JKAU: Med. Sci., **Vol. 18** No. 2, pp: 27-45 (2011 A.D. / 1432 A.H.)
DOI: 10.4197/Med. 18-2.3

Nutritional Status and Eating Behaviors among Adolescents of Some Intermediate Schools in Jeddah

Thanaa A. Alkoly, PhD**, Asmaa M. AbdAllah,** PhD**,**
and **A.K. Alghamidi,** PhD
Department of Clinical Nutrition, Faculty of Applied Medical Science
King Abdulaziz University, Jeddah, Saudi Arabia
thanaelkholy@yahoo.com

Abstract. This study aims to evaluate healthy food habits and nutritional knowledge amongst adolescents; the impact of the previous factors on their nutritional status and, the influence of food availability and television viewing habits on their eating behaviors. A cross-sectional descriptive study, including 140 Saudi students, male (70) and female (70) from intermediate schools in Jeddah, Kingdom of Saudi Arabia. Validated questionnaires were used to measure the family environment, socio-economic status, dietary habits, nutritional knowledge, hygienic habits, health habits, and anthropometric measurement. Daily dietary intake was conducted using 24 hours recall method. Computer software package was used for diet analysis and compared by RDA. SPSS computer software ver.10 was used in data analysis. The main age was 14.8 ± 0.7 for male and female 14.2 ± 0.9. Fruit intake in boys was 67.2% and girls 50%. Sixty percent of females and 61.4% of males skipped daily meals. Availability of healthy food at home was 61.9% for males and 48.6% females. Sixty-seven point one percent of both genders have 2 meals/day; however, 88.6% of males and 84.3% of females have 3 meals/day. The mean intake of protein for females was 147.3 and 130.8 for males. The mean food intake of studied subjects in comparison to the recommended daily dietary allowances was high. This study shows that eating behaviors for intermediate schools still require development.

Keywords: Nutrition status, Adolescence, Behavior.

Correspondence & reprint request to: Dr. Thanaa A. Alkoly
P.O. Box 80209, Jeddah 21589, Saudi Arabia
Accepted for publication: 26 January 2011. Received: 20 October 2010.

Introduction

Adolescence, the transition from childhood to adult life, is one of the most rapid phases of physical growth. One-third of all the growth in a life time occurs during this stage. Adolescence starts with the onset of puberty[1].

The period of adolescence has wide cultural and individual variation. The World Health Organization (WHO 2007)[2] defines 'young people' as those aged between 10 and 24 years. Adolescents experience periods of rapid growth associated with hormonal, cognitive and emotional changes. These are often confounded by lifestyle changes, such as leaving home, changing schools or starting work. Healthy eating habit during adolescence is an extension of healthy eating during childhood, but often in an environment that relies on snacking and irregular meal patterns [3].

Adolescence with the beginning of puberty, the second period of growth acceleration occurs when the hormonal influences are involved; enormous physical changes take place, including the development of the long bones, the sex characteristics, and fat and muscle mass[4].

The transition from childhood into adolescence often results in diets becoming less healthy. An unhealthy diet during adolescence can negatively affect growth and development, and is likely to persist into adulthood[5].

The rapid development in the economy that took place in Saudi Arabia during the previous decades, resulted in the adoption of a sedentary lifestyle and consumption of high fat and low-fiber diet among adolescents[6].

The gradual growth pattern that characterizes early childhood changes to one of rapid growth and development, affecting both physical and psychological aspects of health. Because all of these changes have a direct impact on the nutrient need and dietary behaviors of adolescents, it is important that health care providers develop a full understanding of how these developmental changes of adolescence can affect nutritional status[7].

The study was carried out amongst adolescent Saudi students of intermediate schools in Jeddah, to evaluate food and health habits as well

as their impact on nutritional status and develop a health program using appropriate communication methods to raise their knowledge and motivate their attitude to practice sound nutritional habits.

Subject and Method

This cross sectional descriptive study was conducted on one hundred and forty adolescents (70 males and 70 females); aged 13-16 years. They were chosen by a systemic random method, recruited from four middle schools in Jeddah, Saudi Arabia. All pupils were in the seventh and eighth grade, from two private middle schools and two government middle schools for male and female. Non Saudi adolescents were excluded. Two male students in the University participated in the data collection from male school under the supervision of the investigator. From November 2008 to January 2009, all the studied individuals were subjected to the following criteria.

Anthropometric Measurements

- Weight and height were measured with the subjects wearing light clothing, without shoes and were recorded to the nearest 0.1 kg, and 0.1 cm, respectively. Waist circumference was recorded according to Kuczmarski *et al*.[8].
- Body mass index (BMI) and BMI percentiles for age and sex were determined based upon the established World Health Organization (WHO 1995) international anthropometrical references[9].
- Underweight in adolescents is defined as a BMI $\leq 5^{th}$ percentile. A normal BMI ranges from the 5^{th} to less than the 85^{th} percentile. Overweight is considered between the 85^{th} to $< 95^{th}$ percentile & obesity as BMI $\geq 95^{th}$ percentile[10]. Assessment of social status of the family was done according to Park and Park (1979)[11].

