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## Abstract

**Background**: Interventions to promote healthy eating in adolescents are needed in the United Arab Emirates. To design effective interventions, adolescent eating behaviours need to be understood.

**Aims**: This study aimed to describe eating behaviours of adolescents in Dubai and the factors associated with fruit and vegetable intake.

**Methods**: This was a sequential explanatory study using a mixed methods approach. Ten of the 34 Arabic high schools in Dubai were randomly selected and students in grades 10–12 were included. Data were collected on self-reported fruit and vegetables intake, eating behaviours, food availability and sociodemographic variables. In the qualitative phase, 14 students were interviewed about their eating behaviour.

**Results**: A total of 620 students were included: 57% were boys and most reported medium/high family affluence. Only 28% of the participants met the recommended daily fruit and vegetable intake, with significantly more males than females meeting it (P

**Conclusions**: There are significant differences in eating habits between Emirati male and female adolescents. Lunch, as the main family meal, faces threats because of modern working hours. The gender-specific social context may require targeted interventions to achieve optimal

outcomes in each group.

Keywords: Eating behaviour; adolescent; diet, obesity, United Arab Emirates

Citation: Makansi N; Allison P; Awad M; Bedos C. Fruit and vegetable intake among Emirati adolescents: a mixed methods study. East Mediterr Health J. 2018;24(7):653–663. https://doi.org/10.26719/2018.24.7.653

Received: 08/08/16; accepted: 12/07/17

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## Introduction

Eating behaviours of adolescents in the Middle East have evolved and now tend to resemble those reported in Western Europe and North America, especially in terms of snacking and fast food consumption (1,2). Such behaviours have been associated with several diseases, including obesity and type 2 diabetes (3,4). This phenomenon is particularly evident in Gulf countries, such as the United Arab Emirates (UAE) (5), where oil wealth relative to the small population size has prompted rapid socioenvironmental and nutritional shifts.

In the UAE, significant associations were found in adolescent females between obesity, missing breakfast and fast food consumption (6). Combined figures of overweight and obesity in the Gulf region are now as high as 42.2% in Kuwaiti adolescent males and 42.4% among Bahraini adolescent females (7). The European Society of Cardiology warns that the Gulf region is facing an epidemic of cardiovascular diseases, describing the situation as a “time bomb set to explode in 10–15 years” (8).

Increased intake of fruits and vegetables has a protective effect against chronic diseases (9).

Interventions to promote healthy eating among adolescents are particularly relevant in countries like the UAE. In order to design targeted interventions, we need to understand these behaviours within their socioenvironmental context. Therefore, the aim of this study was: 1) to describe and understand the eating behaviours of Emirati adolescents in the UAE, and 2) to explore behavioural and contextual factors associated with their fruit and vegetable intake. Such findings can inform future interventions and may also be transferable to neighbouring Gulf countries that share similar social, economic and environmental characteristics.

## Methods

### Study design

A sequential explanatory study using a mixed methods approach was selected for its potential to capture the multidimensional nature and complexity of eating behaviour. Quantitative data were first collected followed by qualitative data.

### Study population and sampling

At the time of recruitment for the study, there were 24 public and 48 private high schools in Dubai. The majority of Emirati students (64%) attend public high schools (10). The study was carried out in Arabic, hence, our sampling frame included Arabic high schools only. A total of 34 high schools (24 public and 10 private) were retained in the sampling frame. We randomly selected 4 out of 10 male public schools, 4 out of 14 female public schools, and 2 out of 10 private schools. Two of the public schools we initially contacted declined because of “lack of time”, and another 2 were randomly selected.

### Quantitative phase

### Sample size

Based on previous research (11,12), it was estimated that the proportion of adolescents who meet the daily recommended intake of fruits and vegetables was 32%. Using the appropriate formula for proportions (13), and assuming a design effect of 2 (given the cluster design of the study), a sample size of 668 was calculated. The final sample size was 700. Classes were recruited within the schools based on the availabilities in the academic schedules. All students in a selected class were invited to participate.

