Eating habits, inactivity, and sedentary behavior among adolescents in Iraq: Sex differences in the hidden risks of noncommunicable diseases

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Abstract

Background. Noncommunicable diseases have become the main causes of death in several developing countries. There is a severe shortage of information about the risk factors for these diseases in Iraq.

Objective. To explore the eating habits, physical activity, and sedentary behaviors of adolescents in Mosul City, Iraq, as risk factors for noncommunicable diseases.

Methods. A multistage stratified sampling method was carried out on adolescents aged 15 to 18 years in Mosul City, Iraq. A pretested and validated questionnaire was used to obtain information on frequency of intake of certain foods, physical activity, and screen time (television, video, and computer). Weight and height were measured to obtain the body composition status. The total sample included 723 adolescents (350 boys and 373 girls).

Results. There were significant differences between boys and girls in most eating habits and activity behaviors. The frequency of skipping breakfast and the intakes of fruits and vegetables, french fries, and sweets and chocolates were significantly higher among girls than boys (p < .001). Boys were significantly more likely to consume fast foods, sugar-sweetened drinks, and energy drinks than girls. Boys spent more time in physical activity (p < .001) and looking at screens than girls.

Conclusions. The health authorities of Iraq should focus not only on interventions for undernutrition among adolescents, but also on behavioral risk factors for diet-related noncommunicable diseases.

Key words: Adolescents, eating habits, Iraq, physical activity, sedentary behaviors

Introduction

Iraq has experienced a long period of unsettlement and conflict since the 1991 Gulf War. With the exception of the Northern Region, the health and nutrition status in Iraq has deteriorated since this war, particularly among children and women. Data from the Iraqi Ministry of Health indicate a rapid worsening in the health status of the population in general, and of children in particular [1]. The Gulf War and the economic sanctions that followed the war caused a threefold increase in mortality among Iraqi children. This was mainly due to an increase in infectious diseases and decreased availability of medical care, food, and safe water [2]. On the one hand, the nutrition and health situation has not improved as expected after the coalition invasion in 2003; a worsening humanitarian situation has been reported since this invasion. The proportion of malnutrition among children and adolescents is still high [3]. On the other hand, Iraq has been opened to all aspects of westernization and globalization after the coalition invasion, which in turn promotes the Western lifestyle and increased intake of fast foods and other high-energy-density foods and drinks [4].

Paradoxically, the Iraqi population is facing two nutrition problems: those associated with deficiencies of essential nutrients, such as iron-deficiency anemia, some vitamin deficiencies, and underweight, and those associated with changes in lifestyle and dietary habits, such as obesity, diabetes, hypertension, cardiovascular disease, and some types of cancer. Unfortunately, almost all health reports, especially those by international organizations, have focused on undernutrition among children and women, rather than on the factors associated with diet-related noncommunicable diseases. Statistics from the World Health Organization showed that the prevalence of hypertension among Iraqi adults (15 years of age and older) was higher than...
Lifestyle habits of Iraqi adolescents

that reported in other Eastern Mediterranean countries (40.4% vs. 20% to 28%) [5]. A similar trend was reported for high blood cholesterol [5]. Furthermore, the estimated mortality from cancer, cardiovascular disease, and diabetes for the adult population in Iraq was found to be among the highest in the Eastern Mediterranean Region [6].

