Life style and nutrition and their impact on health of Saudi school students in Abha, Southwestern region of Saudi Arabia

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ABSTRACT

Objectives: To evaluate the life style and dietary habits of school students and the prevalence of some nutritional problems.

Methods: We conducted this study in Abha city during the scholastic year 2000. A two-stage random sample was used to select the students. The sample consisted of 767 male and female students in different grades of education. A designed questionnaire was used to collect data regarding life style practices and dietary habits. Weight, height, and body mass index were obtained.

Results: Diets were rich in carbohydrates, and deficient in fiber. Breakfast was a regular meal for 72% of primary school students compared to 49% of secondary school students. Milk was consumed daily by 51.5% of the sample; fast food consumption was low (2.0 ± 1.7 times/month). Physical exercise was practiced significantly longer by males than by females; 8.6% and 5.8% of males in intermediate and secondary grades were smokers. Sleeping hours during school days were adequate (7.4 ± 1.7 hours/day), but relatively higher (9.5 ± 2.3) during vacation. Underweight (18.9%), obesity (15.9%), and overweight (11%) were prevalent. Overweight and obesity were significantly more prevailing among females of primary and secondary grades.

Conclusion: Health education and physical education programs in the schools are recommended to promote healthy life styles and dietary habits. School feeding programs may be required to achieve some of these goals.

The life style refers to a person's unique pattern of living. These patterns reflect our values and beliefs and involve what, how much, and when an individual chooses to eat; how he/she spends time; and whether he/she exercises regularly. Use of time is a life style choice, one person may spend leisure time watching TV and consuming large amount of snack foods unnecessarily; another person of similar age may spend leisure time reading books, practicing sport, or choose to walk. A young adult may relieve stress in harmful ways such as overeating and smoking. For another, appropriate outlets involve physical exercise, counseling or relaxation techniques.[1] As a result of life style choices, health behaviors develop in adolescence, but have delayed effects in terms of later health.[2] In Lundberg's[3] "unhealthy life career hypothesis", it was stated that poor childhood living conditions would be a principal factor starting a chain of unhealthy living conditions, leading to a low level of education, restricted opportunities on the labor market, and thus, to poor living conditions in adulthood with increased illness risks. School entrance provides an opportunity to identify some nutritional problems, such as growth failure, obesity, and overweight. Also by school age, most children would have established a particular pattern of nutrient intake. In the light of the above, and due to lack of knowledge on the life style of children and adolescents in our region, it was necessary to study the life style of school students in Abha city, which is located in Aseer province, the southwestern region of Saudi Arabia. The city lies in the high mountains of Sarawat at an altitude of approximately 2200 meters above sea level and has population of 350,694, which is 21% of the population in the region. (The total population of the region is 7.4% of the Kingdom population). Abha has a temperate climate and a relatively higher annual rainfall, and the percentage of its urban areas is 64%. These facts may have special impacts on the life style. The aim of the study was to highlight the life style and

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dietary pattern that may affect the health of male and female school students, at different grades of education; and to determine the prevalence of some nutritional problems among them and the effect of dietary pattern on these problems.

Methods. This is a cross-sectional study conducted during the scholastic year 2000 and included Saudi male and female students in primary, intermediate, and secondary schools within Abha city. The total number of students was 25,252 with the male to female ratio of 0.86 (primary school = 0.78, intermediate = 1.1, secondary = 0.79). The sampling procedure was as follows: the total number of students in Abha was estimated for female and male populations in the 3 grades of education; a two-stage random sample was used to select students out of the total number of students in Abha. In the first stage, the sampling frame of all schools located in Abha was prepared from which a sample of schools was chosen using an equal allocation method of sampling; one school was randomly selected from each grade of education for each gender. Thus, the total number of schools included in the study was 6 (3 males and 3 females). In the second sampling stage, the full directory of students' names in each class were obtained from each school selected in stage one, and using the proportional allocation technique, a simple random sample of students in each class was drawn as the final sample. The study group consisted of 767 Saudi students from different grades. A designed questionnaire was used to collect data describing the life style and behavioral activities of the study group. The questionnaire was based on a combination of variables, reflecting demographic characteristics, dietary pattern, and some health related life styles. Each student filled the questionnaire form; however, for students of young age (7-10 years) the form was completed by the parents. Variables studied in dietary pattern among students were divided into those describing dietary habits and those related to intake of food items. The latter were measured by frequency, to estimate how many times a week various foods (major nutrient sources) were eaten; however, for milk and cheese, number of cups and slices consumed per day was requested. This provides a clear picture of the food consumption pattern, variety of food, and texture. The explored health related life styles included: smoking (smoker or non-smoker); time spent practicing physical exercise, studying, TV viewing, playing computer games (including video games and hand-held digital games), and sleeping; and fast food consumption. Anthropometric measurements (weight and height) were taken for all students by a team of trained nurses. A detecto scale was used, and its accuracy was checked before use. Weight was measured in light clothing and without shoes, on a calibrated scale. Body mass index (BMI) was computed as weight in kilograms divided by height in meters squared, weight (Kg)/height^2 (m^2). Anthropometric z-scores were computed for students relative to the World Health Organization (WHO)/National Center for Health Statistics (NCHS) reference population.[4] Obesity in children and adolescents was defined as weight-for-height z-scores more than 2 standard deviation above the mean as recommended by WHO (1995),[5] whereas, overweight was defined as a z-score value more than one standard deviation above the mean. Underweight was defined as z-scores more than 2 standard deviation below the reference mean weight for height.[5]