Daily Dietary Data

1. Data were recorded (three times) about daily dietary intake during interviews using the 24 hours recall method.
2. A questionnaire was used for recording food habits through a personal interview using items from the validated youth and adolescence food frequency questionnaire [12-13].

3. Determination of daily nutrient intake (Dietary behaviors). Nutritional values of consumed food were calculated using computer diet analysis. The adequacy of diets was estimated by using the Recommended Dietary Allowance (1998)[14].

4. Ethical Considerations Permission was attained from the relevant school authorities; the school directors, and their staff.

Statistical analysis has been achieved by using SPSS, Version 10 (1998)[15]. The qualitative data were presented in the form of number and percentage. Chi-square was used as a test of significance for qualitative data. The quantities data were presented in the form of mean, standard deviation and range. One way ANOVA and Student's *t* test was used to compare quantities data. Significance was considered when p value less than 0.05. Insignificance was considered when p value more than 0.05.

Results

The study sample comprised 140 students, 70 (50%) were male and 70 (50%) were female. About 50% of the students were from government schools, and 50% were from private schools. All were at the intermediate level in 7^{th} and 8^{th} grade. Epidemiological features of the studied sample of adolescents at middle schools were presented in Table 1.

It was noticed that the mean age of student was 14.8 ± 0.7 years for male and 14.2 ± 0.9 years for female; the mean weight 57.7 ± 17 for male and 53.3 ± 1.3 for female; the mean height for male and female was 160 ± 10.2 and 155.8 ± 5.9, respectively. The BMI mean for male was 22.6 ± 1.2 and 21.9 ± 1.5 for female. While 70% of the males were at 8^{th} grade compared with 40% of the females.

Mothers' university education was higher among male than females by 58.6% and 41.1%, respectively, while fathers' university education was higher in female than male by 62.9% and 58.5%, respectively. Furthermore, the percentage of working fathers was high in each group, and the majority of the sample family sizes were high from 4 to 10.

Table 2 shows the basic food group consumptions among studied adolescents. The distributions of food groups among males and females according to daily intake > 3 days on weekly consumption, and shows the variation between them. The daily food consumption from different categories is higher among males than females, meat/alternatives daily

consumption among males was 68.6%, while it was 41.4% among females. Fruit consumption was 67.2% among males and only 50% among female. The percent of males who consumed bread daily were slightly higher (75.5%) than females (70%). The percent of rice consumption in male were 47.1% and 40% for females.

Table 1. Epidemiological features of studied adolescents.

Variables	Males		Females	
Age in years (mean ± SD)	14.8 ± 0.7		14.2 ± 0.9	
Weight in Kg (mean ± SD)	57.7 ± 1.7		53.3 ± 1.3	
Height in cm (mean ± SD)	160.6 ± 10.2		155.8 ± 5.9	
Body Mass Index (mean ± SD)	22.6 ± 1.2		21.9 ± 1.5	
Waist Circumference (mean ± SD)	78.7 ± 2.8		70.6 ± 3.4	
	No.	**%**	**No.**	**%**
School grades:				
7th grade	21	30	42	60
8th grade	49	70	28	40
Age groups:				
13 - 14years	21	30	42	60
14.1 - 15 years	41	58.6	23	32.9
15.1 - 16 years	8	11.4	5	7.1
Mother's Education				
Illiterate / Primary	8	11.4	11	15.7
Middle / Secondary	21	30	30	42.9
University	41	58.6	29	41.4
Father's Education				
Illiterate / Primary	5	7.2	2	2.8
Middle / Secondary	24	34.3	24	34.3
University	41	58.5	44	62.9
Working Mother				
Yes	33	47.1	18	25.7
No	37	52.9	52	74.3
Working Father				
Yes	68	97.1	65	92.9
No	2	2.9	5	7.1
Family size				
4-10	64	91.5	62	88.5
11-16	6	8.5	8	11.5
Family Income/SR				
From 1000-3000	6	8.5	7	9.9
3000-6000	9	12.9	12	17.0
6000-10000	11	18.6	46	66.0
> 10000	42	60.0	5	7.1

Table 2. Basic food groups consumptions among males and females adolescents.

Food Groups	Males		Females	
	No.	%	No.	%
Meat/Alternatives				
Daily	48	68.6	29	41.4
> 3 days	1	1.4	12	17.1
Weekly	21	30	29	41.4
Milk				
Daily	39	55.7	21	30
> 3 days	5	7.1	10	14.3
Weekly	26	37.2	39	55.7
Vegetables				
Daily	37	52.9	28	40
> 3 days	8	11.4	9	12.9
Weekly	25	35.7	33	47.1
Fruits				
Fresh	47	67.2	35	50
Juice	23	32.8	35	50
Bread/ Alternatives				
Daily	53	75.7	49	70
> 3 days	13	18.6	13	18.6
Weekly	4	5.7	8	11.4
Rice and another cereals				
Daily	33	47.1	28	40
> 3 days	21	30	26	37.1
Weekly	16	22.9	16	22.9

Table 3 shows that the majority of male and female having fast food daily was 97.1% and 90%, respectively; and sleep immediately after meals by 92.9% and 94.3%, respectively. More than 40% of each said that, they do not chew their food. Females seem to watch TV for more than 6 hrs more than males by 41.4%, while only 12.9% for male and both groups consumed food and nuts while they were watching TV. The percentages of adolescents who have physical exercise are high in male compared with female by 84.3% and 52.9%, respectively. As regard to smoking, the female do not smoke and only few 7.1% of the male who do smoke.