Establishing healthy eating and lifestyle habits during childhood is important to promote intake of essential nutrients for growth and development, as well as to reduce the risk of noncommunicable diseases during adulthood [7]. Therefore, understanding the prevalence and magnitude of dietary habits, physical activity, and sedentary behavior is fundamental for any intervention to promote the nutritional status of schoolchildren. Unlike many countries in the Arab world, studies on the food habits and lifestyle of both children and adults in Iraq are scanty. Majeed [8] investigated some nutrition knowledge and practices in adolescent girls in Baghdad and found that 46% of them skipped breakfast, 53% preferred to drink soft drinks, and 83% consumed sweets (snacks) between meals. Subhi [9] found that 7% of children aged 6 to 12 years in Baghdad were obese. Latla and Khadim [10] found that the prevalence of overweight and obesity among 7- to 13-year-old children in Babil was 6.0% and 1.3%, respectively. Information on dietary and lifestyle behaviors in Iraq is very limited, especially for adolescents. There is a well-documented difference between men and women in the risk of noncommunicable diseases in later life [6]. We did not find any published data on nutritional risk factors among adolescents or adults in Mosul City, where we carried out the current study. Most studies in the Arab region have used qualitative rather than quantitative measures of food intake. This is mainly due to two reasons: absent or incomplete local food composition tables, which makes it difficult to measure actual nutrient intake, and the habit of family members of eating together from the same plate, especially in rural areas, which makes it difficult to estimate individual food intake [11]. However, the qualitative food frequency method is widely used worldwide, with acceptable validity [12].

The objectives of this study were to investigate the eating habits, physical activity, and sedentary habits of adolescents aged 15 to 18 years in Mosul City in northern Iraq, and to compare the behaviors between boys and girls.

Methods

The region

Mosul is the capital of Nineveh Province, located 400 km northwest of Baghdad in northern Iraq. The majority of the population is Arab. With a population of about 1,800,000, it is the third largest city in Iraq, after Baghdad and Basra in the south [13].

Participants and sampling

The present study is part of the Arab Teens Lifestyle Study (ATLS). The ATLS is a school-based, multicenter, cross-sectional study conducted in different Arab cities. Detailed descriptions of ATLS design, methods, and data collection have been previously published [14, 15]. The sample was drawn from adolescent boys and girls attending public and private secondary schools in Mosul. This city was selected because it is the major city in the Northern Region and offers a relatively safe environment for collecting data from schools. A multistage, stratified, cluster-randomized sampling technique was used to select the sample. The schools were stratified into boys’ and girls’ secondary schools. Four schools (two each from the boys’ and girls’ schools) were selected from each of the four geographic regions (east, north, south, and west) of the city. Next, classes were selected from each grade using a simple random-sampling design. One class was randomly selected in each of the three grades of each chosen high school. Thus, the total number of classes selected was at least 24 (12 each from the boys’ and girls’ schools). All students in the selected classes who were free of any known physical health problems were invited to participate in the study. The data were collected during September to November of the school year 2009/10. The study protocol and procedures were approved by the Research Center at King Saud University, Saudi Arabia, as well as by the General Directorate of School Education in Mosul. In addition, the approval of the schools and the consent of the students for conducting the survey were obtained. The total sample comprised 723 adolescents, consisting of 350 boys and 373 girls.

Measurements and procedures

Anthropometric measurements

Body height and weight were measured in the morning according to written standardized procedures. Body height was measured to the nearest centimeter with a calibrated measuring rod with the subject wearing no shoes. Weight was measured to the nearest 100 g with calibrated portable scales with the subject wearing minimal clothing and no shoes. Body mass index (BMI) was calculated as the ratio of the weight in kilograms to the square of the height in meters. The International Obesity Task Force (IOTF) age- and sex-specific BMI cutoff reference standards [16] were used to identify overweight and obese adolescents.

Questionnaire

For the assessment of lifestyle and dietary data, we used the ATLS research instrument [14], which is composed
of questions related to physical activity, dietary habits, and sedentary behaviors. The participants completed the questionnaire in their classrooms under the supervision of one of the authors and in the presence of their teachers. The physical activity questionnaire used in this study was previously tested and found to have high reliability (ICC = 0.85; 95% CI, 0.70 to 0.93) [17] and acceptable validity (r = 0.37, p < .001) against pedometer measurements [18]. The questionnaire included information on frequency, duration, and intensity of a variety of light-, moderate-, and vigorous-intensity physical activities during a typical week. The physical-activity questionnaire covered such domains as travel and within-household, fitness, and sports activities. Physical activities were classified into light-, moderate-, and vigorous-intensity activities based on metabolic equivalent (MET) values according to the compendium of physical activity [19] and the compendium of physical activity for youth [20]. Physical activity levels were classified into three categories: moderate-intensity, vigorous-intensity, and total physical activity. We also calculated the percentage of adolescents who did not meet the physical-activity recommendation of at least 1 hour of moderate-intensity daily physical activity [21].

