

## Impact of Migration on Diet, Physical Activity, and Body Weight among International Students Moving from the Gulf Countries to the United States

Zainab Alyousif\* and Anne E Mathews

Food Science and Human Nutrition Department, University of Florida, Gainesville, Florida, USA

**Rec:** October 20, 2017; **Acc:** January 27, 2018; **Pub:** January 31, 2018

\***Corresponding author:** Zainab Alyousif, Food Science and Human Nutrition Department, University of Florida, 359 FSHN Building Newell Dr, Gainesville, FL 32611-0370, USA, Tel: 352-294-3712; Fax: 352-392-9467; E-mail: [zalyousif@ufl.edu](mailto:zalyousif@ufl.edu)

### Abstract

In 2015/2016, over one million international students studied in the United States, with Saudi Arabia ranking third. However, exposure to an unfamiliar environment may affect eating patterns and risk of chronic disease. The aim of this study was to explore the impact of migration on dietary intake, dietary behaviors, physical activity, and body weight among international students moving from Gulf countries to the US. This case series was conducted during fall 2016 and spring 2017 in Florida, US. Eight students from Saudi Arabia and Kuwait were recruited within their first month of arriving in the US. Participants completed questionnaires about their diet and physical activity before coming to the US and had their height and weight assessed. Anthropometric assessments and the same questionnaires were repeated in December 2016 and in April 2017. Participants experienced a significant decrease in their intake of fruit, vegetables, and sugar after coming to the US. The frequency of food shopping was significantly increased and their physical activity was significantly decreased, but these changes did not affect their body weight. This 7-month prospective study found that international students from the Gulf countries had an overall less healthy dietary intake after coming to the US. Findings from this study may support the rationale for an educational program for the international students to maintain healthy lifestyle habits after coming to the US. Further research is needed to determine longer-term eating pattern changes in students from Gulf countries studying in the US.

**Keywords:** Migration; International students; Gulf countries; Diet, Physical activity; Weight

### Introduction

Studying and living abroad for learning a new language or to complete a degree is a common experience in many countries [1]. In the US, there are 1,043,839 international students studying at US colleges and universities in 2015-2016, and the number is increasing rapidly compared with the number of 974,926 in 2014-2015 [2]. Saudi Arabia is the third in terms of population of international students [3]. According to the Institute of International Education, the number of Saudi international students was 61,287 in 2015-2016. Migration and living in an unfamiliar environment may lead to many challenges including changes in eating patterns and eating behavior [4]. The changes in immigrants' lifestyle are positively associated with chronic disease risk [5]. Therefore, the health status of this population becomes a critical public health issue. Several studies [6-9] showed the effect of migration on dietary pattern in different populations. However, limited data on dietary habits of international students from the Gulf countries living in the US are available. Thus, the goal of this study was to explore the impact of migration on diet, dietary behaviors, physical activity, and body weight among international students moving from Gulf countries to the US.

### Materials and Methods

This prospective observational study recruited

international students from Gulf countries, who were planning to study in English Language Institute in fall 2016 in Florida, US. Students who enrolled in this study were asked to complete 4 questionnaires and have their height and weight measured within the first month of arriving to the US, and at the end of the first and second semesters. The questionnaire included Basic Demographic Questionnaire, Dietary Screener Questionnaire (DSQ) [10], International Physical Activity Questionnaire (IPAQ) [11] and Dietary Behavior Questionnaire (DBQ). The Dietary Behavior Questionnaire included 7 questions asking about the frequency of consuming takeaway food, convenience food, eating outside of home, breakfast, the number of meals per day, the frequency of shopping for food and cooking meals at home. All questionnaires were presented in both English and Arabic at each time point. Separate links were created in Qualtrics® for the students to reduce confusion. All documents were translated and back translated. Statistical analysis was completed using SPSS. Paired t-tests were employed to compare dietary patterns, physical activity and weight status before and after moving to the United States. Data were analyzed at both baseline and

**Citation:** Alyousif Z, Mathews AE. Impact of Migration on Diet, Physical Activity, and Body Weight among International Students Moving from the Gulf Countries to the United States. Case Rep J. 2018;2(1):007

at the end of the first and second semesters. This study was approved by University of Florida Institutional Review Board (IRB) and all participants provided written informed consent.