### Data collection

The survey was administered during school hours to students who had returned the signed parental consent forms and agreed to participate. We used the validated EAT (Eating Among Teens) survey (14). We also included a standard set of questions to assess fruit and vegetable intake based on the YRBS (Youth Risk Behavior Surveillance) survey (15). The tool was translated from English into Arabic using a multistage process of back translation (translation,

synthesis, back translation, expert review and pretesting) and was adapted to cultural values of the UAE (16). We pilot-tested the translated questionnaire on a convenience sample of grade 10 students in a girls' public school (n = 29). One of the authors (NM) was present throughout the session to answer and clarify any questions and collect the written feedback. Based on the pilot survey, and after consultation with the research team members and a professor from the faculty of dietetic and human nutrition at McGill University, the final modifications of the survey included the omission of items measuring self-efficacy. This was done to reduce the length of the survey and to focus on practical findings that can be directly addressed by an intervention.

### Questionnaire items

We assessed self-reported intake of fruit and vegetables, meal frequency, snacking patterns, fast food intake, and soft drink consumption. Sociodemographic variables included: age, sex, grade and family affluence (based on number of cars owned by the family, family holidays in the past year and family computers, and having own bedroom). Socioenvironmental factors included: frequency of family meals, parental presence at meals, priority of family meals, parental support for healthy eating, and atmosphere of family meals. Finally, we assessed the availability of fruit and vegetables, and some common unhealthy snacks (crisps, chocolate, candy and soft drinks) at home and at school. Details of the variables are given in the supplemental table (available on line).

### Data analysis

Analysis was performed using SPSS, version 20. Descriptive statistics were used to describe the demographic characteristics of the sample. The association between eating behaviours and sex was explored using the chi-squared test. A single level multivariate analysis was done using the generalized linear mixed model (17). The dependent variable was dichotomized as: 0 = not meeting the recommended daily intake of fruit and vegetables and 1 = meeting the recommended daily intake (18). The cut-off score for adequate fruit and vegetable intake combined (in relation to recommended daily intake) was ≥ 5 portions per day.

## Qualitative phase

### Sample selection

Since our goal was to inform future nutritional interventions for this target population, the sampling frame included students who did not meet the recommended daily intake of fruit and/or vegetables. We used stratified purposeful sampling based on sex and frequency of reported intake (students reporting zero intake of fruit and/or vegetables and students reporting less than the recommended intake). Participants were then purposefully selected from these strata. The rationale for stratifying was to capture various profiles within the sampling frame.

### Sample size

The sample size was determined during data collection based on reaching thematic saturation. The decision to stop at 14 interviews followed a sense of saturation on main themes of interest, as well as the time limitation as students were approaching the examination period.

### Data collection

A semi-structured interview guide was developed from the findings of the quantitative phase. The goal was to give context to and further our understanding of the quantitative findings (19). All students invited agreed to participate. The first author (NM) conducted all interviews, accompanied by a research assistant. Interviews lasted about 25–30 minutes and were audio recorded for transcription and analysis.

### Data analysis

We analysed interview data using qualitative content analysis with an unconstrained deductive coding approach (20). We developed a list of categories and preliminary codes based on the survey items, such as “meal skipping” and “parental influence”. We also coded emerging themes such as “social norms” and “parental control”. NM and the research assistant independently coded two interview transcripts for cross-comparison. Results were regularly discussed with the research team.

### Ethical considerations

Ethical approval was obtained from the Research Ethics Committee at the University of Sharjah, UAE, and from the Institutional Review Board at McGill University in Montreal, Canada. Permission to access schools was obtained from the Knowledge and Human Development Authority of Dubai.

## Results

Out of the 700 questionnaires handed out, 80 were completed by non-Emirati students and hence were excluded from the analysis. Table 1 shows the demographic characteristics of the overall sample (n = 620). Most participants reported high (47.1%) to medium (39.7%) family affluence. About half of them (48.9%) reported that neither parent had attended college/university.

In the qualitative phase, the sample consisted of seven females and seven males. At the time of the interviews, nine participants were in grade 12 and 5 were in grade 11. Seven participants reported high family affluence and nine indicated that neither of their parents had attended college/university. The sections below report the integrated quantitative and qualitative findings.