In addition to physical-activity items, the questionnaire contained items assessing sedentary behaviors and dietary habits. The participants were asked to provide the average number of daily hours spent on sedentary activities, including time spent viewing television, playing video games, and computer and Internet use, collectively classified as “screen time.” The number of hours of sleep per day was also assessed by self-reporting. We calculated the proportions of adolescents with more than 2 hours of screen time and less than 8 hours of sleep per day.

Qualitative food frequency questionnaires are widely used in different ways and are mostly utilized in cross-sectional surveys [12]. There are no golden rules for selecting specific questionnaires [22]. The dietary habits questions used in this study were adapted from an existing food frequency questionnaire used in Bahrain, an Arab country, that had shown acceptable reliability [23] and that was based on a National Health and Nutrition Examination Survey (NHANES) food questionnaire [24]. Dietary habits were assessed by asking the participants how many times per week they consumed breakfast, vegetables (cooked or uncooked), fruits, milk and other dairy products, sugar-sweetened drinks (including soft drinks), energy drinks, doughnuts or cakes, sweets and chocolates, french fries and potato chips, and fast foods. These dietary habits were selected because they are the main dietary risk factors associated with childhood obesity [25].

The current questionnaire underwent content validity testing by local experts who evaluated the relevance and suitability of the test items to the content domain. The first five behaviors (desirable dietary habits) were scored on a daily basis and the remaining five behaviors (undesirable dietary habits) on a greater than three times a week frequency. These cutoffs were based on previously published studies in Arab countries [23, 26, 27], as well as Western countries [28, 29], and the dietary guidelines for Arab countries [30]. The fast foods included examples of both Western and Arab foods. The participants were given a choice of answers, ranging from zero intake (never) to a maximum intake of 7 days per week (every day).

Data and statistical analysis

Data were checked, cleaned, and then analyzed with SPSS, version 15. Descriptive statistics are presented as means, SDs, and proportions. Weekly physical-activity data that were not normally distributed were log-transformed before parametric statistical analysis was performed. Differences in anthropometric measurements and lifestyle variables relative to sex were tested by independent t-tests. Differences in proportions of overweight and obesity and in lifestyle cutoff values were tested by chi-square tests. Differences were considered significant if p ≤ .05.

Results

The anthropometric characteristics of the subjects are shown in Table 1. Statistically significant differences were observed between boys and girls in means for weight (p < .001) and height (p < .001), as expected from the growth references, but also in BMI (p < .022). The prevalence of overweight and obesity among boys and girls was very similar (19.4% vs. 20.9% and 5.7% vs. 4.6%, respectively).

Means and SDs for frequencies of eating certain

<table>
<thead>
<tr>
<th>Variable</th>
<th>Boys</th>
<th>Girls</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of subjects</td>
<td>350</td>
<td>373</td>
<td>.711</td>
</tr>
<tr>
<td>Age (yr)</td>
<td>16.73 ± 1.5</td>
<td>16.76 ± 1.5</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>62.8 ± 12.5</td>
<td>55.1 ± 9.3</td>
<td>.022</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>168.6 ± 7.5</td>
<td>156.0 ± 6.4</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>22.0 ± 3.8</td>
<td>22.6 ± 3.6</td>
<td>.960</td>
</tr>
<tr>
<td>Nonoverweight and nonobese (%)</td>
<td>74.9</td>
<td>74.5</td>
<td></td>
</tr>
<tr>
<td>Overweight (%)</td>
<td>19.4</td>
<td>20.9</td>
<td></td>
</tr>
<tr>
<td>Obese (%)</td>
<td>5.7</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>Overweight plus obese (%)</td>
<td>25.1</td>
<td>25.5</td>
<td></td>
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</tbody>
</table>

a. Plus-minus data are means ± SD. The differences between boys and girls were tested by independent-sample t-tests, except for proportions of overweight and obesity, where chi-square tests were used.
foods, physical activity, and sedentary behaviors are presented in table 2. Boys were significantly more likely to consume breakfast, fast foods, cakes or doughnuts, and energy drinks than girls (p < .001 for all comparisons), whereas girls were significantly more likely to consume vegetables, fruits, and french fries and potato chips than boys (p < .001 for all comparisons). The mean number of minutes performing physical activity per week was significantly higher among boys than girls (246 ± 471 vs. 372 ± 283, p < .001). The mean daily number of hours of screen time was also significantly higher among boys than girls.

