

Original

Dietary habits associated with obesity among adolescents in Dubai, United Arab Emirates

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Abstract

Aim: to study the association between the dietary habits and behavioural factors with the increased risk of obesity amongst adolescents in Dubai, United Arab Emirates (UAE).

Method: A cross-sectional study was carried out among 661 adolescents (324 boys and 337 girls) aged 12 to 17 years selected by means of a multistage stratified random sampling technique.

Results: The highest percentage of obesity was observed at 14 years of age in boys (30.5%) and at 13 years of age in girls (35.4%). There was a significant association between the frequency of eating breakfast ($P = 0.048$), snacking between breakfast and lunch ($P = 0.044$), and obesity in girls but not in boys. A high risk of obesity was associated with eating breakfast at school in both boys (OR = 3.0; CI 1.1-8.3) and girls (OR = 3.4; CI 1.6-7.4). Fast foods showed a significant association with obesity in girls ($P = 0.007$), but not in boys ($P = 0.745$). The risk of obesity was higher in boys who ate fast foods at home (OR = 1.3; CI 0.5-3.2) but less in girls (OR = 0.2; CI 0.1-1.0).

Conclusion: Intervention programs focused on promoting changes in lifestyles, food habits and increasing physical activity need to be implemented at the earliest.

(Nutr Hosp. 2009;24:437-444)

Key words: *Adolescents. Diet. Lifestyle. Dubai.*

Introduction

A disturbing increase in the prevalence of overweight and obesity among children has taken place over the past twenty years in both the developing and developed coun-

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Recibido: 25-VI-2008.
Aceptado: 14-VIII-2008.

HÁBITOS DIETÉTICOS ASOCIADOS CON LA OBESIDAD EN LOS ADOLESCENTES DE DUBAI, EMIRATOS ÁRABES UNIDOS

Resumen

Objetivo: estudiar la asociación entre los hábitos dietéticos y los factores del comportamiento con el riesgo aumentado de obesidad en los adolescentes de Dubai, Emiratos Árabes Unidos (EAU.)

Método: Se realizó un estudio transversal en 661 adolescentes (324 chicos y 337 chicas) con edades entre 12 y 17 años seleccionados mediante una técnica de muestreo aleatoria estratificada de múltiples etapas.

Resultados: el mayor porcentaje de obesidad se observó en los chicos de 14 años de edad (30,5%) y en las chicas de 13 años (35,4%). Hubo una asociación significativa entre la frecuencia de desayunar ($P = 0,048$), merendar entre el desayuno y la comida ($P = 0,044$) y la obesidad en las chicas pero no en los chicos. El riesgo elevado de obesidad se asoció con desayunar en el colegio tanto en los niños (OR = 3,0; IC 1,1-8,3) como en las niñas (OR = 3,4; IC 1,6-7,4). La comida rápida mostró una asociación significativa con la obesidad en las niñas ($P = 0,007$), pero no en los niños ($P = 0,745$). El riesgo de obesidad fue mayor en los chicos que comían comida rápida en casa (OR = 1,3; IC 0,5-3,2) pero menos en las niñas (OR = 0,2; IC 0,1-1,0).

Conclusión: Se necesita implantar lo antes posible programas de intervención centrados en promocionar los cambios en el estilo de vida, los hábitos de alimentación y aumentar la actividad física.

(Nutr Hosp. 2009;24:437-444)

Palabras clave: *Adolescentes. Dieta. Estilo de vida. Dubai.*

tries.^{1,2} Specifically in the context of the Arabian Gulf countries and the United Arab Emirates in particular, it has been widely reported that obesity has become a major health problem in the past three decades as a result of the economic boom.³ Recent research in the United Arab Emirates (UAE) suggests that the prevalence of childhood obesity is increasing dramatically, already surpassing the high levels of obesity found amongst children and adolescents in the USA and Europe.⁴ In a similar study Al-haddad et al.,⁵ reported that the frequency of obesity is two to three times greater than the recently published international standards in the UAE.