### Eating behaviours

Less than a third of the participants met the recommendations for intake of fruit and vegetables combined, however, males were significantly more likely than females to meet the recommendations (33.2% males versus 21.3% females, P

During school hours, food choices were limited. The school canteen sold prepackaged croissant, za'tar bread, crisps, chocolate, juices and occasional cooked foods like pasta or French fries. The schools in our sample had no assigned dining areas and students typically ate in the schoolyard. Most participants said they would not bring food from home explaining, as two girls said; "no one does that!" and "(Only) girls who are on a diet."

When probed on school food choices, participants criticized the quality and presentation of food. Some suggested adding traditional hot meals while others described the available selection as "boring", "Cold and not appetizing".

Participants always ate "lunch" at home after returning from school. All participants described lunch as the most significant meal of the day, hence confirming the quantitative results ( Table 2 ).
This significance stemmed from factors including location, timing, quality and social context of the lunch meal.

Lunch consisted of traditional meat or vegetable stews with rice as a staple side dish. Salads were often served as well. In terms of context, lunch was the time for family gathering. However, some participants explained that it had become difficult for some family members to attend lunch because of longer working hours; lunch would therefore be set up at a certain time and family members ate at different times upon their arrival from school or work.

More students skipped dinner than lunch ( Table 2 ). Like breakfast there was a significant difference between boys and girls (P **Socio environmental factors**

Table 3 shows the prevalence of family meals, parental presence at meals, and availability of fruit and vegetables at home. Participants reported high availability of fruit and vegetables at home only but at school they were rarely available; on the other hand, potato crisps, chocolate and candy were reportedly "always" available at school.

More than a third of the students recognized time barriers as a threat to family meals ( Table 4 ). This finding was supported during the interviews as students described the conflict between long working hours and having lunch with the family.

### Factors associated with fruit and vegetable intake

Table 5 shows the factors associated with meeting the recommended daily fruit and vegetable intake. Being male, eating frequent lunches, consuming soft drinks and snacking were significantly associated with meeting the recommendations for fruit and vegetable intake across the models. In the final adjusted model (model 3), parental support for healthy eating and family meal atmosphere were also significantly positively correlated with adequate fruit and vegetable intake.

### Qualitative factors that emerged

Accessibility. Qualitative analysis led us to replace our initial deductive theme of food “availability” with “accessibility”, as participants talked about choosing food that was in front of them or prepared for them: “I wouldn’t get up to make a salad for me. If they make it, I eat it.”

The interviews also reflected that respondents did not participate in food-related tasks and simply received food. References were made to the “nanny”, “housemaid”, or the mother as the individuals responsible for food preparation at home.

Food presentation. Appeal of food also emerged as an influencing factor on the students’ food choices; they expressed willingness to try food that “looked good” such as packaged salads with special toppings or vegetables in familiar stews

Parental control. Some participants described their parents’ support in the form of control over what they can or cannot eat. Some parents were said to prohibit certain foods. Students perceived the strategies their parents use to control their food intake as positive and helpful: “Since a young age (my parents) don’t let us eat too much chocolate and stuff and I feel they do a good job”, “My parents don’t pay attention to what I eat but I feel that parents should…they should say eat this, don’t eat too much of that”.

Social and peer norms. Girls, in particular, described the eating habits of their school friends as a main influence on their food choices. They expressed sensitivity towards their friends' perception of what they ate: "my friends believe it would look funny (to eat an apple at school) so they discourage me to eat healthy food at school. I would feel more comfortable if everyone was eating it". Boys, on the other hand, did not seem affected by a certain context. They all made references to several environmental settings (besides school) where influential interactions with peers may occur including sports venues and during evening outings.

## Discussion

Our results showed low rates of fruit and vegetable intake in Emirati adolescents, with significantly lower intake frequency among girls. These results are consistent with previous reports from the Gulf region. In Bahrain, only 25.3% and 26.3% of adolescents reported daily consumption of fruit and vegetables respectively. Girls were also less likely than boys to report adequate intake (21). In Saudi Arabia, more than 50% of adolescents reported they "never" or "rarely" consumed fruit and vegetables (2). In 2013, a study among Kuwaiti adolescents similarly reported significantly lower intake of fruit and vegetables among girls than boys (22). In Western Europe and North America, low rates of fruit and vegetable intake are also common among adolescents, but they tend to be more pronounced among low-income families and certain ethnic groups (such as African Americans) (12,23). In contrast to our findings, girls in North America and Europe tend to report higher intake of fruit and vegetable than boys (24,25). This said, our observed gender differences should to be interpreted in context. Our qualitative data suggest that the eating habits of boys may be influenced by a wider range of socioenvironmental factors than girls because they typically lead a more active and socially varied lifestyle, which may lead to higher energy needs and food intake.