Table 4 shows the percent distribution of male and female adolescents by weight categories. The incidence of underweight and normal weight is 72.95% for each of male and female adolescents. Also, the combined prevalence of obesity and overweight was 27.1% in both (male and female) adolescents.

Table 3. Comparison of selected behaviors in male and female adolescents

Food Behaviors	Males		Females	
	No.	%	No.	%
Having Fast foods				
Yes	68	97.1	63	90
No	2	2.9		10
Frequency of fast foods				
Daily	65	92.9	66	94.3
Weekly	4	5.7	4	5.7
Monthly	1	1.4	---	----
Sleeping immediately after meals				
Yes	61	87.1	64	91.4
No	9	12.9	6	8.6
Chewing of food				
Yes	7	10	13	18.6
No	33	47.1	29	41.4
Sometimes	30	42.9	28	40
Having food and nuts during watching T.V.				
Yes	50	71.4	40	57.2
No.	2	2.9	4	5.7
Sometimes	18	25.7	26	37.1
Number of watching T.V. hours				
Three	38	54.2	19	27.2
Five	23	32.9	22	31.4
Number of watching T.V. hours				
> Six	9	12.9	29	41.4
Physical Exercises				
Yes	59	84.3	37	52.9
No	11	15.7	33	47.1
Smoking				
Yes	5	7.1	0	0
No	65	92.9	70	100

Table 4. Percent distribution of levels of BMI in relation to sex.

Body Mass Index	Students Gender				Total	
	Males		Females			
	No	%	No	%	No	%
Under weight	35	50	30	42.9	65	46.4
Normal	16	22.9	21	30	37	26.4
Over weight	10	14.2	15	21.4	25	17.9
Obesity	9	12.9	4	5.7	13	9.3
Total	70	100	70	100	140	100

Table 5 depicts the mean of energy and macronutrients intakes of studied subjects. The average base line levels of energy were 2378.5 and 2362.0 for male and female adolescents, respectively. It can be noticed that the differences in energy intake are not significant. Moreover, it can be noticed that the differences in protein intake were significant at ($p <$

0.05). But in male, total carbohydrates showed a highly significant difference at ($p < 0.01$). The mean total fat as percent of calories intake for male and female in the same table was insignificant.

Table 5. Mean ± SD of energy and macronutrients intakes of studied subjects.

Variables / Nutrients	Male Mean ± SD	Female Mean ± SD	*T.* Test
Energy	2378.5 ± 45.7	2362.0 ± 12.1	0.11
Protein	130.8 ± 8.3	147.3 ± 7.0	1.58*
Fat	60.2 ± 2.6	63.7 ± 1.8	0.43
Carbohydrate	328.3 ± 6.2	299.9 ± 9.2	1.55†

*Differences are significant at $p < 0.05$.
†Differences are highly significant at $p < 0.01$.
‡Differences are highly significant at $p < 0.001$.

Table 6 shows the mean of vitamins intake of male and female adolescents. It can be noticed that the differences in the Vitamin C, Vitamin B12, Pantothenic and Vitamin D intake showed a highly significant difference at ($p < 0.01$). While the differences in Niacin and Vitamin A showed significance at ($p < 0.05$). Other vitamin intakes were of insignificant differences.

Table 6. Mean ± SD of vitamins intakes of studied subjects.

Variables / Vitamins	Male Mean ± SD	Female Mean ± SD	*T.* Test
Vitamin C (mg)	111.5 ± 9.6	87.0 ± 3.5	1.22†
Thiamin (mg)	4.8 ± 0.11	4.5 ± 0.21	0.51
Riboflavin (mg)	3.3 ± 0.12	4.5 ± 0.32	0.46
Niacin (mg)	65.2 ± 4.1	50.9 ± 1.5	1.72*
Pantothenic (mg)	15.5 ± 1.3	15.6 ± 1.2	0.01
Vitamin B6(mg)	6.7 ± 0.32	5.7 ± 0.41	1.12
Folate (mcg)	372.9 ± 8.4	388.5 ± 7.6	0.49
Vitamin B12 (mcg)	7.4 ± 0.54	10.6 ± 0.87	2.41†
Vitamin A (RE)	3568.3 ± 38.7	3932.5 ± 23.1	0.34*
Vitamin E (mg)	7.9 ± 0.45	7.1 ± 0.52	0.71
Vitamin D (mg)	68.8 ± 4.6	128.8 ± 2.9	0.91†
Vitamin K (mg)	19.1 ± 1.2	20.2 ± 1.9	0.28
Cholesterol (mg)	313 ± 11.2	310.6 ± 7.7	0.07

*Differences are significant at $p < 0.05$.
†Differences are highly significant at $p < 0.01$.
‡Differences are highly significant at $p < 0.001$.

