that preschool children are given a balanced and nutritious home-based diet.[33]

Conclusion

As food security affects children's BMI, and 2–5 years old children's life are the most vital and susceptible to the

threats of undernutrition or overweight and obesity, which could affect the whole health of the person., in order to improve child's health status and community health, it is essential to focus more on this issue.

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Conflicts of interest

There are no conflicts of interest.

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