Statistical analysis. Data collected were coded and entered into an IBM compatible computer using Statistical Program for Social Sciences. After entry, data were checked for precision and statistical analysis was conducted separately for each gender and grade of education. Data analyses were carried out using the appropriate statistical significance tests at 5% level of significance.

Results. The study sample was 767 students, which constituted 3.0% of Abha students: 327 (42.6%) were males and 440 (57.4%) were females. Sample distribution, mean age, and residences of the students are given in **Table 1.** The ages of students ranged from 7-20 years. Most of students (89.3%) were residing in urban areas.

Table 2 shows the status of eating breakfast meal, drinking milk and eating dates at breakfast, and mean number of meals. Breakfast is never taken by 6% of the students at different grades (range: 2.5-17.2%), and often skipped by 28% (19.7-48.3%). It was noted to be a regular meal for 72% of children in primary school, while it was so for 49% of children in secondary school. A significant gender difference in relation to breakfast was found only among intermediate grade students. Regular consumption of milk was found in 51.5% of the sample. Those who never drink milk with breakfast were 21.6% (range: 14.7-51.8%), the highest being among female students in the secondary school.

Table 3 shows the mean intake frequencies of common food items for male and female students in different grades. The average consumption of milk and cheese equals 1.2±1.3 cups/day and 1.7±1.3 slices per day; the lowest consumption was among females in secondary school. The mean frequency of meat intake was 4.4±2.4 per week, and the mean rice intake frequency was 4.9±2.2 per week. Vegetable intake was the least frequent among the major food items (3.3 times/week). Health-related lifestyle and activities are shown in **Table 4.** The sleeping hours for students were

more in weekends and vacations than in school days (9.2±2.1, 9.5±2.3, and 7.4±1.7 hours/day, respectively). Girls had a mean number of studying hours significantly more than boys. The mean time spent by students in practicing physical exercises was 0.7±0.9 hours/day. The prevalence of smoking among male students in intermediate school was 8.6%. Anthropometric measurements and the prevalence of some nutritional problems are shown in **Table 5** and **Table 6.** On average, males had significantly higher weight and height values than females in similar grades. Comparison of dietary pattern between normal and malnourished students

shows that normal students ate significantly more meals than underweight students (2.9±0.8 meals compared to 2.6±1.3 meals, $p<0.05$). There was no significant difference in meals number between normal and obese (2.9±0.9 meals). There were no significant differences in the intake frequency of high-calorie containing food between the underweight, normal, and obese.

Discussion. Epidemiologic, clinical, and basic researches have established that diet and life style play a significant role in the etiology and pathogenesis of major chronic diseases, and that modifying these styles

Table 1 - Demographic characteristics of students by gender and educational grades.

Characteristics	Grades					
	Primary		Intermediate		Secondary	
	Male (n=142)	Female (n=293)	Male (n=116)	Female (n=118)	Male (n=69)	Female (n=29)
Age (years)	12.1±1.3	10.5±1.6	14.9±1.8	13.7±1.1	16.5±0.8	16.6±1.1
	t=2.27 ($p<0.02$)		t=0.24 NS		t=0.02 NS	
Residence (%)						
Urban	125 (88)	271 (92.5)	95 (81.9)	110 (93.2)	57 (82.6)	27 (93.1)
Rural	17 (12)	22 (7.5)	21 (18.1)	8 (6.8)	12 (17.4)	2 (6.9)
	$\chi^2_{(1)}$=2.33 NS		$\chi^2_{(1)}$=6.91 (p=0.009)		p=0.22	
NS - not significant						

Table 2 - Dietary habits among school students by sex and educational grades.