The aetiology of overweight and obesity is clearly multifactorial, but ultimately it is determined by the long-term balance between energy intake and expenditure.⁶ Hence, one of the reasons for fuelling a world-wide increase in obesity in children and adolescents is the change in their food consumption and exercise patterns.⁷ The recent changes in the nutrition environment, including greater reliance on convenience foods and fast foods, a lack of access to fruit and vegetables, and expanding portion sizes, are also widely believed to contribute to the epidemic of childhood obesity.⁸ In the Arabian Gulf, the traditional diet, characterized as a high-fibre content and low in fat, has changed to a more westernized diet with a high content of fat, free sugars, sodium and cholesterol.⁹ In addition, with the availability of cars, life has become more sedentary, and the pattern of exercise has diminished steeply.³ In particular, children today seem less likely to walk to school and travel more in cars than they did during the early 1970s, perhaps because of changes in the built environment.¹⁰ Additionally, children spend more time viewing television and using computers and their greater exposure to TV and videos may influence children's consumption of unhealthy foods.¹¹ Studies among male university students in the UAE indicate that that social and lifestyle factors are important factors in the occurrence of obesity, and the risk of obesity was high among those who watched television for more than four hours a day (RR=1.31), were not engaged in sport (RR = 1.77) and had a car (RR = 1.23).¹² Although, the rise of overweight and obesity in the UAE has been documented by researchers,¹³⁻¹⁵ studies regarding lifestyle factors associated with obesity among UAE adolescents are at most scanty. Hence, this study is an attempt to evaluate the association between some dietary and behavioural factors which lead to an increased risk of obesity in Dubai adolescents.

Methods

Subjects: The study population included U.A.E nationals, male and female students, aged 12 to 17 years. A representative sample of these adolescents (661 students, 324 boys and 337 girls) was selected from schools using a multistage stratified random sampling technique and stratified by sex and school type (preparatory and secondary). The sample was selected from between different educational grades and geographical areas of Dubai (within the preparatory and secondary school levels) to ensure that the appropriate age groups and different strata of the target population were represented. Only the national adolescents were included in the study. Ages and dates of birth were verified against school records, which in turn were based on the birth certificates. The study was approved by the Research Ethics Committee of the Ministry of Health, Dubai Medical District. All adolescents, parents and teachers were clearly informed about the purpose and

content of the study and written consent was obtained from the parents.

Anthropometric measurements: Weight and height were measured using the standard procedure as described earlier.¹⁵ Weight was measured to the nearest 0.1 kg using an electronic portable scale (Seca). To ensure accuracy in measurement the scale was checked for a zero reading before each weighing and calibrated with a known weight on the morning of each data collection. Furthermore, both weight and height measurements were carried out by one person to avoid interpersonal error. The height of the student height was measured, in the standing position, to the nearest 0.1 cm using a portable stadiometer which was attached to the "Seca" weighing scale. The student was asked to stand without shoes and socks, back against the scale, heels together and head in the upright position. The movable headboard was lowered until it firmly touched the upper part of the subject's head and a direct reading of height was obtained.

The body mass index (BMI) (weight in kilograms divided by height in meters squared) was computed to determine overweight and obesity among adolescents using the cut-off values as recommended by the World Health Organization (WHO, 1995) as follows:

Underweight: < 5th percentile of BMI for age
Normal weight: 5th to < 85th percentile of BMI for age
Overweight: 85th to < 95th percentile of BMI for age
Obese : ≥ 95th percentile of BMI for age.

For the purpose of this paper the adolescents were divided into two categories: non-obese, which included underweight and normal weight adolescents (< 85th percentile of BMI for age), and obese: which included overweight and obese adolescents (> 85th of BMI for age).

Dietary and behavioural habits assessment: Many of the questions used in the family study questionnaire were adapted from the Family Eating and Activity Habits Questionnaire, developed and validated by Golan and Weizman.¹⁶ The content validity of this questionnaire was determined by a group of 5 experts in the field of nutrition, epidemiology, and public health for clarity and appropriateness. The questionnaire was pre-tested twice, during the development stage and prior to data collection and was translated into Arabic and back into English. A language expert then checked the translation to ensure that the meaning of the questions was essentially the same in both the Arabic and English versions.

