



## Dietary Behaviors among Medical Students in the Middle East: Identifying Areas for Intervention

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### Authors' contributions

This work was carried out in collaboration between both authors. Authors SA and RRH designed the study and wrote the protocol. Data collection and statistical analysis were conducted by author SA. The manuscript was written and approved by both authors.

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### ABSTRACT

**Aims:** The objective of the study was to describe the Arabian Gulf University medical students dietary patterns and to provide recommendations for promoting healthy dietary behaviors and lifestyle among the students.

**Study Design and Place of Study:** A cross sectional study was conducted on medical students enrolled in the Arabian Gulf University in the Kingdom of Bahrain.

**Methodology:** A self-administered anonymous questionnaire was used, which included questions on demography and dietary behaviors.

**Results:** Of the 535 medical students who were enrolled in years 1-4, 443 responded to the questionnaire thus resulting in a 82.8% response rate. One third of the students of both sexes had breakfast for 3-5 days per week. Seventy two percent of the males and 75.2% of the females had lunch for 6-7 days per week, while 23% of male students had lunch for 3-5 days per week compared to 19.4% of their female counterparts. Half of male and female students had dinner 6-7 days per week, and 39.7% of the males had it for 3-5 days per week compared to 28.9% of the female students. When looking at specific nutritional items, there were significant differences by

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gender, nationality, medical year and accommodation status.

**Conclusion:** Dietary patterns and behaviors cluster among students according to gender and medical year, nationality and accommodation status. Urgent interventions are needed at AGU to promote healthy dietary patterns and behaviors among medical students.

*Keywords: Diet; healthy lifestyle; medical students; intervention; policy.*

## 1. INTRODUCTION

Dietary behaviors and lifestyle factors are associated with mortality from all causes, cardiovascular diseases, and cancer [1,2]. Improving diet and lifestyle is an important aspect in the cardiovascular disease risk reduction strategy among the general population [1,3]. Adolescents, particularly those in the age range 15-24 years, practice health-risk behaviors such as smoking, drinking, and adopting poor dietary behaviors. These behaviors lead to multiple adverse health outcomes among that age group [4]. Lifestyle modification is key to managing established non-communicable disease (NCD) risk factors including physical inactivity, unhealthy diets, smoking, obesity, and alcohol use [5]. Individuals suffering from obesity are at increased risks of diseases such as type 2 diabetes mellitus, hypertension, dyslipidemia, coronary heart disease (CHD), stroke, sleep apnea, osteoarthritis, gallstones, stress incontinence, depression and certain types of cancer [6]. "Physically active lifestyles are associated with improved health and quality of life. Differences in lifestyles in society can partly be understood through the differences in the social and physical environment" [7].

NCD such as CHD, diabetes, hypertension and cancer have become the main public health problems in most of Arab Middle Eastern countries. Patterns of food consumption may play an important part in the increasing incidence of CHD in this region. The traditional diet, which is characterized by a high-fiber and a low fat and cholesterol content has changed to a more westernized diet which is high in fat, free sugars, sodium and cholesterol [8]. Irregular meal frequency leads to a lower postprandial energy expenditure, higher total and LDL cholesterol, and lower postprandial insulin sensitivity [9]. Intake of meat, fish and chicken add variety of nutrients to the diet. Adding a small amount of these dietary products to the daily diet can produce considerable enhancements in human health. When consumed in moderation, meat, fish and chicken can be part of a healthy diet [10]. Fresh fruits and vegetables are highly

recommended to be part of the daily diet due their properties, as half of individual's plate during meals should consist of freshfruits and vegetables. They have vitamins (A and C), minerals (electrolytes), and antioxidants. They are also highly recommended to be included in the diet as a source of dietary fibers. Regular consumption of fresh fruits and vegetables has been negatively correlated with the risk of developing chronic diseases [11,12].

