Obesity, unhealthy dietary habits and sedentary behaviors among university students in Sudan: growing risks for chronic diseases in a poor country

Abdulrahman O. Musaiger1 · Fatima Al-Khalifa2 · Mariam Al-Mannai3

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Abstract

Objective This study aimed to highlight nutritional status, dietary habits and sedentary patterns among university students in Khartoum state, Sudan.

Methods A cross-sectional survey was carried out among 400 university students (183 males and 217 females) from University of Khartoum, Sudan. A pre-validated self-reported questionnaire was used to collect the data. Weight and height were measured and body mass index was used to determine obesity status.

Results Of the students, 20.5, 14.7, and 1.7 % were underweight, overweight and obese, respectively. The majority of students (85.5 %) consumed breakfast daily. About 45 and 21.8 % of students consumed vegetables and fruit, respectively, on more than 3 days a week. Fast food was consumed significantly more \( (p < 0.01) \) for more than 3 days per week by females (44.2 %) than males (27.3 %). Females (42.9 %) were more likely to watch television for 3 h and more per day than males (30.6 %) \( (p < 0.039) \). Males (33.9 %) were more prone to sleep for fewer than 7 h per day than females (23 %) \( (p < 0.016) \).

Conclusion The health authority in Sudan should not only focus on prevention of malnutrition among children but also should organize programs to promote healthy eating and lifestyle among children and youths to prevent and control alarming risk factors for chronic diseases.

Keywords Dietary habits · Nutritional status · Sedentary behaviors · Sudan · University students

Introduction

Most developing countries have experienced nutrition transition, which is characterized by marked socio-economic transformation over the past decades. Such transition has led to great changes in food consumption and lifestyle patterns [1]. Even in poor countries such as Sudan (based on the World Bank criteria), it was indicated that there are changes in urban areas in the past decade toward westernized lifestyle patterns and dietary habits, especially among middle and high socio-economic classes [2]. As a result of this nutrition transition, the intake of fast food and sugar-sweetened beverages has increased and the intake of fruit, vegetables, and high fiber foods has decreased. Moreover, the level of physical activity in these countries has decreased and sedentary behaviors have risen. This may contribute to the occurrence of obesity and other chronic diseases [3].

Transition from high school to university is a critical period for changes to occur in dietary habits, lifestyle and weight gain [4, 5]. Several studies in developing and developed countries have shown that dietary behaviors of university students are poor, with low intake of milk, fruit and vegetables, and high intake of food rich in fat and carbohydrates [5–7]. There are no nutritional studies on university students in Sudan, nor among young adults. Most nutritional and health studies carried out in Sudan have focused on pre-school children [8–10]. Data on dietary and lifestyle patterns of young people are needed for any intervention program to promote healthy food habits and lifestyle among the young population. The objective of
this study, therefore, was to highlight the nutritional status, meal patterns, dietary habits, and sedentary behaviors of university students in Sudan.

Methods

Design and participants

The target group of this study was university students at the College of Education, University of Khartoum, Sudan. The data were collected during February 2015. A convenient sample of 400 recruited students (183 males and 217 females) was included in this study. This represented 9% of total students in the College of Education (4600 students). The age of the students ranged between 18 and 30 years, with a mean age of 21.3. Four trained final year nutrition students were available in the main hall of the College of Education. The nutrition students explained the purpose of the study to the participants and gave them the choice to accept to participate in the study or decline. Then the questionnaire was distributed to those who agreed to participate and they were asked to fill it on the spot in the presence of the nutrition students. Weight and height measurements were then taken for the participants after finishing filling the questionnaire. The response rate was estimated to be 70%. All questionnaires were reviewed for completion before students left the research area.

The questionnaire

A self-reported validated questionnaire was used to gather the data. Detailed information on the reliability and validity of the questionnaire has been published elsewhere [11]. The questionnaire consisted of information on socio-demographic characteristics, dietary habits, sedentary behaviors, duration of sleeping, and weight and height measurements.

Ethical considerations

The ethical permission to carry out the study was obtained from the Department of Nutrition, College of Education, University of Khartoum, Sudan.