The proportions of subjects who exceeded desirable and undesirable cutoff values for eating habits, physical activity, and sedentary behaviors are given in table 3. Girls were significantly more likely than boys to exceed desirable cutoffs for consumption of vegetables (62.3% vs. 46.1%, p < .001) and fruits (46.3% vs. 24.3%, p < .001). The proportions of subjects who ate breakfast daily and who consumed fast foods and energy drinks on more than 3 days per week were significantly higher among boys than girls (p < .001, p < .001, and p < .024, respectively). Girls were much more likely than boys to be physically inactive (68.8% vs. 29.8%) but less likely to spend more than 2 hours per day on screen time (64.1% vs. 82.3%).

Discussion

This study showed that there were many unhealthy dietary and lifestyle behaviors among Iraqi adolescents, and there were significant differences between boys and girls in most of these behaviors. Girls were more likely than boys to skip breakfast and to consume fruits, vegetables, french fries and potato chips and sweets and chocolates. The consumption of fast foods, sugar-sweetened drinks, and energy drinks was higher among boys than girls. As for lifestyle factors, boys were more physically active than girls but they spent more time at the screens than did girls.

The finding that the percentage of adolescents skipping breakfast was higher among girls than boys is in line with many studies in Arab [23, 26, 27] and Western [31, 32] countries. One reason for this practice is based on the widespread, but erroneous, belief among girls in the region that skipping breakfast helps reduce weight by reducing the amount of food consumed during the day [33]. Another important factor that may be related to missing breakfast among both sexes is the time at which school starts. In most Arab countries, the schools start very early (about 7 to 8 a.m.). Terry-McElrath et al. [34] found that an earlier start of school was negatively associated with eating breakfast: the later the start time, the more likely schoolchildren were to consume breakfast. It is well established that regular intake of breakfast is associated with healthy body weight and improved school achievement [35]. However, for those who eat breakfast, we do not know the quality of their breakfasts. This was not addressed in this study, but it is highly likely that many students do not consume healthy breakfasts, mainly because of low family income. Eating a nutritious breakfast may have two positive effects on Iraqi adolescents: reducing the risk of weight gain for those in better-off families, and increasing the intake of some essential nutrients among students from families of low socioeconomic status [36].