Dietary Habits	Grades					
	Primary		Intermediate		Secondary	
	Male (n=142)	Female (n=293)	Male (n=116)	Female (n=118)	Male (n=69)	Female (n=29)
Breakfast meal						
Regular*	105 (73.9)	207 (70.6)	82 (70.7)	65 (55.1)	38 (55.1)	10 (34.5)
Sometimes	28 (19.7)	72 (24.6)	27 (23.3)	50 (42.4)	23 (33.3)	14 (48.3)
Never	9 (6.4)	14 (4.8)	7 (6.0)	3 (2.5)	8 (11.6)	5 (17.2)
	$\chi^2_{(2)}$=1.57 NS		$\chi^2_{(2)}$=10.42 ($p<0.005$)		$\chi^2_{(2)}$=3.47 NS	
Drinking milk with breakfast						
Regular*	82 (57.7)	166 (56.6)	58 (50)	61 (51.7)	21 (30.4)	7 (24.1)
Sometimes	38 (26.8)	84 (28.7)	24 (20.7)	28 (23.7)	25 (36.3)	7 (24.1)
Never	22 (15.5)	43 (14.7)	34 (29.3)	29 (24.6)	23 (33.3)	15 (51.8)
	$\chi^2_{(2)}$=0.19 NS		$\chi^2_{(2)}$=0.76 NS		$\chi^2_{(2)}$=2.98 NS	
Consumption of dates						
Regular*	53 (37.3)	76 (25.9)	41 (35.3)	43 (36.4)	18 (26.1)	8 (27.6)
Sometimes	73 (51.4)	171 (58.4)	64 (55.2)	60 (50.8)	44 (63.8)	15 (51.7)
Never	16 (11.3)	46 (15.7)	11 (9.5)	15 (12.8)	7 (10.1)	6 (20.7)
	$\chi^2_{(2)}$=6.32 ($p<0.04$)		$\chi^2_{(2)}$=0.77 NS		$\chi^2_{(2)}$=2.22 NS	
Frequency of daily meals	2.2±1.5	3.1±0.4	3.1±0.7	3.1±0.6	3.1±0.5	2.7±0.8
	F=24.48 ($p<0.001$)					
Data are expressed as number and (%), *Daily, NS - not significant						

can substantially decrease disease risks.[6] It seems likely that the roots of adult life styles are found in patterns of adjustment in childhood and adolescence.[7] When a person reaches adolescence, the influences on eating habits are numerous and the formation of those habits is extremely complex.

It is a major concern that breakfast is often skipped by 28% of our students at various grades and never taken by 17% of secondary school female students. Breakfast skipping is common in other parts of the world; it is highly prevalent in the United States and Europe (10-30%).[8] It is well-known that breakfast is

often neglected and omitted more by teenagers and young adults than by any other age group. Studies have indicated that, compared to other meals, breakfast meals provide significantly fewer nutrients, but do supply energy;[1] this is essential for better cognitive functions and physical activities.[8] In our country, the school day starts early, and children may not have the appetite or time to eat their breakfast before going to school. One solution is to establish school breakfast program, during which appropriate amount of calories, milk, and special nutrients can be provided at reduced cost. It is annoying that our children still get junk food,

Table 3 - The mean and standard deviation of food intake frequencies of students by gender and educational grades.