Anthropometric measurements

Body weight and height were measured as described by Lee and Nieman [12]. Weight and height were obtained without shoes and with minimum clothing. Height was measured in full standing position to the nearest 0.1 cm using a portable stadiometer. Weight was measured to the nearest 0.1 kg using a calibrated scale.

Determination of nutritional status

Body mass index (BMI) was used to determine the nutritional status of the university students, using the World Health Organization (WHO) [13] definition of BMI for adults. The participants were classified as underweight (BMI < 18.5), normal weight (BMI = 18.5–24.9), overweight (BMI = 25–29.9), or obese (BMI ≥ 30).

Statistical analysis

The statistical analysis was performed using SPSS version 20 (SPSS Inc, Chicago, IL, US). Chi-squared tests were used to determine the presence of association between genders and the variables. The significance level was set at $p < 0.05$.

Results

Socio-demographic characteristics of Sudanese university students according to gender are presented in Table 1. The mean age of male students was significantly higher (22.30) than female (20.44). Male students were more likely to belong to low education mothers (62.3%) than females (37.8%) ($p < 0.01$). Similarly, male students were more likely to belong to low education fathers than females (47.5% and 28.6%, respectively) ($p < 0.01$). The majority of students had unemployed mothers (83.2%). There was no significant difference between males and females regarding father’s occupation ($p < 0.119$).

The nutritional status of Sudanese university students according to gender is given in Table 2. Of students, 63.5% were at normal weight, whereas 20.5% of them were underweight. The prevalence of overweight was slightly higher among females (15.7%) than males (12.6%). Only 1.7% of students were obese.

The meal and snack patterns of Sudanese university students according to gender are shown in Table 3. Breakfast was consumed daily by most of the students (85.5%); however, the majority of students ate their breakfast at the university cafeteria (91.2%). Females were more likely to consume a daily lunch than males (54.8% and 44.5%, respectively) ($p < 0.02$). In contrast, males (62.8%) were more prone to a daily consumed supper than females (34.6%) ($p < 0.001$). Snacking was not a common habit among Sudanese university students, as only 18.8 and 11.8% of them regularly ate morning and afternoon snacks, respectively.

The frequency of food intake among Sudanese university students according to gender is reported in Table 4. Almost half of the students consumed vegetables (44.5%) more than 3 days per week, compared with 21.8% who...
consumed fruit for the same frequency. Fast food was significantly ($p < 0.01$) more consumed for more than 3 days per week by females (44.2 %) than by males (27.3 %). Only 31 % of students consumed milk and its products on more than 3 days per week. Fish (7.3 %), nuts (9.8 %), and chicken (15.5 %) were rarely consumed on more than 3 days per week. Females were more likely to consume sweets (32.3 %) and chocolate (25.8 %) on more than 3 days per week than males (23.1 % and 11.5 %, respectively). Of students, 24.3 and 17.5 % drunk carbonated beverages, and canned fruit drinks more than 3 days per week.

Sedentary behaviors and duration of sleep among Sudanese university students according to gender are presented in Table 5. Watching television for 3 h and more per day was more prevalent among females (42.9 %) than males (30.6 %) ($p < 0.039$). Similarly, use of the internet for more than 2 h a day was more prevalent among females (63.6 %) than males (53 %) ($p < 0.001$). Males (33.9 %) were more prone to sleep for less than 7 h per day than females (23 %) ($p < 0.016$).

Discussion

The current survey indicates an alarming prevalence of overweight, unhealthy dietary habits and sedentary behaviors among young people in urban areas of Sudan. The proportion of overweight and obesity among Sudanese university students (16 %) in this study is slightly higher than that reported in their counterparts in Turkey (14 %) [14] and close to those in Jordan (18 %) (female only) [15], but lower than those in Lebanon (30 %) [16] and Saudi Arabia (37.5 %) [17]. The growing problem of obesity in urban Sudan should be given high priority in prevention.
Unhealthy dietary habits, characterized by skipping meals, low consumption of some healthy food and high intake of energy and sugar rich foods, were prevalent among a relatively large proportion of Sudanese university students. Lunch and supper were infrequently consumed by studied subjects. It was found that skipping meals is associated with poor dietary intake [18]. However, it is interesting that the majority of Sudanese university students consumed breakfast daily (85.5 %). This percentage is higher than that documented in university students in Ghana (8 %) [19] and in Saudi Arabia (68 %) (female only) [20]. Several studies report that regular intake of breakfast reduces the risk of obesity and some chronic problems [21, 22]. Nevertheless, it is worth mentioning that most of the Sudanese students consumed their breakfast at the university, and therefore the dietary quality of their breakfast depends on foods provided by the university cafeteria. We did not aim to investigate food provided in the university cafeteria, but this could be a subject for further investigation. A morning snack was skipped by 38 % of Sudanese university students, compared with 62.0 % who skipped an afternoon snack. A literature review indicates contrasting findings for snacking, as eating snacks may be a protective factor for obesity and provide essential nutrients. On the other hand, snacking provides extra energy and may contribute to weight gain [23]. However, this depends on the types of food consumed during snacking time. Such matters are beyond the objective of the current study.