## Results

This study was conducted between September 2016 and April 2017 in Florida, US. At the recruitment period, 29 new students from Saudi Arabia, Kuwait and Qatar were interested in the study and filled out the Screener Questionnaire. Among them, eight students from Saudi Arabia and Kuwait (5 male and 3 female) (mean age 23.25 years  $\pm$  3.7 years, mean body weight 66 kg  $\pm$  11.7 kg, mean BMI 24.3  $\pm$  3.5) participated in this study and completed the questionnaires at three time points including within their first month of arrival to the US, and at the end of the first and second semesters.

### Dietary patterns

The dietary patterns of the new international students changed after coming to the US. During their first semester, they experienced decreases in all food groups with significant decreases in consumption of all fruit, vegetables, and sugar, with no further changes in dietary pattern between the first and second semesters (data is not shown). Although fiber intake was not significantly changed, fiber intakes before and after coming to the US were low and below the Adequate Intake recommendation, which are 38 g/day and 25 g/day for men and women of this age group, respectively (Table 1) [12]. The diet changes, however, did not affect body weight during the seven-month study period.

### Eating behaviors

International students from the Gulf countries showed non-significant decrease in the frequency of eating takeaway foods, convenience food, eating outside, eating breakfast, and the number of meals per day. They showed an increase in the frequency of cooking at home and a significant increase in the frequency of shopping for food after coming to the US (Table 2). No further changes were found in terms of eating

behavior between the first and the second semester (data is not shown).

### Physical activity

During the first semester, IPAQ showed that the international students significantly decreased their physical activity after coming to the US. Regarding the intensity of the physical activities (walking, moderate, vigorous), walking intensity activity was higher than moderate and vigorous intensity activities before coming to the US. However, all the three intensities were decreased, with a significant reduction in the vigorous activity after coming to the US (Table 3). In terms of the activity domains, leisure domain was found to be higher than the other domains (work, transportation, garden) prior to arrival in the US. However, a significant decrease was found after coming to the US. Leisure domain was more than nine times higher before coming to the US than after arrival. The international students did not report any work activity after coming to the US. Although all domains decreased after coming to the US, transportation was the only domain that increased after coming to the US and showed a non-significant decrease in the second semester. In terms of the activity domains, work, garden, and leisure increased during the second semester but not significantly (data is not shown). Regarding activity intensities, vigorous activity was significantly higher in the second semester than the first semester but less than before coming to the US (data is not shown).

## Discussion

In this study, eight international students from the Gulf countries, 7 from Saudi Arabia and 1 from Kuwait, completed the study. The international students showed some changes in their dietary pattern, dietary behavior, and the physical activities but not a significant change in their body weight after arriving in the US. Studies of international students have reported that most of the international students gain weight after coming to the US which is different than our finding [13].

Variables	In home country	In US	Difference (In US - In home country)	P-value
Fiber (g/day)	16.4 $\pm$ 1.1	14.9 $\pm$ 0.6	-1.5 $\pm$ 0.85	0.11
Whole Grain (oz/day)	0.59 $\pm$ 0.07	0.60 $\pm$ 0.07	0.01 $\pm$ 0.07	0.84
All Fruit & Vegetables (cup/day) <sup>1</sup>	2.5 $\pm$ 0.2	2.1 $\pm$ 0.1	-0.45 $\pm$ 0.15	0.02
Healthy Fruit & Vegetables (cup/day) <sup>2</sup>	2.4 $\pm$ 0.2	1.9 $\pm$ 0.1	-0.46 $\pm$ 0.16	0.02
All Vegetables (cup/day) <sup>3</sup>	1.6 $\pm$ 0.1	1.3 $\pm$ 0.05	-0.26 $\pm$ 0.08	0.01
Healthy Vegetables (cup/day) <sup>4</sup>	1.5 $\pm$ 0.1	1.2 $\pm$ 0.05	-0.2 $\pm$ 0.09	0.01
Fruit (cup/day)	0.9 $\pm$ 0.1	0.7 $\pm$ 0.07	-0.21 $\pm$ 0.09	0.06
Sugar (tsp/day)	18.9 $\pm$ 1.6	16.3 $\pm$ 1.4	-2.5 $\pm$ 1.0	0.05
SSB (tsp/day) <sup>5</sup>	8.2 $\pm$ 1.1	7.5 $\pm$ 0.9	-0.73 $\pm$ 0.7	0.33
Dairy (cup/day)	1.9 $\pm$ 0.2	2.0 $\pm$ 0.4	0.06 $\pm$ 0.5	0.9
Calcium (mg/day)	1092.8 $\pm$ 81.2	1079.1 $\pm$ 131.4	-13.7 $\pm$ 133.2	0.92

<sup>1</sup>Fruit and vegetables including legumes and French fries; <sup>2</sup>Fruit and vegetables including legumes and excluding French fries; <sup>3</sup>Vegetables including legumes and French fries; <sup>4</sup>Vegetables including legumes and excluding French fries; <sup>5</sup>Added sugars from sugar-sweetened beverages

**Table 1:** Changes in dietary patterns of the international students (n=8) between time residing in the Gulf countries and in the United States (December 2016) (Mean  $\pm$  SE).