Table 7 shows the mean of minerals intakes of male and female adolescents. It can be noticed that the differences in the calcium and potassium intake was highly significant at ($p < 0.01$). However, differences in phosphorus, magnesium and manganese intake were significant at ($p < 0.05$). And the difference in other minerals intake was not significant.

Table 7. Mean ± SD of minerals intakes of studied subjects.

Variables / Minerals	Male Mean ± SD	Female Mean ± SD	*T.* Value
Calcium (mg)	1629 ± 18.5	2674.3 ± 23.3	2.88†
Phosphorus (mg)	3834.9 ± 15.9	4155.4 ± 26.8	0.82*
Magnesium (mg)	1230.4 ± 22.2	1119.8 ± 19.5	0.69*
Iron (mg)	32.3 ±2.7	28.3 ±2 .2	1.02
Zinc (mg)	19.7 ± 1.1	20.2 ± 1.2	0.25
Copper (mg)	2.0 ± 0.12	1.9 ± 0.14	0.24
Manganese (mg)	18.5 ± 1.2	14.9 ± 1..4	1.17*
Selenium (mg)	141.6 ± 4.9	132.7 ± 6.5	1.06
Sodium (mg)	2666.8 ± 28.4	4494.5 ± 35.9	3.58‡
Potassium (mg)	5293.8 ± 23.5	6004.5 ± 34.5	1.45†

**Differences are significant at p< 0.05.*
†Differences are highly significant at p < 0.01.
‡Differences are highly significant at p < 0.001.

Table 8 shows average nutrient intake as a percentage of recommended dietary allowances (RDA) of studied subjects (male and female adolescents). It was noticed that the male adolescents consume (82.02%) calories from RDA and female adolescents consume (107.36) calories from RDA.

Table 8. Average nutrient intake as a percentage of recommended dietary allowances (RDA) of studied subjects.

Nutrients	Male		Female	
	RDA	% of RDA	RDA	% of RDA
Energy (Kcal)	2900	82.02	2200	107.36
Protein (gm)	52	251.53	45	327.33
Fat (gm)	80.55	74.73	61.11	104.23
Carbohydrate(gm)	491.75	66.76	367.5	81.61
Calcium(mg)	1200	135.75	1200	222.85
Phosphorus(mg)	1200	319.57	1200	346.28
Magnesium(mg)	335	367.28	340	329.35
Iron(mg)	12	269.16	15	188.66
Zinc(mg)	15	131.33	12	168.33
Copper(µg)	890	224.72	890	213.48
Manganese (mg)	2.2	840.9	1.6	931.25
Selenium (µg)	45	314.66	47.5	279.36
Sodium (mg)	3000	88.89	3000	149.82
Potassium(mg)	3000	176.46	3000	200.15
Vitamin C (mg)	55	202.73	55	158.18
Thiamin (mg)	1.4	342.86	1.1	409.09
Riboflavin (mg)	1.65	200	1.3	346.15
Niacin (mg)	18.5	352.43	15	329.33
Vitamin B6(mg)	1.85	362.16	1.45	393.1
Folate (mcg)	175	213.08	165	235.45
Vitamin B12 (mcg)	2	370	2	530
Vitamin A (RE)	1000	356.83	800	491.56
Vitamin E (mg)	10	79	8	88.75
Vitamin D (µg)	10	688	10	1288
Vitamin K (µg)	55	34.72	50	40.4

Female adolescents consume (81.6% and 104.2) of carbohydrates and fat respectively as an average from the RDA, while male adolescents consume 66.76% and 74.73% of carbohydrates and fat respectively as an average from the RDA. With regard to average protein intake as a percent of RDA, it was found to be higher in female than the average intake of males by (327.33% and 251.53%), respectively.

Furthermore, for calcium, phosphorus, zinc, and manganese average intake for females as a percentage of RDA was higher than in male adolescents by (222.85%, 346.28%, 168.33% and 931.25%, respectively) for female *vs.* (135.75%, 319.57, 131.33% and 840.9%, respectively) for male.

With regards to average vitamin intake as a percent of RDA, it was noticed that the average intake from Vitamin C, Riboflavin, B6, Folate, B12, A, E, D and K as a percent of RDA for females was higher than it was in males. This was considered a good result as female adolescents in this age group requires increased intake of these specific nutrients.

Discussion

The rising prevalence in overweight adolescents is of particular concern because of the implications for negative effects on their morbidity and mortality in young adulthood. Overweight and obesity is definitely associated with a relative increase in diabetes, cardiovascular disease, various cancers, and respiratory disorders in sleep, gallbladder disease and osteoarthritis. It is an integral component of the metabolic syndrome, which is emerging as a key constellation of risk factors for cardiovascular disease[16].