A preliminary version of the questionnaire was piloted prior to actual data collection. Questions that resulted in ambiguous answers on pilot testing were subsequently reworded to enhance clarity. A nutritionist then administered the final version of the questionnaire to both male and female adolescents to obtain

information on the socio-demographic characteristics (age and sex) and dietary/behavioural habits (eating breakfast daily, snacking habits, eating meals with the family, eating meals while watching the television etc.).

A statistical analysis was performed using the SPSS (version 15) software package. Chi-square statistics were used to determine the presence of an association between the variables. Odds ratio (OR) and confidence intervals (CI) were used to quantify the strength of association between obesity risk and each of the other variables.

Results

The prevalence of overweight and obesity among Dubai male and female adolescents as assessed by the WHO (1995) reference data are seen in table I. The proportion of overweight (18.5%) and obese males (22.2%) was higher than that of overweight (13.1%) and obese (20.5%) females. Obesity was highest among boys at 12 years of age (32.4%) followed by 14 years (30.5%). A decline in obesity with age was observed, the lowest proportion of obese boys was at 17 years of age (12.5%). Overweight in boys was highest at 16 years of age (25.5%) though a decline was seen the following year (16.7%). In girls, the highest percentage of obesity was at 13 and 14 years of age (35.4% and 25.4% respectively). Overweight was the highest at 17 years of age (19.0%) and seemed to increase from the previous year (14.3%). About 66.5% of adolescent girls were in the normal weight group.

The crude association between dietary habits and obesity among Dubai adolescents is presented in table

II. The risk of obesity decreased among girls who always (OR = 0.5; CI 0.2-1.0) and frequently (OR = 0.9; CI 0.5-1.7) ate breakfast, compared to those who never ate breakfast. The case was similar with boys who always (OR = 0.6; CI 0.3-1.4) and frequently (OR = 0.7; CI 0.3-1.5) ate breakfast. The association between obesity and frequency of breakfast intake was significant among girls (P = 0.048) but not in boys. A high risk of obesity was associated with eating breakfast at school in boys (OR = 3.0; CI 1.1-8.3) and in girls (OR = 3.4; CI 1.6-7.4). This is nearly three times more than the risk of eating breakfast at home for boys (OR = 1.4; CI 0.6-3.5) and girls (OR = 1.2; CI 0.6-2.6) respectively. There was a statistically significant difference between, snacking in between breakfast and lunch and obesity in girls (P = 0.044) but not in boys. Midnight snacking was significantly associated with obesity in boys (P = 0.050), but not in girls (P = 0.161). However, compared to the reference group, the obesity risk was higher in girls who always consumed midnight snacks (OR = 1.2; CI 0.6-2.2), but was not so in boys (OR = 0.5; CI 0.2-1.0).

The crude association between behavioural habits and obesity in Dubai adolescent is presented in table III. The risk of obesity increased in boys who sometimes (OR = 1.1; CI 0.6-1.0) and always (OR = 1.1; CI 0.6-2.1) ate while watching TV, compared to those who never ate while watching TV. In contrast, there was a decrease in the risk of obesity in girls who sometimes (OR = 0.5; CI 0.3-1.0) and always (OR = 0.6; CI 0.3-1.2) ate while watching TV, compared to the reference group. The risk of obesity was higher in boys (OR = 1.1; CI 0.6-2.1) and girls (OR = 1.2; CI 0.7-2.1) who ate lunch with the family compared to those who ate alone. In the case of supper, the risk of obesity were

Table I
Weight status based on BMI categories among Dubai adolescents age 12-17 years

Age (years)	N	BMI					
		Non-obese		Overweight		Obese	
		Count	%	Count	%	Count	%
<i>Males</i>							
12	37	16	43.2	9	24.3	12	32.4
13	59	38	64.4	8	13.6	13	22.0
14	82	44	53.7	13	15.9	25	30.5
15	51	31	60.8	10	19.6	10	19.6
16	47	29	61.7	12	25.5	6	12.8
17	48	34	70.8	8	16.7	6	12.5
Total	324	192	59.3	60	18.5	72	22.2
<i>Females</i>							
12	15	12	80.0	1	6.7	2	13.3
13	65	32	49.2	10	15.4	23	35.4
14	131	45	67.2	5	7.5	17	25.4
15	64	46	71.9	7	10.9	11	17.2
16	63	46	73.0	9	14.3	8	12.7
17	63	43	68.3	12	19.0	8	12.7
Total	337	224	66.5	44	13.1	69	20.5