More vegetables were consumed than fruit by Sudanese students. This is probably due to the fact that vegetables are widely used in the preparation of many local dishes in Sudan. However, both vegetables and fruit were consumed less than dietary guidelines recommend [24]. A similar low intake of vegetables and fruit was reported among university students in Jordan [15], Lebanon [16], and Saudi Arabia [17]. A review of the intake of fruit and vegetables in university students in 26 countries showed that 83 % of students consumed less than the recommended guidelines [25]. It is interesting that Sudanese female students were more likely to consume fast food on more than 3 days per week than their male counterparts (44.3 vs. 27.3 %). Fast food intake was found to be higher among adolescent males than females in five Arab countries [26]. The proportion of fast food intake of Sudanese females was higher than that reported in female university students in Jordan (25.6 %) [15], but lower than their counterparts in Kuwait (58.8 %) [27]. The relatively high consumption of fast food among Sudanese students indicates a great shift in food habits among young people in urban areas of Sudan. It has been shown that high intake of fast food is positively associated with obesity and maybe other chronic diseases [28, 29]. Therefore, a nutrition education program should be established in the universities in Sudan to increase the awareness of students toward healthy dietary habits.

About one-third (30 %) of both male and female students consumed milk and dairy products on more than 3 days per week. This proportion is less than that found among their counterparts in Jordan (51 %) [15]. It has been suggested that a greater dairy consumption is associated with lower prevalence of metabolic syndrome, with calcium probably being responsible for this association [30]. About 24 and 18 % of Sudanese studied subjects consumed carbonated beverages and canned fruit drinks on more than 3 days per week, respectively. This trend is alarming, as sugar-sweetened beverages have been found to be associated with obesity and diet-related chronic diseases worldwide [31].

Long duration of screen time (watching television and using the internet) was highly prevalent among Sudanese students. Females were more likely to spend more hours on screen time than males. This is probably due to cultural factors, as men have more freedom to spend their leisure time outside the home than women. Consequently, women are more exposed to television and the internet at home.
There is good evidence that sedentary behaviors are risk factors for several non-communicable diseases [32]. It was recommended that screen time, especially for watching television, should not exceed 2 h per day to prevent obesity and its co-morbidity [33]. The current study shows that about one-third (37 %) of subjects watched television for more than 2 h per day. On the other hand, about a quarter of Sudanese university students slept for less than 7 h per day. It is well documented that short daily sleeping is associated with obesity and other health problems [34]. In conclusion, this study showed that there were differences between male and female university students with regard to nutritional status, dietary habits, and lifestyle, which may be due to several confounding factors. Such factors could be the target for future study utilizing the current data. This study is the first attempt to explore the nutritional status, food habits, and some lifestyle patterns among young people in urban areas of Sudan. Findings revealed that there is potential for increased risk factors for chronic diseases among this age group. This was evident in the relatively high prevalence of overweight, unhealthy dietary habits, and sedentary lifestyles. The health authority in Sudan should not only focus on programs for prevention and control of malnutrition in pre-school children,