The main age of the studied adolescents was 14.8 ± 0.7 for male adolescents and 14.2 ± 0.9 for female adolescents. About 50% of males had underweight BMI, but normal weight was 22.9%. In females it was noticed that 42.9%, were underweight for BMI and 30% were of normal weight. Results of the study concluded that more males were under weight at 50% when compared to females at 42.9%. This revealed that male adolescents had physical exercises more than female as shown in Table 3. In general, our adolescents exercise is less than those in developed countries[17]. This may be due to inadequate school physical activity programs for these students. Lack of regular physical activity constitutes a major risk factor for cardiovascular disease[18]. Encouraging

adolescents into a sustainable active lifestyle will influence the incidence of adult heart disease and stroke in the future[19].

The present study shows that overweight females were more than males by 21.4% *vs.* 14.2% as shown in Table 4. These results revealed that the availability of healthy foods at home in males 61.9% was more than in females 48.6%.

The national survey in Egypt investigated by Ismail, 2005[20] showed nearly similar results, where over weight (13.4%) adolescent females were more than male adolescents. Also, he acknowledged that under weight males were more than female adolescents.

Our study revealed that the combined prevalence of obesity and overweight is equal at 27.1% in both genders (the included subjects). These results is in a concordance with those studies in the Eastern province Al-Hasaa, Kingdom of Saudi Arabia, which revealed that the combined prevalence of obesity and overweight was (23.9%)[21],which had the highest prevalence compared to other studies in KSA[22]. While another school-based survey in the Kingdom revealed that the overall prevalence of overweight was 11.7% and obesity was 15.8% (combined prevalence of obesity and overweight 27.5%) among the included subjects aged 6-18 years. The highest prevalence of obesity was recorded in the capital, Riyadh[23].

The present results were also in accordance with the previously mentioned school survey, but lower with regard to the prevalence of obesity. The difference could be explained on the basis of the different age groups included in these studies and / or the methods used for assessing overweight and obesity. A growing body of evidence suggests that increasing the dairy intake by approximately two serving per day could reduce the risk of overweight by up to 70%[24]. In addition, calcium intake was associated with 21% reduce risk of development of insulin resistance among overweight younger adolescents and may reduce the risk of diabetes[25].

In the recent years, with the huge advances in technology and improved living standards, the overall energy intake has increased due to over nutrition. On the other hand, lifestyle is becoming more and more sedentary and energy expenditure is reduced. Our study supported that concept. The apparent differences in the rates observed from different studies carried out in different parts of KSA may be partly attributed to

different socioeconomic status of the study samples, science social class is a pre-cursor to nutritional habit which is a risk factor for overweight and obesity. In addition to different socio-economic status, ethics and genetic difference may account for the variations in the prevalence of obesity between American and Saudi adolescents[26].

The psychosocial environmental model in our study explained most of the variance in fruit intake in both boys 67.2% and girls 50% as shown in Table 2. Previously conducted studies, explained the variance found between boys at 47% and girls at 42%[5,27]. It was less than 30% reported by Baranowski *et al*.[28], and Neumark-Sztainer *et al*.[29]. Differences in results can be caused by differences in measures and analysis methods. In the study of Neumark-Sztainer *et al.*[29], self efficacy, which was the strongest predictor for fruit intake in both boys and girls, however, in the present study did not include the model. Furthermore, in the present study behavior specific measures of psychosocial determinants were used.

Eating behaviors were equal for males and females in the consumption of bread/alternatives and rice/cereals mainly as shown in Table 2.

The present study also shows that the adolescent consumption of fast food was very high (97.1% males, 90% females) as shown in Table 3. The results of Al Beltagy's study[30] in Egypt revealed that most adolescents in the urban areas eat fast food 60.56% compared to 28% among adolescents in the rural areas. It was equal among male and female adolescents in both urban and rural areas.

Eating habits, which affect food preferences, energy consumption and nutrient intakes, are generally developed in early childhood and particularly during adolescence. The home and school environments play a major role in determining a child's attitude, and consumption of individual foods.

The study in Egypt investigated by Al Beltagy[30] using questionnaires about dietary habits, showed that most of the dietary practices of both male and female adolescents were similar but with some variations. Although, more than 60% of studied adolescents were following sound dietary habits in both urban and rural areas, none of them had excellent score for dietary habits. The distribution of good and very good scores was more or less the same among the three groups of

body weight. Male adolescents practiced more sound dietary habits than females.

The food pattern was characterized by irregularity of meal consumption. Although snacks can be a source of needed nutrients, it is important that they do not substitute this for regular meals[31].

Regardless of the regular consumption of breakfast, Niklas *et al*.[32] argued that regular consumption of breakfast may control body weight due to the decrease in fat content in the diet because of the role it plays in minimizing the intake of high energy snacks. Adolescents who eat breakfast consume adequate amount of grains, fruits and dairy product. This result shows that 50% of females and 38% of males having breakfast as shown in Table 3 were consistent with those of both the previous Brazilian as well as Niklas study. Obese and overweight students were significantly missing or infrequently taking breakfast compared to those in the non obese group.