Table II
Crude association between dietary habits and obesity in Dubai adolescents by gender

	Males					Females						
	Non-obese		Obese		P-value	Odds Ratio (95% CI)	Non-obese		Obese		P-value	Odds Ratio (95% CI)
	< 85 th P	> = 85 th P	< 85 th P	> = 85 th P			n	%	n	%		
n	%	n	%			n	%	n	%			
<i>How often do you eat breakfast?</i>												
Never	16	50.0	16	50.0		1.0*	38	61.3	24	38.7		1.0*
Frequently	89	59.7	60	40.3	0.523	0.7 (0.3-1.5)	121	63.4	70	36.6	0.048	0.9 (0.5-1.7)
Always	87	60.8	56	39.2		0.6 (0.3-1.4)	65	77.4	19	22.6		0.5 (0.2-1.0)
<i>Where do you eat breakfast?</i>												
Never	16	69.6	7	30.4		1.0*	38	76.0	12	24.0		1.0*
At home	150	62.2	91	37.8	0.017	1.4 (0.6-3.5)	145	71.8	57	28.2	0.000	1.2 (0.6-2.6)
At school	26	43.3	34	56.7		3.0 (1.1-8.3)	41	48.2	44	51.8		3.4 (1.6-7.4)
<i>Do you snack between breakfast and lunch?</i>												
Never	30	49.2	31	50.8		1.0*	46	55.4	37	44.6		1.0*
Frequently	87	62.6	52	37.4	0.194	0.6 (0.3-1.1)	118	71.1	48	28.9	0.044	0.5 (0.3-0.9)
Always	75	60.5	49	39.5		0.6 (0.3-1.2)	60	68.2	28	31.8		0.6 (0.3-1.1)
<i>Do you eat midnight snacks?</i>												
Never	62	57.4	46	42.6		1.0*	81	63.3	47	36.7		1.0*
Frequently	90	55.6	72	44.4	0.050	1.1 (0.7-1.8)	109	71.7	43	28.3	0.161	0.7 (0.4-1.1)
Always	40	74.1	14	25.9		0.5 (0.2-1.0)	34	59.6	23	40.4		1.2 (0.6-2.2)

* Reference value.

higher in boys (OR = 1.5; CI 0.9-2.7) but lower in girls (OR = 0.8; CI 0.5-1.3). The location of the consumption of fast foods was not significantly associated with obesity, however the risk of obesity was higher in boys who ate fast foods at home (OR = 1.3; CI 0.5-3.2), but lower in girls (OR = 0.2; CI 0.1-1.0).

The crude association between necessary and non-necessary food intake and obesity among Dubai adolescents is presented in Table IV. There was a statistically significant difference between the frequency of meat consumption and obesity in girls (P = 0.024) but not in boys. Boys who consumed meat more than 4 times a week had a higher risk of obesity (OR = 0.7; CI 0.4-1.4) compared to girls (OR = 0.1; CI 0.02-1.0). The risk of obesity with fish intake was higher in girls (OR = 1.3; CI 0.7-2.1) compared to boys (OR = 1.0; CI 0.6-1.7). Boys had a higher risk of obesity with consumption of dairy products (OR = 1.1; CI 0.7-1.7) compared to girls (OR = 0.8; CI 0.5-1.3). Consumption of fruits was significantly associated with obesity in boys (P = 0.041); though the risk of obesity decreased (OR = 0.6; CI 0.4-1.0). There was a significant association between the consumption of chocolates and sweets (P = 0.002), soft drinks (P = 0.006) and fast foods (P = 0.007) and obesity in girls but not in boys. However, the risk of obesity were double that for boys compared to girls: chocolates and sweets (OR = 1.0; CI 0.7-1.6 and OR = 0.5; CI 0.3-1.8 respectively), soft drinks (OR = 0.8; CI 0.5-1.2 and OR = 0.5; CI 0.3-0.8 respec-

tively), fast foods (OR = 1.1; CI 0.7-1.7 and OR = 0.5; CI 0.3-0.8 respectively).