A study on adult Saudis, showed that overweight and obesity prevalence is significantly high among them, where males have a significantly higher prevalence of overweight, and females being more obese which predicts the future trend of overweight and obesity among boys and girls in the present study, with the current lifestyle pattern, putting Saudi school children at high risk of becoming obese in adulthood. The authors emphasized the urgent need to implement comprehensive lifestyle modification intervention programs in schools that addresses nutrition and physical education, and other healthy lifestyle habits [13].

The Arabian Gulf University (AGU) is a regional university established in 1983 and based in the Kingdom of Bahrain. It has two colleges, the College of Medicine and Medical Sciences (CMMS) and the College of Graduate Studies. AGU accepts students of both genders from the Gulf Cooperation Council (GCC) countries (Bahrain, Saudi Arabia, Kuwait, Oman, UAE and Qatar), where students are admitted based on their country's quota. Thus, AGU provides a unique opportunity to suggest guidelines to medical schools in the GCC countries. The CMMS follows a problem-based, student-centered and community-oriented curriculum. The problem-based learning (PBL) curriculum integrates basic medical sciences with related professional skills training, and community health activities. The program is of six years duration divided into three phases: the basic Sciences Phase (Phase I, Year 1), Pre-clerkship Phase (Phase II, Years 2-4) and Clinical Clerkships Phase (Phase III: Years 5 and 6). At CMMS, English is the language of instruction [14]. The

aim of the study was to describe the Arabian Gulf University medical students dietary behaviors and to provide recommendations for promoting a healthy dietary behaviors and lifestyle among the students.

## **2. METHODS**

### **2.1 Participants**

A cross sectional study was conducted among AGU Years 1 to 4 medical students, during May 2009. A census of all AGU Years 1 to 4 medical students (535) who were enrolled during the Academic Year 2008-2009, was obtained from the Admission and Registration Unit.

### **2.2 Instrument**

A self administered anonymous questionnaire in the English language was used. The questionnaire was abridged from the adult questionnaire of the United Arab Emirates Health and Lifestyle Survey 2000 [15], which was validated and field tested. The questionnaire included questions about demography (Age, gender, nationality, medical year, place of residence), and dietary behaviors: On average how often do students usually eat breakfast, lunch and dinner per week. How often do students usually eat red meat, fish, chicken, fresh fruits and vegetables per week. Have students consumed any energy drinks during the last 6 months.

### **2.3 Data Collection**

The questionnaire was distributed to the students in the following manner: For Year 1 students, the questionnaires were distributed at the beginning of the Biostatistics class. As Years 2 to 4 students are divided into groups of 8-10 students in the tutorial sessions which are held twice per week, hence those students were given the questionnaires by their respective tutors during their first session. The respective tutors were briefed about this process by a covering letter, which was kept along with the questionnaires in the tutorial boxes that contain the teaching materials. These boxes were collected from the medical education office by tutors before the tutorial sessions and returned back after the tutorial sessions. The completed questionnaires were put in sealed envelopes by the students and returned to the tutor who placed them in the tutorial boxes. The questionnaires were resent in

the following week to the tutors for them to give students who were absent the day of data collection during the tutorial session. A covering letter was enclosed in the tutorial box to the respective tutors instructing them to distribute the questionnaires only to the students who were absent in the previous tutorial session [16].

### **2.4 Data Analysis**

Data entry and analysis were done using the Statistical Product and Service Solutions (SPSS), Version 17.0. Descriptive statistics and the chi-square test were applied when appropriate.

## **3. RESULTS**

Of the 535 medical students who were enrolled in years 1-4, 443 responded to the questionnaire thus resulting in a 82.8% response rate.