Food items	Grades							
	Primary		Intermediate		Secondary		Total	F-value
	Male (n=142)	Female (n=293)	Male (n=116)	Female (n=118)	Male (n=69)	Female (n=29)	(n=767)	
	$(\bar{X} \pm S)$	$(\bar{X} \pm S)$	$(\bar{X} \pm S)$	$(\bar{X} \pm S)$	$(\bar{X} \pm S)$	$(\bar{X} \pm S)$	$(\bar{X} \pm S)$	
Cups of milk (number/day)	1.6±1.6	1.2±1.2	1.2±1.3	1.2±1.4	0.5±0.9	0.6±1.2	1.2±1.3	6.88*
Cheese slices (number/day)	2.0±1.4	1.7±1.3	1.6±1.4	1.5±1.2	1.6±1.4	1.1±0.7	1.7±1.3	3.90*
Bread (times/day)	2.6±1.0	2.6±1.0	2.6±1.1	2.2±0.9	2.6±0.9	2.0±1.1	2.5±1.0	3.35*
Meat or poultry (times/week)	4.4±2.2	4.1±2.4	4.9±2.4	4.3±2.4	5.2±2.3	3.9±2.3	4.4±2.4	3.88*
Fish (times/week)	1.3±1.2	1.4±1.5	1.3±1.4	1.3±1.2	1.1±0.7	1.0±1.4	1.3±1.3	0.90†
Rice (times/week)	5.1±2.2	4.8±2.2	5.3±2.2	4.5±2.2	5.3±2.2	4.8±2.3	4.9±2.2	2.94*
Traditional food (times/week)	1.9±1.5	1.6±1.4	2.8±2.2	1.4±1.2	2.4±1.8	1.2±1.0	1.9±1.6	13.35*
Vegetables (times/week)	3.5±2.1	3.4±2.1	3.1±2.4	3.4±2.4	2.8±2.3	2.3±2.2	3.3±2.3	2.42*
Chips (times/week)	3.9±2.4	3.7±2.4	2.8±2.3	3.5±2.3	2.1±1.8	3.5±2.1	3.4±2.3	7.61*
Biscuit (times/week)	3.2±2.1	3.5±2.2	2.3±1.8	2.8±2.1	2.7±2.2	3.0±2.3	3.1±2.2	6.32*
Sweet (times/week)	2.8±2.4	3.6±2.4	2.1±2.2	3.3±2.5	2.6±2.3	2.7±2.2	3.0±2.4	7.87*
Fast food (times/month)	1.4±1.5	1.8±1.7	2.6±1.8	2.1±1.8	2.7±1.8	1.5±1.3	2.0±1.7	10.41*
Beverages (times/week)	4.1±2.5	3.4±2.3	4.4±2.5	4.0±2.5	4.6±2.4	4.3±2.8	3.9±2.5	5.23*
Canned juice (times/week)	4.0±2.4	4.2±2.4	3.7±2.3	3.5±2.4	4.0±2.4	2.9±2.3	3.9±2.4	2.99*
Cup of milk=200 ml, *significant at 5% level, †not significant								

Table 4 - Life style variables among males and females in different educational grades.

Life style items	Grades							
	Primary		Intermediate		Secondary		Total	Significance
	Male (n=142)	Female (n=293)	Male (n=116)	Female (n=118)	Male (n=69)	Female (n=29)	(n=767)	
	$(\bar{X} \pm S)$	$(\bar{X} \pm S)$	$(\bar{X} \pm S)$	$(\bar{X} \pm S)$	$(\bar{X} \pm S)$	$(\bar{X} \pm S)$	$(\bar{X} \pm S)$	
Daily sleeping hours during school days	7.6±1.6	7.5±1.6	7.3±1.8	7.1±1.5	7.1±1.9	6.3±1.3	7.4±1.7	F=5.10*
Sleeping hours during weekends/day	8.3±2.0	9.4±1.7	9.2±2.9	9.3±2.0	9.5±2.2	9.1±2.0	9.2±2.1	F=5.67*
Sleeping hours during vacations/day	8.6±2.4	9.8±2.0	9.5±3.0	9.9±1.9	9.7±2.3	9.5±2.3	9.5±2.3	F=5.28*
Studying hours/day	1.7±1.2	2.3±1.3	1.6±1.1	2.9±1.2	1.7±1.2	3.2±0.9	2.1±1.3	F=24.75*
TV viewing in hours/day	1.2±1.1	0.9±0.9	1.2±1.2	0.8±0.9	1.5±1.2	1.1±1.1	1.0±1.0	F=7.04*
Computer games in hours/day	0.7±1.0	0.5±0.8	0.9±1.1	0.6±0.8	1.0±1.1	0.6±1.0	0.7±0.9	F=4.93*
Physical exercise in hours/day	0.9±0.9	0.5±0.8	1.1±1.0	0.4±0.6	1.0±1.0	0.4±0.8	0.7±0.9	F=15.99*
Smoking (%)	-	-	10 (8.6)	-	4 (5.8)	-	14 (1.9)	$\chi^2_{(1)}$= 0.49†
*significant at 5% level, †not significant								