Discussion

The higher proportions of obesity observed amongst adolescents in Dubai the UAE are in concurrence with previous reports that showed that 22.9% girls and 20.2% boys in UAE were overweight and obese.¹⁴ The prevalence of obesity among girls in this study is higher than that reported for female students in Saudi Arabia where overweight and obesity were 20% and 11% respectively.¹⁷ The main reasons for the rising levels of obesity are the improved socio-economic status of many Middle East countries, which makes life more sedentary and is coupled with diminished patterns of exercise.³

The findings that missing breakfast was significantly related to the weight status of female adolescents are in accordance with observations made among adolescents in Brazil and in the Gulf region.^{18,19} Skipping breakfast is a reflection of a dieting technique practiced by girls, and studies in the US indicated that 32% of female college students aged 18 to 24 years skip breakfast as means of weight control.²⁰ It is reported that the emergence of dieting among girls is most prevalent at 13 and 14 years of age and remains prevalent throughout adulthood.²¹ It is also possible

Table III
Crude association between behavioral factors and obesity in Dubai adolescents by gender

	Males					Females						
	Non-obese		Obese		P-value	Odds Ratio (95% CI)	Non-obese		Obese		P-value	Odds Ratio (95% CI)
	< 85 th P	> = 85 th P	< 85 th P	> = 85 th P			n	%	n	%		
n	%	n	%			n	%	n	%			
<i>Eating while watching TV</i>												
Never	36	61.0	23	39.0		1.0*	34	55.7	27	44.3		1.0*
Sometimes	97	58.8	68	41.2	0.954	1.1 (0.6-1.10)	105	70.5	44	29.5	0.120	0.5 (0.3-1.0)
Always	59	59.0	41	41.0		1.1 (0.6-2.1)	85	66.9	42	33.1		0.6 (0.3-1.2)
<i>Eating while bored</i>												
Never	107	59.1	74	40.9		1.0*	98	66.7	49	33.3		1.0*
Sometimes	65	60.2	43	39.8	0.949	1.0 (0.6-1.6)	94	66.7	47	33.3	0.983	1.0 (0.6-1.6)
Always	20	57.1	15	42.9		1.1 (0.5-2.3)	32	65.3	17	34.7		1.1 (0.5-2.1)
<i>Eating when depressed and upset</i>												
Never	125	59.0	87	41.0		1.0*	134	65.0	72	35.0		1.0*
Sometimes	43	55.8	34	44.2	0.441	1.1 (0.7-1.9)	68	70.1	29	29.9	0.667	0.8 (0.5-1.3)
Always	24	68.6	11			0.7 (0.3-1.4)	22	64.7	12	35.3		1.0 (0.5-2.2)
<i>With whom do you eat lunch?</i>												
Alone	31	62.0	19	38.0		1.0*	53	69.7	23	30.3		1.0*
With family	161	58.8	113	41.2	0.668	1.1 (0.6-2.1)	171	65.5	90	34.5	0.493	1.2 (0.7-2.1)
<i>With whom do you eat supper?</i>												
Alone	45	67.2	22	32.8		1.0*	48	62.3	29	37.7		1.0*
With family	147	57.2	110	42.8	0.139	1.5 (0.9-2.7)	176	67.7	84	32.3	0.382	0.8 (0.5-1.3)
<i>Where do you prefer eating your fast food?</i>												
Don't eat	14	53.8	12	46.2		1.0*	5	41.7	7	58.3		1.0*
Home	27	48.2	29	51.8	0.194	1.3 (0.5-3.2)	21	75.0	7	25.0	0.198	0.2 (0.1-1.0)
Restaurant	87	60.4	57	39.6		0.8 (0.3-1.8)	96	64.9	52	35.1		0.4 (0.1-1.3)
Rest. & Home	64	65.3	34	34.7		0.6 (0.3-1.5)	102	68.5	47	31.5		1.3 (0.1-1.1)

* Reference value.

that girls who miss breakfast tend to consume greater amounts of food at lunch thereby gaining weight.