<table>
<thead>
<tr>
<th>Variable</th>
<th>Boys</th>
<th>Girls</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast consumption (frequency/wk)</td>
<td>5.0 ± 2.4</td>
<td>4.1 ± 2.6</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Vegetable consumption (frequency/wk)</td>
<td>5.3 ± 1.9</td>
<td>5.9 ± 1.7</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Fruit consumption (frequency/wk)</td>
<td>4.5 ± 1.9</td>
<td>5.3 ± 2.0</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Milk/dairy products consumption (frequency/wk)</td>
<td>4.6 ± 2.4</td>
<td>4.3 ± 2.5</td>
<td>.093</td>
</tr>
<tr>
<td>Sugar-sweetened drinks consumption (frequency/wk)</td>
<td>4.6 ± 2.2</td>
<td>4.4 ± 2.3</td>
<td>.226</td>
</tr>
<tr>
<td>Fast foods consumption (frequency/wk)</td>
<td>3.0 ± 2.2</td>
<td>2.4 ± 2.0</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>French fries/potato chips consumption (frequency/wk)</td>
<td>3.6 ± 2.2</td>
<td>4.6 ± 2.3</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Cake/doughnut/biscuit consumption (frequency/wk)</td>
<td>3.5 ± 2.1</td>
<td>4.1 ± 2.3</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Sweets/chocolates consumption (frequency/wk)</td>
<td>3.5 ± 2.3</td>
<td>3.8 ± 2.4</td>
<td>.048</td>
</tr>
<tr>
<td>Energy drinks consumption (frequency/wk)</td>
<td>0.63 ± 1.4</td>
<td>0.30 ± 1.0</td>
<td>.01</td>
</tr>
<tr>
<td>Total physical activity (min/wk)</td>
<td>746.2 ± 470.9</td>
<td>371.5 ± 283.1</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Total vigorous-intensity physical activity (min/wk)</td>
<td>373.0 ± 331.1</td>
<td>76.6 ± 125.1</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Total moderate-intensity physical activity (min/wk)</td>
<td>369.4 ± 262.5</td>
<td>287.2 ± 215.5</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Television viewing (h/day)</td>
<td>2.65 ± 1.8</td>
<td>2.28 ± 1.7</td>
<td>.005</td>
</tr>
<tr>
<td>Computer games/Internet use (h/day)</td>
<td>1.86 ± 1.8</td>
<td>1.13 ± 1.3</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Sleep duration (h/day)</td>
<td>7.04 ± 1.6</td>
<td>7.18 ± 1.6</td>
<td>.229</td>
</tr>
</tbody>
</table>

a. Data are means ± SD. The differences between boys and girls were tested by independent-sample t-tests.
Although the current study found that the intake of fruits and vegetables was higher among girls than boys, both boys and girls had low intakes of these foods in absolute terms. This is consistent with other studies in the region [23, 26] as well as in the West [37, 38]. Lock et al. [39] estimated the amount of fruit and vegetable intake worldwide according to age and sex. They divided the Eastern Mediterranean countries into two groups based on their per capita income, and reported that the mean daily per capita intake of fruits and vegetables among people 15 to 29 years of age in the low-income group, which includes Iraq, was 312 g for males and 348 g for females. These amounts are greater than those reported for the same age group from an Arab oil-rich country (296 g for males and 323 g for females) [39], but are still less than the recommended guideline (not less than 400 g) [39]. The difference between the countries could be due to the fact that Iraq produces some of its foods, such as fruits and vegetables, which are thus more available at low cost. However, it is difficult to compare our findings on the frequency of intake of fruits and vegetables with those of Lock et al. [39], because our data are qualitative and not quantitative. The low frequency of intake of fruits and vegetables may play an important role in increasing the risk of chronic noncommunicable diseases during adulthood in this country.

Evidence indicates that an appropriate intake of fruits and vegetables helps reduce the risks of overweight [41]. Encouraging intake of fruits and vegetables as well as low-fat milk, therefore, should be given high priority to promote healthy eating among children in Iraq.