Our analysis showed no correlation between skipping breakfast and adequate fruit and vegetable intake. This could be because, traditionally, fruit and vegetables are not eaten at breakfast in the region. Breakfast was the most commonly skipped meal in our study especially among girls. Similarly, in Bahrain, 62.8% of females versus 37.2% of males reported irregular breakfast consumption (21). Also, reports from Kuwait and Jeddah, Saudi Arabic showed that over half of the adolescent participants skipped the morning meal (2,22).

Family meal frequency has been shown to positively influence the quality of adolescents' diet (26). Family lunches are a long-standing tradition in the Middle East (27). Culturally, this is different from European and North American societies, where dinner (the evening meal) is considered the main family meal. Yet our data indicate that the tension between lunch timing and modern working hours might be affecting the family lunch and eating patterns of Emirati adolescents. More research is needed to assess the impact of this tension and possible means to preserve this family meal. Contrary to previous reports (24,28), we did not find an association between family affluence and intake of fruit and vegetables. This could be due to the fact that

the vast majority of students in this sample were from families of moderate to high affluence.

Fast food consumption among Emirati adolescents in our sample was as high as reports from neighbouring countries such as Saudi Arabia where 55.7% of adolescents eat outside the house (mainly in fast food restaurants) up to three times per week (2). In contrast with Kuwaiti adolescents, more girls (30.5%) than boys (27.2%) in our study reported eating fast food on 3 days or more in the past week (22).

Qualitative themes that emerged added important information that helped refine our interpretations. For example, the distinction we made between 'availability', and 'accessibility' has been previously highlighted in research on children's (rather than adolescents') dietary habits in the US, where accessibility was used to refer to "prepared fruits and vegetables within reach or in a visible place, in the fridge or on a table" (29). Adolescents in our study expressed a similar dependence on their social support system. This can be attributed to the strong cultural emphasis on children's dependence on family in this region, even during adolescence. Yet, in order to involve Emirati parents in future interventions, it is important to recognize potential challenges. For example, half of the parents in our study reportedly did not have higher education. These parents may lack the knowledge needed to guide the eating habits of their adolescent children (30).

Our results also indicated that subgroups of the adolescent population, defined by demographic and lifestyle factors, may require different intervention approaches. As an example, given the social restrictions on female lifestyle, schools become an important setting for socializing among Emirati girls. This may lead to a stronger influence of school social norms among females (30). On the other hand, social norms in boys' schools might be diluted, as they tend to have more opportunities to socialize outside school. It is also possible that girls are generally more responsive to peer influence than boys (31). We recommend further investigation of social and peer norms among Emirati adolescents.

Finally, our findings emphasize the need for supportive food environments in schools. In October of 2012, after finalizing the data collection for this study, and independent of our research project, the Ministry of Education of the UAE made a significant move towards improving the quality of school food across the country. A 15-page guide for school caterers was issued (32). The guide reportedly bans the selling of fried potatoes, crisps, ice creams and chocolate in schools. Such initiatives could be re-examined to assess their effect on eating habits and attitudes of adolescents. Future school-based interventions could use creative ways to introduce fruits and vegetables, such as fresh cocktails and attractive salads. Another idea is to install a salad bar in the school cafeteria, offering a colourful selection of fresh products and

allowing students to build their own plates. Salad bars have been shown to entice adolescents to try new vegetables and fruits (33,34).

### Limitations

The cross-sectional design of this study and exclusion of Emirati students attending private high schools where Arabic is taught as a second language may limit the generalizability of the results. However, we argue that language is an important component of the cultural homogeneity in our target population for future interventions. We did not formally validate the adapted questionnaire used in this study; however, it was formally back translated to Arabic and was successfully piloted for face and construct validity. Finally, the qualitative sample size was partly determined by thematic saturation. True data saturation is difficult to achieve; however we argue that the purposeful sampling within the larger sample and the homogeneity of the qualitative sample helped achieve the supplemental purpose of our qualitative interviews and enhance thematic saturation.