The higher weight status resulting from eating breakfast at school as seen in this study could be due to the consumption of high density foods. Recently, a study by Musaiger et al.,²³ found that foods such as thymes bread and the sausage sandwich commonly served in Bahraini school canteens have greater calorific values. In Bahrain, it was found that beef burgers, liver and egg sandwiches were consumed more by boys, while girls preferred carbonated beverages, cheese, uncarbonated canned drinks and broad beans as a morning snack.²³ Frequent snacking is an important feature of adolescent food consumption, and since many snacks have a high caloric content, the direct relationship between the frequency of snacking and obesity observed in this study may be indicative of increased energy intake.²⁴ Snacking may contribute to weight gain by both providing occasions for consumption of energy-dense foods in between meals, as well as by increasing the frequency of such intake.²⁵ The obser-

vation that midnight snacking was linked to obesity in U.A.E. boys and not in girls, is not entirely unexpected and appears to be related to the social context in which snacking occurs, wherein the UAE adolescents have more opportunity to go out, especially at night.

The practice of consuming meals in front of the television has become very popular among UAE families in recent years and reports indicate that more than half of secondary school girls in the UAE frequently eat while watching television.²³ This is contrary to reports that there exists a positive relationship between obesity and watching television,²⁶ this study indicates no such association between consuming meals while watching television and obesity in both boys and girls. This could be because, it was not the amount of food consumed during television viewing that was associated with the adolescent's BMI but, it was the fat content of the foods.²⁷ This could explain the lack of association as seen in this study. It should, however, be noted that since the type of food consumed during TV viewing was not determined, it is not possible to draw any con-

Table IV
Crude association of food intake with obesity in Dubai adolescents by gender

	Males						Females					
	Non-obese		Obese		P-value	Odds Ratio (95% CI)	Non-obese		Obese		P-value	Odds Ratio (95% CI)
	< 85 th P	> = 85 th P	< 85 th P	> = 85 th P			n	%	n	%		
n	%	n	%			n	%	n	%			
<i>Meat</i>												
1-3 times a week	162	58.3	116	41.7		1.0*	210	65.2	112	34.8		1.0*
≥ 4 times a week	30	65.2	16	34.8	0.375	0.7 (0.4-1.4)	14	93.3	1	6.7	0.024	0.1 (0.02-1.0)
<i>Chicken</i>												
1-3 times a week	114	57.9	83	42.1		1.0*	115	62.2	70	37.8		1.0*
≥ 4 times a week	78	61.4	49	38.6	0.526	0.9 (0.5-1.4)	109	71.7	43	28.3	0.065	0.6 (0.4-1.0)
<i>Fish</i>												
1-3 times a week	134	59.6	91	40.4		1.0*	174	67.7	83	32.3		1.0*
≥ 4 times a week	58	58.6	41	41.4	0.870	1.0 (0.6-1.7)	50	62.5	30	37.5	0.389	1.3 (0.7-2.1)
<i>Milk & dairy products</i>												
1-3 times a week	76	60.3	50	39.7		1.0*	116	64.1	65	35.9		1.0*
≥ 4 times a week	116	58.6	82	41.4	0.757	1.1 (0.7-1.7)	108	69.2	48	30.8	0.319	0.8 (0.5-1.3)
<i>Legumes</i>												
1-3 times a week	147	57.2	110	42.8		1.0*	196	66.2	100	33.8		1.0*
≥ 4 times a week	45	67.2	22	32.8	0.139	0.7 (0.4-1.2)	28	68.3	13	31.7	0.792	0.9 (0.5-1.8)
<i>Fruit</i>												
1-3 times a week	67	52.3	61	47.7		1.0*	113	66.1	58	33.9		1.0*
≥ 4 times a week	125	63.8	71	36.2	0.041	0.6 (0.4-1.0)	111	66.9	55	33.1	0.879	1.0 (0.6-1.5)
<i>Vegetables</i>												
1-3 times a week	76	59.8	51	40.2		1.0*	93	64.6	51	35.4		1.0*
≥ 4 times a week	116	58.9	81	41.1	0.864	1.0 (0.7-1.6)	131	67.9	62	32.1	0.527	0.9 (0.5-1.4)
<i>Chocolate & sweets</i>												
1-3 times a week	83	59.7	56	40.3		1.0*	58	54.7	48	45.3		1.0*
≥ 4 times a week	109	58.9	76	41.1	0.886	1.0 (0.7-1.6)	166	71.9	65	28.1	0.002	0.5 (0.3-0.8)
<i>Soft drinks</i>												
1-3 times a week	56	54.9	46	45.1		1.0*	82	58.2	59	41.8		1.0*
≥ 4 times a week	136	61.3	86	38.7	0.279	0.8 (0.5-1.2)	142	72.4	54	27.6	0.006	0.5 (0.3-0.8)
<i>Fast food</i>												
1-3 times a week	127	59.9	85	40.1		1.0*	120	60.6	78	39.4		1.0*
≥ 4 times a week	65	58.0	47	42.0	0.745	1.1 (0.7-1.7)	104	74.8	35	25.2	0.007	0.5 (0.3-0.8)