### **3.1 Breakfast, Lunch and Dinner**

Medical students did not have breakfast regularly while the majority had lunch and dinner regularly during the week. The percentage (10.7%) of students who skipped breakfast daily was higher than that of those who did not have lunch (0.2%) or dinner (3.2%) in both sexes compared to 26% of the students missed breakfast. One third of the students had breakfast 3-5 days per week and two thirds had lunch daily. Ninety percent of the students had their lunch regularly in all medical years. However, a small percentage (5%) skipped lunch 1-2 days per week. Half of the medical students had their dinner for 6-7 days per week, while one third had it for 3-5 days per week, and 15% for 1-2 days per week.

The patterns of eating breakfast, lunch and dinner were almost similar between males and females (Table 1). However, 14.3% of the male students did not eat breakfast at all during the week compared to 9.3% of the females. Seventy two percent of the males and 75.2% of the females had lunch for 6-7 days per week, while 23.0% of the former had lunch for 3-5 days per week compared to 19.4% of their female counterparts. Unlike breakfast, the majority of the students of both sexes did not skip lunch. Half of male and female students had dinner for 6-7 days per week, and 39.7% of the males had it for 3-5 days per week compared to 28.9% of the female students. Further analyses did not show any statistically significant differences between eating meals and students' medical year.

However, a higher percentage of Year 2 and 4 students (13.8% and 15.2%, respectively) did not have breakfast at all compared to Years 1 and 3 students (7.8% and 5.6%, respectively).

When the data was analyzed by accommodation status, it revealed that there were statistically significant differences between the accommodation status and the frequency of having meals per week. For breakfast, 23.4% of the students who lived alone and 16.7% of those who lived with their friends skipped breakfast everyday of the week, compared to 8.1% of those who lived with their families, 8.2% who stayed in university housing and 11.1% of those who lived with their relatives. Forty one percent of the students who lived with their families and 28.6% of those stayed in university housing had breakfast 6-7 days per week, compared to 11.1% of those who lived with their relatives, 12.5% who lived with friends and 19.1% who lived alone. A similar percentage of students skipped lunch daily by students who lived with friends (8.2%) and alone (8.5%). The percentage was halved for those who lived with their families (4.3%) and in university housing (4.1%). Twenty two percent of the students who lived with their relatives did not eat dinner at all, compared to 4.3% of those who lived alone, 4.1% in university housing and 2.1% of those who lived with friends and 1.1% of those who lived with their families (Table 1).

### 3.2 Food Items

Almost one third of the students did not eat fish at all during the week. The corresponding percentages for fresh fruits, vegetables, red meat and chicken were 16.3%, 13.3%, 14.3% and 2.5%, respectively (Fig. 1). One fourth of the medical students reported eating red meat, fresh fruits and vegetables for 3-5 days per week, compared to 50% for chicken and 10% for fish.

Statistically significant differences were observed between the frequency of eating food items and accommodation. Twenty percent of the students who lived in the university housing and 21.3% of those lived alone did not eat red meat at all compared to 9.6% of those who lived with their

families, 11.1% with their relatives and 8.2% with friends. Different results were seen for eating fish, as 41.5% of those who lived in university housing, 38.8% of those who lived with friends and 34% of those who lived alone did not eat fish at all compared to those who lived with their relatives and with their families (24.1% and 11.1%, respectively). Unlike red meat and fish, chicken was eaten by majority of the students at least once during the week (97.5%). However, 8.5% of those who lived alone did not eat chicken, compared to 1.6% of those who lived with their families, 2.7% in university housing, and none of those who lived with relatives and friends. Twenty three percent of those who resided in the university accommodation and 21.3% of those lived alone did not have fresh fruits at all during the week compared to 9.6% of those who lived with their families, 11.1% with relatives and 16.7% with friends. As for vegetables, 18.1% of those who lived with their families, 14.3% of those who lived with friends and 14.9% of those who lived alone did not eat vegetables at all, compared to 9.1% of those who lived with their families and 11.1% of those who stayed in university housing (Tables 2-3).