Also our study revealed that 88.6% of male and 84.3% of female adolescents have regular daily meals as shown in Table 3.

Our study showed that 41.4% of female adolescents spent > 6 hours watching TV and 54.2% male adolescents spent only 3 hours watching TV as shown in Table 4. These results concur with the result of Roberts *et al*. (2005)[33], American youths spend 6.5 hours per day or 44.5 hours per week with media. Almost 4 hours per day listening to radio or recorded music, and 45 minutes per day reading magazines or books (not for school).

Moreover, our results revealed that the average nutrient intake of adolescents as percentage of recommended daily allowances (RDA) was extremely high. Macronutrient intake of adolescents in Table 8 conflicts with Table 2 basic food group consumption among male and female adolescents.

Table 8 shows that the percentage of macronutrients intake was high in females compared with males, while Table 2 shows that the percents of food group's consumption for male were high when compared with female adolescents.

However, the results in Table 8 were concordant with the results presented in Table 6 which revealed that the mean intake of protein for

female was higher than male mean intake of protein by (147.3 and 130.8), respectively.

With regard to calcium, phosphorus, zinc, and manganese the average intake for female as percentage of RDA was higher than in male adolescents by (222.85%, 346.28%, 168.33% and 931.25%, respectively) for female *vs.* (135.75%, 319.57%, 131.33%, and 840.9%, respectively) for male as shown in Table 8.

The result of this study demonstrated the complexity of home environmental influences on eating behaviors, given that different environmental factors were related to different eating behaviors, and that correlation was different in boys and girls. From the results, it appeared that gender might be an important factor to consider when designing healthy eating interventions. Setting rules according to unhealthy products and improving television viewing habits may be effective for both genders. For changing boys' eating behaviors, decreasing availability of unhealthy products may be effective, whereas for girls, increasing availability of healthy products seems more important. In the present study, food rules related to healthy food products were not measured. However, results from a recently conducted study[34] suggest that household eating rules related to healthful foods might also be important to consider for adolescents.

Furthermore, given the cross-sectional design of the present study, no causal conclusions can be drawn. Although cross-sectional studies are necessary to understand the relationship between the environment and eating behaviors in adolescents, prospective studies are needed. The influence of parents on adolescents' eating behaviors is often questioned, given the increased autonomy and independence associated with this age.

However, our findings suggest that parents can play an important role in influencing adolescents' eating behaviors. Although the family environment is not limited to the correlations investigated in the present study, the investigated correlations can be useful for generating hypotheses to be tested in future studies. However, the home environment is just one part of the broader environment in which adolescents live. Other important environmental influences for adolescents positioned outside the home, such as the influences from peers, schools, neighborhoods and media need to be explored in future research. Prospective studies are needed to determine causal

relationships between the change in environmental factors and the change in eating behaviors in adolescents.

Conclusions

The present study was based on self-reported measures of environmental factors and eating behaviors, and although, validated questionnaires were used, this can be seen as a limitation of the study. Our limitation is the sample number, the duration of food calculation, and the participant age.

To understand better the relationship between the family environment and eating behaviors in adolescents, it is essential to develop and use objective environmental measures.

Although nutrition vulnerability may in certain respects be lower in adolescence than early childhood, adolescence provides a window of opportunity for long term positive impact that nutrition should be a programmatic priority in adolescents. It is a challenge, however, considering that while health is not a major concern at that age, and promotion of healthy nutrition behaviors is the core element. Furthermore, there is very little data on adolescent nutrition to back up programs and their funding. Adolescents who are not attending school may also be quite difficult to reach in certain settings.

From this research, it can be concluded that the dietary practices of adolescents can still be improved. More health education needs to be carried out in schools and colleges as well as through the mass media to convey the necessity of adopting sound dietary practices in adolescence. Better nutritional information on all products may also need to be provided to help adolescents choose food wisely for better nutrition and health.

A better understanding of adolescent's diet and eating behaviors is essential for relevant education and intervention programs. Additionally, enquiry tools specifically designed for adolescents are directly needed. The enquiry should encompass household food security, food diversity (as an indicator of nutritional quality), eating practices and underlying influences, and physical activity. These tools need to be developed and validated in different settings, in connection with school based or health centre based intervention programs rather than as free standing research,

for higher relevance. Participatory approaches are particularly well suited for research work with adolescents.

References

[1] **Byrd-Bredbenner C, Berning J, Beshgetoor D, Moe G.** *Warldlaw's Perspectives in Nutrition*, 8th ed. McGraw-Hill Higher Education. 2009. 61-75.

[2] **Bearinger LH, Sieving RE, Ferguson J, Sharma V.** Global perspectives on the sexual and reproductive health of adolescents: patterns, prevention, and potential. *Lancet* 2007; **369**(9568): 1220-1231.

[3] **Ministry of Health.** *Food and Nutrition Guidelines for Healthy Adolescents*: *A Background Paper*. Wellington, New Zealand: MOH. 1998.

[4] **Rodwell Williams S, Schlenker ED.** *Nutrition for Growth and Development*. *In*: William's Essential of Nutrition and Diet Therapy. 8th ed. St. Louis, MO.: Mosby Elsevier, 2003. 294.