soft drink, chips, and candies from the school canteens. We believe that school feeding programs help eliminate such problems. Where these programs are felt inappropriate or not applicable, a firm policy and close supervision over food items sold to our students should be urgently and strictly implemented. In our study, the percentages of females in intermediate and secondary schools who often skip breakfast were more than those of males. A likely explanation as to why females at that age are more apt to miss breakfast is the pursuit of thinness and frequent dieting attempts. Skipping meals and eating snacks are more pronounced in adolescents than in other people;[9] therefore, education and intervention programs directed to this age group should address these phenomena. Regular consumption of milk in the study was found only in 51% of all students; 25% of females in the intermediate grades, and 52% of females in secondary grades never drink milk with breakfast. This is very alarming, as adolescents need 3 servings of milk and dairy products per day (one standard serving = one cup of whole milk or skim milk, one cup of yogurt, or 1.5 oz of cheese). This supplies the body with calcium, riboflavin and vitamin D, and decreases the risk of bone diseases such as osteoporosis. Our students' daily consumption of dairy products (a cup of milk and 1.7 slices of cheese) is inadequate and should be increased. Low-fat milk may be used for children at risk of overweight or certain diseases. Dates consumption in Saudi Arabia is an important religious and cultural habit, 87% of students consume dates. This is an advantage that may be cultivated by school feeding programs, as date is rich in energy and nutrients. Our students' dietary pattern reflects a type of diet, which is rich in carbohydrates and protein, but low in fiber as indicated by low vegetable consumption. This habit has to be modified by decreasing the white rice, bread, and sweets intake, and encouraging the intake of fiber containing food as fiber may help reduce the future risk of certain diseases such as gastrointestinal diseases including cancers, type 2 diabetes and cardiovascular diseases.[10] The dietary guidelines for Americans recommended intake of 19-38 grams of fiber per day for healthy individuals over the age of 2 years (age 1-3: 19 grams, age 4-8: 25 grams, age 9-13: 26 grams for females and 31 grams for males).[10] Examples of fiber-containing foods are various beans (1/2 cup = 5.2-8 grams), mixed vegetables (1/2 cup = 4 grams), apple (one medium size = 3.3

Table 5 - Anthropometric measurements for male and female students in different educational grades.

Measurements	Grades							
	Primary		Intermediate		Secondary		Total	F-value
	Male (n=142)	Female (n=293)	Male (n=116)	Female (n=118)	Male (n=69)	Female (n=29)	(n=767)	
	($\bar{X} \pm S$)	($\bar{X} \pm S$)	($\bar{X} \pm S$)	($\bar{X} \pm S$)	($\bar{X} \pm S$)	($\bar{X} \pm S$)	($\bar{X} \pm S$)	
Anthropometric								
Weight (kg)	37.3 ± 25.9	33.0 ± 9.9	50.7 ± 16.3	40.7 ± 13.9	64.8 ± 68.9	54.6 ± 14.1	41.9 ± 29.4	18.34*
Height (cm)	145.6 ± 8.8	135.9 ± 10.7	159.6 ± 12.0	146.2 ± 9.5	169.8 ± 7.0	155.5 ± 6.9	147.3 ± 15.4	167.88*
Body mass index (kg/m²)	17.5 ± 12.4	17.6 ± 3.6	19.6 ± 4.7	18.6 ± 4.5	23.0 ± 28.5	22.6 ± 6.0	18.8 ± 11.6	3.29*

*significant at 5% level

Table 6 - Prevalence of nutritional problems among school students by gender and educational grades.

Nutritional problems	Grades						
	Primary		Intermediate		Secondary		Total (n=767)
	Male (n=142)	Female (n=293)	Male (n=116)	Female (n=118)	Male (n=69)	Female (n=29)	
Underweight	46 (32.4)	27 (9.2)	26 (22.4)	24 (20.3)	22 (31.8)	- (0)	145 (18.9)
Overweight	10 (7.0)	38 (13.0)	10 (8.6)	16 (13.6)	6 (8.7)	4 (13.8)	84 (11.0)
Obesity	18 (12.7)	48 (16.4)	26 (22.4)	16 (13.6)	8 (11.6)	6 (20.7)	122 (15.9)
χ²-value	33.69*		0.91†		11.56*		351 (45.8)