Almost one third of the male, female students and both sexes combined dieted during the last 6 months. Of those males who dieted, 34.1% followed low fat diet, 26.8% low carbohydrate diet, 12.2% high protein diet and 26.8% a combination of several diets. The corresponding percentages for females were 38.8%, 30.6%, 5.1% and 25.5%, respectively. Further, only 1.8% of the students used weight reduction medications in dieting during the last 6 months. One quarter of the students consumed energy drinks with statistically significant differences ( $P < .001$ ) by gender. The consumption of energy drinks in males (46.8%) during the last 6 months was almost double that of their female counterparts (26.8%) No statistically significant differences were observed between medical years and energy drink consumption, although, 54.8% of the male students in Year 2 and 57.9% of Year 3 consumed energy drinks during the last 6 months, compared 40.9% and 40.6% in years 1 and 4, respectively.

**Table 1. Frequency of having breakfast, lunch and dinner per week**

	Breakfast				Lunch				Dinner			
	0 days/week	1-2 days/week	3-5 days/week	6-7 days/week	0 days/week	1-2 days/week	3-5 days/week	6-7 days/week	0 days/week	1-2 days/week	3-5 days/week	6-7 days/week
<b>Gender</b>												
Male	14.3%	34.1%	32.5%	19.0%	0%	4.8%	23.0%	72.2%	3.2%	8.7%	39.7%	48.4%
Female	9.4%	22.3%	32.6%	35.8%	0.3%	5.2%	19.4%	75.2%	3.2%	17.7%	28.9%	50.2%
<i>P</i> value	.002				.77				.45			
<b>Nationality</b>												
Bahraini	6.7%	16.7%	33.3%	43.3%	0.0%	4.7%	12.0%	83.3%	2.0%	6.0%	21.9%	70.2%
Kuwaiti	19.2%	39.4%	29.3%	12.1%	1.0%	3.0%	27.3%	68.7%	5.1%	20.2%	37.4%	37.4%
Saudi	7.1%	25.3%	35.7%	31.8%	0.0%	7.8%	22.1%	70.1%	3.2%	22.1%	37.7%	37.0%
Omani	25.0%	25.0%	30.0%	20.0%	0.0%	0.0%	30.0%	70.0%	0.0%	10.0%	25.0%	65.0%
Other	15.4%	38.5%	15.4%	30.8%	0.0%	0.0%	23.1%	76.9%	7.7%	7.7%	53.8%	30.8%
<i>P</i> value	< .001				.08				< .001			
<b>Medical year</b>												
Year 1	7.8%	24.8%	35.7%	31.8%	0.0%	6.2%	24.6%	69.2%	4.6%	16.2%	35.4%	43.8%
Year 2	13.8%	26.6%	34.9%	24.8%	0.9%	1.8%	19.3%	78.0%	4.6%	13.8%	27.5%	54.1%
Year 3	5.6%	29.2%	27.0%	38.2%	0.0%	5.7%	17.0%	77.3%	0.0%	16.9%	31.5%	51.7%
Year 4	15.2%	24.1%	30.4%	30.4%	0.0%	6.3%	18.8%	75.0%	2.7%	13.4%	33.9%	50.0%
<i>P</i> value	.25				.48				.56			
<b>Accommodation status</b>												
With Family	8.1%	18.3%	32.8%	40.9%	0.0%	4.3%	16.1%	79.6%	1.1%	8.6%	24.1%	66.3%
University housing	8.2%	30.6%	32.7%	28.6%	0.0%	4.1%	26.5%	69.4%	4.1%	19.7%	40.1%	36.1%
With Relatives	11.1%	55.6%	22.2%	11.1%	0.0%	0.0%	22.2%	77.8%	22.2%	22.2%	33.3%	22.2%
With Friends	16.7%	31.3%	39.6%	12.5%	0.0%	8.3%	22.9%	68.8%	2.1%	14.6%	43.8%	39.6%
Alone	23.4%	31.9%	25.5%	19.1%	2.1%	8.5%	14.9%	74.5%	4.3%	25.5%	29.8%	40.4%
<i>P</i> value	< .001				.12				< .001			