* Reference value.

crete conclusion with regard to the energy content. Another observation in this study was that eating when upset, angry or bored was not associated with an increase in body mass index and obesity in both the genders. It has been reported that that a stressed or depressed state in humans induces either increased comfort food intake and body weight gain or decreased intake and body weight loss.²⁸

Family food habits are a major factor influencing a child's energy intake, which includes not only food selection for meals but also the habit of eating meals

together with parents and other family members.²⁹ The results of this study indicated that eating meals together with the family or alone had no significant relation to obesity in boys and girls. A similar outcome has been reported among American adolescents wherein, it was suggested that although eating family dinner improved diet quality, prevention of overweight was not an additional benefit.³⁰

Daily consumption of fruit and vegetables is an important indicator of a healthy diet and the beneficial effect of lowered BMI has been well documented.³¹

Contrary to expectations, the findings from this study indicate that fruit consumption revealed a significant association with obesity in boys. One plausible explanation could be the consumption of canned fruits packed in syrup in place of fresh fruit resulting in increased calorie consumption. A previous study of Bahraini adults showed that frequent consumption of vegetables was negatively related to obesity whereas, fruit consumption was positively related.²³

The findings that the frequency of eating fast foods was significantly related to obesity in girls but not in boys may be related to a sedentary lifestyle amongst women. As reported by Kerkadi,³² the lack of physical activity due to social and religious norms precludes many UAE female students, especially obese and overweight ones, from engaging in public sports, thereby contributing to their higher weight status. It should also be noted that we found the risk of obesity due to consumption of sweets, soft drinks and fast foods was lower in girls than in boys. One reason could be due to a greater consumption of diet sodas by girls by using portion size control. This leads to the minimizing of overall energy consumption and existing data suggests that portion size influences energy intake.³³ Studies in the Gulf region have reported in recent years that there is a preference for a smaller body size among Arab women.^{34,35} This could also explain the lower overweight and obesity status among girls versus boys as seen in this study. Furthermore, it has been reported that greater involvement in healthy dietary habits is associated with being female.³⁶

The findings from this study suggest that although multiple factors can account for weight gain, the basic cause is an excess of energy intake over expenditure. An obvious reason is the consumption of food prepared outside the home in addition to unhealthy food selection practices thereby resulting in the higher weight status. Since snacks eaten between meals provide up to a quarter of the daily energy intake in some adolescent populations, limiting snacks or replacing them with healthy alternatives may be effective. Activity patterns have changed much in the past decade, making life more sedentary and the need to promote a healthy lifestyle and regular physical activity among adolescents has to become a top priority for health professionals. Understanding the contexts in which adolescents snack and skip meals may help parents and health professionals develop strategies to promote healthy food and lifestyle habits among adolescents.

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