[5] **Haerens L, Craeynest M, Deforche B, Maes L, Cardon G, De Bourdeaudhuij I**. The contribution of psychosocial and home environmental factors in explaining eating behaviors in adolescents. *Eur J Clin Nutr* 2008; **62**(1): 51–59.

[6] **Abalkhail B, Shawky S.** Comparison between body mass index, triceps skin fold thickness and mid-arm muscle circumference in Saudi adolescents. *Ann Saudi Med* 2002; **22**(5-6): 324-328.

[7] **Mahan, LK, Escott-Stump S.** eds. Krause's Food & Nutrition Therapy**.** 12th ed. St. Louis, MO: Elsevier Saunders, 2008.

[8] **Kuczmarski RJ Ogden CL, Grummer-Strawnl M, Flegal KM, Guoss Wei R.** CDC growth charts; United States. *Advanced Data from Vital and Health Statistics* No 314. Hyatts Ville, Maryland: National Center for Health Statistics. 2000.

[9] **[No authors listed].** The use and interpretation of anthropometry: Report of WHO Expert Committee. *WHO Team Rep Ser* 1995. **854**: 1452.

[10] **Bellizzi MC, Dietz WH.** Workshop and childhood obesity, summery of the discussion. *Am J Clin Nutr* 1999; **70**(1): 173S-175S.

[11] **Park JE. Park K.** *Park's Textbook of Preventive and Social Medicine*. 7th ed. Hessers Barner Sides: Phnat Publisher. 1979. 81.

[12] **Rockett HR, Wolf AM, Colditz GA.** Development and reproducibility of a food frequency questionnaire to occur diets of older children and adolescent. *Jam Diet Assoc* 1995; **95**(3): 336-40.

[13] **Rockett HR, Breitenbach MA, Frazier AL, Witschi J, Wolf AM, Field AE, Colditz GA.** Validation of a youth /adolescent food frequency questionnaire. *Prev Med* 1997; **26**(6): 808-816.

[14] **[No authors listed].** *Recommended Dietary Allowance*, 10th ed. Washington: National Acad Sc, 1998.

[15] Statistical Package for Social Science (SPSS) Computer software, ver. 10. SPSS Company. Chi-square was used as a test of significance for qualitative data. The quantities data were presented in the form of mean, standard deviation and range. One way ANOVA and Student's *t* test London, UK 1998.

[16] **Rubenstein AH.** Obesity: a Modern epidemic. Transaction of the American Clinical and Climatologically Association 2005; **116**: 103-111.

[17] **Kann L, Kinchen SA, Williams BI, Ross JG, Lowry R, Grunbaum JA.** Youth risk behaviors surveillance. United States. *J Sch Health* 2000; **70**(7): 271-286.

[18] **Grundy SM, Balady GJ, Criqui MH, Fletcher G, Greenland P, Hiratzka LF, Houston-Miller N, Kris-Etherton P, Krumholz HM, LaRosa J, Ockene IS, Pearson TA, Reed J, Washington R, Smith SC Jr.** Guide to primary prevention of cardiovascular diseases. A statement for healthcare professionals from the Task Force on Risk Reduction. American Heart Association Science Advisory and Coordinating Committee. *Circulation* 1997; **95**(9): 2329-2331.

[19] **Walton J, Hoerr S, Heine L, Frost S, Roisen D, Berkimer M.** Physical activity and stages of change in fifth and sixth grades. *J Sch Health* 1999; **69**(7): 285-289.

[20] **Ismail M.** *Diet*, *Nutrition and Prevention of Chronic Non-Communicable Disease Survey*, Phase 1, National Nutrition Institute 2005.

[21] **Amin TT, Al-Sultan AI, Ali A.** Overweight and obesity and their association with dietary habits and sociodemographic characteristic among male primary school children in Al-Hassa, Kingdom of Saudi Arabia. *Indian J Community Med* 2008; **33**(3). 172-181.

[22] **El Hazmi MA, Warsy AS.** The prevalence obesity and overweight in 1-18 year old Saudi children. *Ann Saudi Med* 2002; **22**(5-6): 202-207.

[23] **Al-Nuaim AR, Bamgboye EA, Al-Herbish A.** The pattern of growth and obesity in Saudi Arabian male school children. *Int J Obes Relat Metab Disord* 1996; **20**(11): 1000-1005.

[24] **Heaney RP, Davies KM, Barger-Lux MJ.** Calcium and weight: clinical studies. *J Am Coll Nutr* 2002; **21**(2): 1525-1555.

[25] **Pereira MA, Jacobs DR Jr, Van Horn L, Slattery ML, Kartashov AI, Ludwig DS.** Diary consumption, obesity, and insulin resistance syndrome in young adult; The CARDIA study. *JAMA* 2002; **287**(16): 2081-2089.

[26] **Al-Rukban MO.** Obesity among Saudi male adolescents in Riyadh, Saudi Arabia. *Saudi Med J* 2003; **24**(1): 27-33.