**Table 2. Weekly consumption of red meat, fish and chicken per week by accommodation**

	Red meat				Fish				Chicken			
	0 days/week	1-2 days/week	3-5 days/week	6-7 days/week	0 days/week	1-2 days/week	3-5 days/week	6-7 days/week	0 days/week	1-2 days/week	3-5 days/week	6-7 days/week
With family	9.6%	55.1%	31.0%	4.3%	24.1%	56.1%	19.8%	0.0%	1.6%	22.7%	64.3%	11.4%
University housing	20.4%	49.7%	25.9%	4.1%	41.5%	50.3%	5.4%	2.7%	2.7%	20.1%	60.4%	16.8%
With relatives	11.1%	66.7%	22.2%	0.0%	11.1%	88.9%	0.0%	0.0%	0.0%	22.2%	55.6%	22.2%
With Friends	8.2%	44.9%	36.7%	10.2%	38.8%	53.1%	8.2%	0.0%	0.0%	16.7%	58.3%	25.0%
Alone	21.3%	46.8%	29.8%	2.1%	34.0%	61.7%	4.3%	0.0%	8.5%	29.8%	46.8%	14.9%
<i>P</i> value	.13				< .001				.11			

**Table 3. Weekly consumption of fresh fruits and vegetables per week by accommodation**

	Fresh fruits				Vegetables			
	0 days/week	1-2 days/week	3-5 days/week	6-7 days/week	0 days/week	1-2 days/week	3-5 days/week	6-7 days/week
With family	9.6%	34.8%	33.2%	22.5%	9.1%	27.8%	33.7%	29.4%
University housing	23.0%	43.2%	25.0%	8.8%	18.1%	47.7%	20.1%	14.1%
With relatives	11.1%	55.6%	22.2%	11.1%	11.1%	66.7%	22.2%	0.0%
With friends	16.7%	58.3%	16.7%	8.3%	14.3%	40.8%	32.7%	12.2%
Alone	21.3%	48.9%	12.8%	17.0%	14.9%	40.4%	21.3%	23.4%
<i>P</i> value	< .001				< .001			