Data are expressed as number and (%), *significant at 5% level, †not significant

grams), pear (small = 4.1 grams), and whole grains. In a previous study comparing the carbohydrate consumption in both developed and developing countries, it was found that the supply of carbohydrate was similar for both, however, the types of carbohydrates eaten and the proportion they contributed to the energy intake were not similar; the carbohydrates from staple foods such as cereals and roots, composed mainly of starch, represented 85% of carbohydrate intake in developing countries but only 62% in the affluent ones. Carbohydrates from fruit and sugar largely made up the difference.[11] Unfortunately, the major sources of carbohydrate consumed in our population are white bread, rice, canned juice/beverages, sweets, and biscuits. Higher intake of sucrose (table-sugar) in the last 4 items predisposes to obesity and dental caries. Fast food intake is an unusual habit among our students (average 2 times a month). Avoidance of fast food is a healthy practice as the nutritious value of such food is questionable. Moreover, the adolescent may not choose balanced takeaway meals from items offered at fast food restaurants. Major nutritional limitations of fast food meals include reduction in essential nutrients as calcium, riboflavin, and vitamin A, unless milk is ordered. Common fast food meals combinations have excessive kilocalories, fats and sodium, and inadequate amounts of folate and fiber.[12] Sleeping hours during school days are adequate, however, there is increased number of sleeping hours during weekends and vacations; the latter could be related to increased daily physical activities during vacation and lack of involvement in structured summer programs. We recommend that the authority should construct and supervise such programs, and make them widely available to promote appropriate use of time, and healthy life style. Although the data show that number of hours the students spend in studying at home is not long (mean 2.1 hours/day ±1.3), it was clear that female students study for longer time (2.3-3.2 hours/day) than males. Surprisingly, our students were not so much occupied with TV viewing or playing computer games, approximately 1-1.5 hours and less than one hour. As expected, taking part in daily physical exercise was significantly less among female students who spent on average 0.5 hour per day in practicing physical exercise. It is well recognized that moderate physical activity performed regularly has health benefits. Physical exercise should be encouraged in female schools and physical education programs should be established, as early as possible so as to build up this healthy habit. An important finding in the study was the absence of smoking among females. However, the fact that 8.6% of male students in the intermediate grade smoke emphasizes the need for early

educational and intervention programs as smoking may be the stimulus for a more serious habit, namely, use of illicit substances. Some researchers hypothesize that risk for smoking may be associated more with a masculine image,[13] and that adolescents may engage in smoking to gain acceptance into particular groups or to enhance their images.[14] Anthropometric measurements are important indicators for health status; generally, our male students were found to be heavier and taller than females of the same grade of education. The BMI values change with age, beginning at 13 kg/m^2 at birth reaching a peak of 18 at approximately one year, and rise to adult values during adolescence ranging from 19-27 kg/m^2.[11] The mean BMI values for male and female students at secondary school were 23 and 22.6 kg/m^2. In the present study, underweight was the most prevalent nutritional problem among students; an overall prevalence of 18.9% is alarming. This is higher than that reported in other series, 14.2%.[15] The highest prevalence of underweight is among primary school male students; generally, underweight students eat less frequently than those students with normal weight. Although severe malnutrition secondary to poverty has almost disappeared with the oil boom in our country during the last 3 decades, underweight is still common; this may be explained by inadequate parental knowledge regarding proper nutrition and healthy dietary attitude. Improper weaning during infancy and conflict over the types of food between the child and the parents may lead to poor dietary habits, which may predispose to underweight or obesity later in childhood and adulthood. Some parents, for example, are often concerned with building up the weight of the infant, but not with building up healthy dietary habits. This will be translated into poor dietary habits and various forms of nutritional deficiency at various stages of life. The second most common nutritional problem is overweight and obesity; the prevalence of overweight and obesity (combined) among female students (29%) and male students (23.9%) are similar to the findings in a national study, 31.8% and 27.7%.[16] The overall incidence of obesity alone (15.9%) are similar to a prevalence (15.8%) quoted in another study covering various regions of Saudi Arabia.[17] The highest prevalence of obesity (20.7%) in our study is among female students in secondary schools; the prevalence of overweight and obesity (combined) in adolescent females is 28.6%, which is similar to the prevalence (28%) in a study from Al-Khobar city.[18] There was no significant difference between normal and obese students with regards to eating frequency. It has been shown by many studies that, on the average, obese teenagers do not eat more than their normal-weight peers. They often have disturbed unstructured patterns

of eating. They may eat only in the latter part of the day, feeling nausea when eating earlier, and eat rapidly and indiscriminately.[1]

In the past, obesity was thought to be a pure eating disorder; now, it is known that in some children and adolescents adiposity may be under powerful genetic control, and that environment may play a facilitating role.[19] Having said that, it is essential to develop national school programs for prevention of obesity and promotion of physical activity among male and female students alike. It should be emphasized to parents that obesity is a disease, and that obesity in early childhood is not a sign of good health and may predispose to obesity in adulthood. The health authority should reevaluate the availability of wide range of high-calorie infant formula and the easy access to it by the public.

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