[27] **Wind M, De Bourdeaudhuij I, Te Velde S, Sandvik C, Due P, Klepp KI.** Correlates of fruit and vegetable consumption among 11-year-old Belgian-Flemish and Dutch schoolchildren. *J Nutr Educ Behav* 2006; **38**(4): 211-221.

[28] **Baranowski T, Cullen KW, Baranowski J.** Psychosocial correlates of dietary intake: advancing dietary intervention. *Annu Rev Nutr* 1999; **19**: 17-40.

[29] **Neumark-Sztainer D, Wall M, Perry C, Story M.** Correlates of fruit and vegetable intake among adolescents. Findings from Project EAT. *Prev Med* 2003; **37**(3): 198-208.

[30] **Al Beltagy R.** Food Habits among Adolescents in El Gharbia Governorate. Nutrition and Food Science Department, Faculty of Home Economics, Alazhar University, 2008. *Thesis Masters*.

[31] **Bashour HN.** Survey of dietary habits of in-school adolescents in Damascus, Syrian Arab Republic. *East Mediterr Health J* 2004; **10**(6): 853-862.

[32] **Nicklas TA, Baranowski T, Cullen KW, Berenson G.** Eating patterns, dietary quality and obesity. *J Am Coll Nutr* 2001; **20**(6): 599-608.

[33] **Roberts DF, Foehr UG, Rideout V.** *Generation M: Media in the Lives of 8–18 Year-Olds.* Menlo Park, CA: Kaiser Family Foundation, 2005. 7251.

[34] **Zabinski MF, Daly T, Norman GJ, Rupp JW, Calfas KJ, Sallis JF, Patrick K.** Psychosocial correlates of fruit, vegetable and dietary fat intake among adolescent boys and girls. *J Am Diet Assoc* 2005; **106**(6): 814-821.

الحالة الغذائية للمراهقين وسلوكياتهم في الأكل في بعض المدارس المتوسطة بجدة

ثناء عبدالفتاح علي الخولي، وأسماء محمود عبدالله[١]، وأحمد الغامدي[٢]

أستاذ مشارك كلية العلوم الطبية التطبيقية قسم التغذية الإكلينيكية

[١]أستاذ مساعد كلية العلوم الطبية التطبيقية قسم التغذية الإكلينيكية

[٢]أستاذ مساعد كلية العلوم الطبية التطبيقية قسم تقنية مختبرات

المستخلص. هذه الدراسة تهدف إلى تقييم السلوكيات الغذائية والصحية بين المراهقين والمراهقات وأثر هذه العوامل على حالتهم الغذائية، وتتضمن الدراسة تأثير عاداتهم الغذائية ومدى إتاحة الغذاء الصحي ومشاهدة التلفاز على التصرفات الغذائية. وتمت الدراسة المقطعية ببعض المدارس المتوسطة الحكومية والخاصة "جدّة"، المملكة العربية السعودية، ١٤٠ طالب وطالبة، ٥٠٪ من المدارس الحكومية، و٥٠٪ من المدارس الخاصّة، واستخدمت استبيانات لقياس الحالة الاجتماعية والاقتصادية والبيئية للأسرة، والمعلومات الغذائية، والصحية، وأخذ القياسات الجسمانية. وسجل المتناول الغذائي اليومي بطريقة ٢٤ ساعة. وحسبت القيم الغذائية المستهلكة باستخدام برامج التحليل الغذائي بالكمبيوتر ومقارنتها بالتوصيات الغذائية اليومية. والتحليل الإحصائي ببرنامج (SPSS) النسخة ١٥.

النتائج: متوسط الوزن ٥٧,٧±١٧ للذكور، ٥٣,٣±١,٣ للإناث، ومتوسّط الطول للذكور ١٦٠±١٠,٢ وللإناث ١٥٥,٨±٥,٩، ومعدل كتلة الجسم للذكور ٢٢,٦±١,٢ وللإناث ٢١,٩±١,٥. واستهلاك الفاكهة ٦٧,٢٪ للذكور و٥٠٪ للإناث. و٤١,٤٪ ذكور و٤٤,٣٪ إناث يعتمدون على الوجبات الخفيفة والسريعة. توافر الغذاء الصحي في منازل الذكور ٦١,٩٪ وفي منازل الإناث ٤٨,٦٪. و٤١,٤٪ من المراهقات يقضين ٦ ساعات أمام التليفزيون والأولاد ٥٤,٢٪ يقضون ٣ ساعات. يتلقّى الذكور والإناث بالتّساوي بنسبة ٦٧،١٪ وجبتين يوميا. متوسط المأخوذ من البروتين للإناث ١٤٧،٣ والذكور ١٣٠,٨. متوسط المتناول من الأطعمة المختلفة كان مرتفعاً جدا في مجموعتي الدراسة مقارنة بالتوصيات اليومية العالمية. وقد توصلت هذه الدراسة إلى أنه مازالت الممارسات الغذائية بين طلبة المدارس المتوسطة تحتاج إلى مراقبة جيدة.