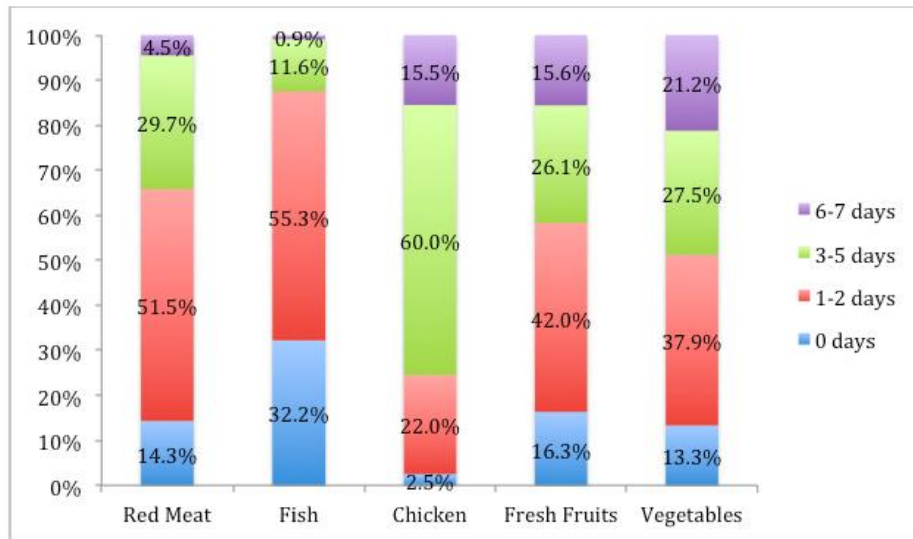


Fig. 1. Consumption of selected food items per week

#### 4. DISCUSSION

The dietary behaviors of AGU medical students deviate from the recommended dietary patterns [9,10,11,12]. The food consumption patterns of the students are of particular concern because students tend to skip meals frequently. The study showed that 10.7% of the medical students skipped breakfast on all days of the week, compared to 0.2% for lunch and 3.2% for dinner. Female students showed healthier eating habits compared to the male students in terms of meal intake especially breakfast ( $P = .002$ ). As for lunch, 74.5% of the students had it 6-7 days per week and 20.3% for 3-5 days per week with no significant differences by gender. On the other hand, male students had dinner more often than females during the week. A similar finding was reported in Lebanon [17], as female students were adopting healthier meals intake habits than male students. More students of Years 2- 4 had the meals during the week than those of Year 1, but the differences were not significant. However, a similar finding was reported in Southern Medical University in China as junior undergraduates scored lower than senior students on the nutrition behaviors dimension [4]. Moreover, more of students who lived with their families or with their friends had meals than those who lived in the university housing or alone, especially breakfast and dinner meals ( $P < .001$ ).

There were significant differences between frequency of consumption of different food items

where by 4.5% reported daily intake of red meat, 15.5% chicken, 21.2% vegetables, 15.6% fresh fruits and none for fish. These habits were more prevalent among students who lived with their families or friends compared to those who lived in university housing or alone. Similar findings were reported [18,19] as significant differences were found among undergraduate college students in diet (lamb, veal, fish, green leafy vegetables, fresh fruits, and the cumulative total of all meats); and 30.5% of the university students reported daily intake of colored vegetables, 27.3% of fresh fruits, and eating daily with family and friends was common among students. One third of the students consumed energy drinks with a statistically significant difference between males and females. Almost half (46.8%) of the male students consumed energy drinks during the last 6 months compared to 26.8% of the females. There were no statistically significant differences between different medical years even after controlling for the gender. This is in contrast to what has been reported in the United States (US) were 51% of the college students consumed energy drinks, with a higher prevalence among females (53%) than males (42%). However, these results of the US study were explained by the fact that 54% of the energy drinks consumers were drinking them with alcohol while partying and 17% to treat hangover [15]. In the Arabian Peninsula, alcohol consumption does exist despite cultural, social, religious, and legal constraints on Muslim Arab nationals living in the region against alcohol consumption [20].

The study has the following limitations: the questionnaire focused on events that happened during the past, ranging from the previous week to the previous six months. Hence, the possibility of recall bias could not be excluded particularly in nutrition related questions. The study did not include students in the clerkship phase (Year 5 and 6). Accordingly, the results are applicable to the students in Years 1-4.

## 5. CONCLUSION AND RECOMMENDATIONS

Dietary patterns and behaviors cluster among students according to gender and medical year, nationality and accommodation status. Urgent interventions are needed at AGU on promoting healthy dietary behaviors among medical students. Such interventions include reinforcing the wellbeing and healthy behaviors and specific intervention measures like diet control throughout the medical curriculum. Providing counseling services at the university and university housings for healthy dietary and nutritional habits. Establishing a cafeteria/canteen at the university housing to provide students with healthy meals and healthy food products. Increasing the number of days that the university cafeteria serves seafood and other healthy food items. Opening a small supermarket/grocery shop inside the university campus that sells the nutritional products that are liked by students. Suggesting to the supermarket owners in the university housing to provide a variety of fresh fruits, vegetables and healthy food items. Reinforcing the exemplary role of faculty members by adopting their healthy lifestyle. Further research in this aspect of students' behavior is highly recommended.

## ETHICAL CONSIDERATIONS AND PRIVACY OF PARTICIPANTS

The Academic Committee of the Masters of Science in Health Policy and Population Studies program approved the research protocol. Study participation was on a voluntary basis and participants were assured of the confidentiality of the study by having the questionnaire anonymous and keeping the completed ones in sealed envelopes.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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