### Table 4 Frequency of intake of foods among Sudanese university students according to gender

| Food                  | Intake (days/week) | Male | Female | P value | Total |
|-----------------------|--------------------|------|--------|---------|-------|
|                       | N      | %    | N      | %       | N     | %    |
| Vegetables            | 4+     | 83   | 45.4   | 95      | 43.8  | 178  | 44.5 |
|                       | <4     | 100  | 54.6   | 122     | 56.2  | 222  | 55.5 |
| Fruit                 | 4+     | 40   | 21.9   | 47      | 21.7  | 87   | 21.8 |
|                       | <4     | 143  | 78.1   | 175     | 78.3  | 318  | 78.2 |
| Fast food             | 4+     | 50   | 27.3   | 96      | 44.2  | 146  | 36.5 |
|                       | <4     | 133  | 72.7   | 121     | 55.8  | 254  | 63.5 |
| Milk and its products | 4+     | 58   | 31.7   | 66      | 30.4  | 124  | 31.0 |
|                       | <4     | 125  | 68.3   | 151     | 69.6  | 276  | 69.0 |
| Red meat              | 4+     | 48   | 26.2   | 65      | 30.0  | 113  | 28.3 |
|                       | <4     | 135  | 73.8   | 152     | 70.0  | 287  | 71.7 |
| Fish                  | 4+     | 16   | 8.7    | 13      | 6.0   | 29   | 7.3  |
|                       | <4     | 167  | 91.3   | 204     | 94.0  | 371  | 92.7 |
| Chicken               | 4+     | 33   | 18.0   | 29      | 13.4  | 62   | 15.5 |
|                       | <4     | 150  | 82.0   | 188     | 86.6  | 338  | 84.5 |
| Sweets                | 4+     | 43   | 23.1   | 70      | 32.3  | 112  | 28.1 |
|                       | <4     | 140  | 76.9   | 147     | 67.7  | 287  | 71.9 |
| Nuts                  | 4+     | 19   | 10.4   | 20      | 9.2   | 39   | 9.8  |
|                       | <4     | 164  | 89.6   | 197     | 90.8  | 361  | 90.2 |
| Chocolates            | 4+     | 21   | 11.5   | 56      | 25.8  | 77   | 19.3 |
|                       | <4     | 162  | 88.5   | 161     | 74.2  | 323  | 80.7 |
| Carbonated beverages  | 4+     | 47   | 25.7   | 50      | 23.0  | 97   | 24.3 |
|                       | <4     | 136  | 74.3   | 167     | 77.0  | 303  | 75.7 |
| Canned fruit drinks   | 4+     | 38   | 20.8   | 32      | 14.7  | 70   | 17.5 |
|                       | <4     | 145  | 79.2   | 185     | 85.3  | 330  | 82.5 |
| Legumes               | 4+     | 119  | 65.0   | 119     | 54.8  | 238  | 59.5 |
|                       | <4     | 64   | 35.0   | 98      | 45.2  | 162  | 40.5 |

### Table 5 Sedentary behaviors and sleeping hours among Sudanese university students according to gender

| Sedentary behavior      | Male | Female | P value | Total |
|-------------------------|------|--------|---------|-------|
| Hours watching television/day | N%   | N%     | N%     | N%   |
| Do not watch            | 64   | 35.0   | 65      | 30.0  | 129  | 32.3 |
| <3                      | 63   | 34.4   | 59      | 27.1  | 122  | 30.5 |
| 3+                      | 56   | 30.6   | 93      | 42.9  | 149  | 37.2 |
| Hours using internet/day | N%   | N%     | N%     | N%   |
| Do not use              | 30   | 16.4   | 49      | 22.6  | 79   | 19.8 |
| <3                      | 56   | 30.6   | 30      | 13.8  | 86   | 21.5 |
| 3+                      | 97   | 53.0   | 138     | 63.6  | 235  | 58.7 |
| Sleeping hours/day      | N%   | N%     | N%     | N%   |
| <7                      | 62   | 33.9   | 50      | 23.0  | 112  | 28.0 |
| 7+                      | 121  | 66.1   | 167     | 77.0  | 288  | 72.0 |
but should extend such programs to school children and the young population to reduce the risks of chronic diseases. Further in-depth investigations with more advanced statistical analysis and larger sample size related to factors associated with obesity, dietary habits and lifestyles of adolescents and the young population in Sudan are definitely needed. We hope that this study provides baseline data for carrying out such investigations. We also hope that this study provides information for establishing an intervention program to promote healthy nutrition and lifestyle among university students, as well as providing baseline data for further studies.

Compliance with ethical standards

Conflict of interest The authors declare no conflict of interest.

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