## Conclusion

Despite the similarities between eating behaviours of Emirati adolescents and those reported in Western Europe and North America, there are unique socioenvironmental and lifestyle influences that affect male versus female Emirati adolescents differently. Future interventions may benefit from gender-specific strategies as well as creative school-based programmes.

Table 5 Description of variables

**Funding**: None.

**Competing interests**: None declared

## L’apport en fruits et légumes chez les adolescents émiratis : une étude à méthodologie mixte

### Résumé

**Contexte** : Les adolescents des Émirats arabes unis doivent être encouragés à adopter une alimentation saine. Afin de mettre en place des interventions efficaces à cet effet, il faut tout d’abord bien comprendre les comportements alimentaires des adolescents.

**Objectif** : La présente étude avait pour objectif de décrire les comportements alimentaires des adolescents à Dubaï ainsi que les différents facteurs liés à leur apport en fruits et légumes.

**Méthodes** : Il s'agissait d'une étude séquentielle à visée explicative qui s'appuyait sur une approche méthodologique mixte. Dix des 34 lycées arabes de Dubaï ont été choisis au hasard et on y a recruté des élèves du secondaire (15-18 ans). Les données recueillies concernaient l'apport en fruits et légumes autodéclaré par les élèves, les comportements alimentaires, la disponibilité de la nourriture et les variables sociodémographiques. Lors de la phase qualitative, 14 élèves ont été questionnés au regard de leur comportement alimentaire.

**Résultats** : Au total, 620 élèves ont été inclus, dont 57 % de garçons, et la plupart ont déclaré un niveau d'aisance familiale moyen à aisé. Seuls 28 % des participants atteignaient le niveau recommandé en matière d'apport quotidien en fruits et légumes, dont une part significativement plus élevée de garçons que de filles (p

**Conclusion** : Des différences significatives sur le plan des habitudes alimentaires ont été notées entre les adolescents et les adolescentes émiratis. Les horaires de travail actuels constituent une menace pour le traditionnel déjeuner familial. Le contexte social étant propre à chaque sexe, il pourrait s'avérer nécessaire de cibler les interventions afin d'optimiser les résultats au sein de chaque groupe.

WHO EMRO | Fruit and vegetable intake among Emirati adolescents: a mixed methods study

: هذه دراسة توضيحية تتابعية باستخدام مقاربة الطرق المختلطة . تم اختيار 10طرق البحث
مدارس من بين 34 مدرسة ثانوية في دبي اختياراً عشوائياً لإدراج طلاب من الصفوف
الدراسية 10-12 في الدراسة . وجُمِعَت البيانات المبلغ عنها ذاتياً عن استهلاك الفواكه
والخضروات وعن سلوكيات تناول الطعام وتوافر الغذاء والمتغيرات الاجتماعية والسكانية .
وفي مرحلة الدراسة الكيفية، أجريت مقابلات مع 14 طالباً حول سلوكهم في تناول الطعام .

: شملت الدراسة إجمالي 620 طالباً، كان ٪ 57 منهم من الأولاد ومعظمهم أبلغ عنالنتائ ج
أنه من ذوي الثراء العائلي المتوسط / الرفيع . ولم يستوفِ المدخول اليومي الموصى به من
الفواكه والخضراوات إلا ٪ 28 فقط من المشاركين في الدراسة، وكان عدد الذكور بينهم أكبر
من عدد الإناث الذين استوفوا المدخول اليومي بمقدار يعتَدّ به إحصائياً، P)

: هناك اختلافات يعتدّ بها في عادات الأكل بين الذكور والإناث منالاستنتاجات
المراهقين . وتواجه وجبة الغذاء من حيث كونها الوجبة العائلية الرئيسية تهديدات
بزوالها بسبب ساعات العمل الحديثة . وقد يتطلب السياق الاجتماعي الخاص بالجنسين تدخلات
تستهدف تحقيق النتائج المثلى في كل مجموعة .

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