Western fast foods have spread widely in Iraq since the coalition invasion in 2003. At the beginning they were offered mainly in the Green Zone of Baghdad for American soldiers. However, thereafter, more and more restaurants started to introduce Western fast food into their menus, and international fast food chains and branches of fast food restaurants were started in neighboring countries [42, 43]. Interestingly, the mean frequency of intake of fast foods by Iraqi adolescents, as reported in this study, was close to that found among Saudi adolescents at same age group [26], and the percentage of Iraqi adolescents who consumed fast food per week is also close to that reported in Bahraini adolescents of a similar age group [23]. The National Youth and Adolescents Survey in Iraq [44] reported that 47% of Iraqis aged 10 to 14 years consumed fast foods, and consumption was higher among boys (63%) than girls (31%). This trend among boys and girls is similar to the findings of this study. It was also found that the consumption of fast foods was higher in urban than in rural areas [44]. This may indicate that the nutrition transition in Iraq, although it started later than in the neighboring Arab Gulf countries, has caught up very fast. Nevertheless, with the absence of reliable information on sociocultural changes in Iraq during the past decade, it is difficult to draw any concrete conclusions about the effect of nutrition transition in Iraq in this aspect. The rising intake of fast foods and sugar-sweetened drinks among the young generation in Iraq should be taken into consideration, as the high intake of these foods is linked with increased risk of overweight and perhaps of other metabolic disorders.
This study demonstrated that the prevalence of overweight and obesity (25%) is relatively high for a country like Iraq, which has high proportions of low- and middle-class families. This study found that the prevalence of physical inactivity was much higher among girls (68.8%) than among boys (29.8%). A similar trend has been found in most Arab countries [23, 26, 27, 47, 48]. It is well documented that regular physical activity is a protective factor against many chronic diseases [49]. Furthermore, people who practice physical activity on a regular basis are more likely to eat healthy food than those who are inactive [50]. Therefore, it is essential to promote physical activity, especially among girls in Iraq. Such efforts need careful study of the barriers to practicing physical activity in girls and women in this country. Findings from other Arab countries [51, 52] show that there are many sociocultural barriers to physical activity among girls and women, such as lack of availability of sports clubs for women, difficulty of exercising outdoors, unfavorable attitudes of the family and community toward women who practice exercise or sports, and lack of a secure environment to exercise outdoors. A study in Iraq found that 2.1% of females and 21.6% of males aged 10 to 30 years went to a sports club. Social and religious customs and traditions were mentioned as obstacles for 32% of people in this age group (58% of females and 4.3% of males) to go to a sports club [44]. The absence of secure places to exercise is a considerable barrier, especially among females. Thirty-three percent of Iraqi adolescents 10 to 14 years of age believe that they cannot go through their daily lives securely [44]. The women’s commission reported that women and girls in Iraq have been targeted for murder and kidnapping and have been subjected to violence [53].

The amount of screen time (watching television, playing video games, and using the Internet) is an additional factor that may contribute to obesity and perhaps other metabolic disorders among Iraqi adolescents. The majority of the adolescents in this study (82% of boys and 62% of girls) spent more than 2 hours daily on these activities. Watching television was found to be the main leisure-time activity of Iraqi adolescents and youths [44]. The amount of time spent watching television by adolescents has been explored in several studies in developing [54, 55] and developed [56, 57] countries. Increased time spent watching television, playing video games, and using the Internet is a contributory factor to increased sedentary behaviors and consequently decreased physical activity [58]. It was recommended that children aged 5 to 18 years should not spend more than 2 hours a day on screen time [59]. Findings indicated that adolescents who exceed this amount of screen time have increased risks of overweight [60] and insulin resistance [61] and lower cardiorespiratory fitness [62]. The large percentage of adolescents who sleep less than 8 hours a day (about 50% for both sexes) creates another challenge to healthy lifestyles among adolescents in Iraq. Evidence suggests that there is a consistent increased risk of obesity among short sleepers in children and adults [63]. Insufficient sleep was also found to be associated with morning tiredness in adolescents [64]. Unsettlement and civil war in Iraq may be associated with short or infrequent sleep among adolescents. It was found that 39% of Iraqi youths 10 to 30 years of age worried about civil war and 20% worried about lack of security [44]. Increasing time spent watching television may be a contributing factor to insufficient time spent sleeping [65]. Investigation is needed into the causes of short sleeping time in this age group.

A limitation of this study is that it was conducted only in Mosul and therefore the findings cannot be generalized to the rest of Iraq. However, the present study contributes to the information on dietary and lifestyle behaviors among adolescents in Iraq. It also shows that there is a need to focus on prevention of risk factors for noncommunicable diseases in this country. There are few if any data on this subject for Iraq, and thus this study has two strengths. First, it offers updated information on lifestyle risks for chronic noncommunicable diseases. Second, it provides a valuable picture of dietary habits, physical activity, and sedentary behaviors in an unsettled, unsecured, and economically disadvantaged population. The findings of this study could be used for interventions to promote healthy eating and lifestyles of schoolchildren in Iraq, as well as to carry out more in-depth studies.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Authors’ contributions

All authors contributed equally to this paper. All authors critically read the draft and approved the final version of the manuscript.

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