Variables	In home country n (%)	In US n (%)	N (%) who changed behaviors		P-value
<b>Frequency of eating takeaway foods</b>					
Never	0	1 (12.5%)	Decrease	3 (37.5%)	0.35
<1 meal/week	3 (37.5%)	1 (12.5%)	Same	4 (50%)	
About 1 meal/week	1 (12.5%)	4 (50%)	Increase	1 (12.5%)	
≥ 2 meals/week	4 (50%)	2 (25%)			
<b>Frequency of eating convenience foods</b>					
Never	2 (25%)	2 (25%)	Decrease	2 (25%)	0.4
<1 meal/week	1 (12.5%)	2 (25%)	Same	5 (62.5%)	
About 1 meal/week	1 (12.5%)	1 (12.5%)	Increase	1 (12.5%)	
≥ 2 meals/week	4 (50%)	3 (37.5%)			
<b>Frequency of eating outside</b>					
<1 meal/week	0	4 (50%)	Decrease	4 (50%)	0.5
About 1 meal/week	7 (87.5)	1 (12.5%)	Same	1 (12.5%)	
≥ 2 meals/week	1 (12.5%)	3 (37.5%)	Increase	3 (37.5%)	
<b>Frequency of eating breakfast</b>					
Seldom/Never	1 (12.5%)	1 (12.5%)	Decrease	3 (37.5%)	0.28
Often	2 (25%)	5 (62.5%)	Same	4 (50%)	
Always	5 (62.5%)	2 (25%)	Increase	1 (12.5%)	
<b>Number of meals/day</b>					
≤ 2 meals/day	2 (25%)	5 (62.5%)	Decrease	4 (50%)	0.07
3 meals/day	6 (75%)	3 (37.5%)	Same	4 (50%)	
<b>Shopping for foods</b>					
Yes	4 (50%)	8 (100%)	Same	4 (50%)	0.03
No	4 (50%)	0	No to yes*	4 (50%)	
<b>Frequency of cooking</b>					
Rarely	4 (50%)	2 (25%)	Decrease	1 (12.5%)	0.16
1 time/week	2 (25%)	0	Same	2 (25%)	
3 times/week	1 (12.5%)	2 (25%)	Increase	5 (62.5%)	
Daily	1 (12.5%)	4 (50%)			

\*changes in shopping behavior from no shopping to yes

**Table 2:** The changes in eating behaviors of the international students (n=8) between time residing in the Gulf countries and in the United States (December 2016).

Variables	In home country	In US	Difference (In US – In home country)	P-value
<b>Domain</b>				
Work	677.4 ± 411.0	0	-677.4 ± 411.0	0.14
Transportation	276.3 ± 178.3	668.4 ± 130.2	392.0 ± 220.4	0.11
Garden	780.3 ± 393.0	529.3 ± 247.8	-250.9 ± 231.9	0.3
Leisure	2201.2 ± 765.3	229.6 ± 149.9	-1971.6 ± 722.1	0.02
<b>Intensities</b>				
Walk	1074.5 ± 399.6	468.1 ± 150.1	-606.3 ± 363.0	0.1
Moderation	1385 ± 524.6	640 ± 261.0	-745 ± 353.4	0.07
Vigorous	1515 ± 558.6	80 ± 60.4	-1435 ± 565.9	0.03
<b>Total</b>	<b>3974.5 ± 793.5</b>	<b>1188.1 ± 275.1</b>	<b>-2786.3 ± 762.0</b>	<b>0.008</b>

**Table 3:** Changes in physical activity (MET-minutes/week) by domain and intensities of the international students (n=8) between time residing in the Gulf countries and in the United States (December 2016) (Mean ± SE).

However, these studies included international students from different cultures and did not include students from Middle East.

The physical activity of the international students significantly decreased in previous studies [13] which is consistent with our findings. Physical activity is very important to prevent chronic diseases, improve the psychological and social wellbeing, and reduces anxiety. The total physical

activity increased in the second semester with a significant increase in the vigorous activity. Long term follow up may show an improvement in physical activity in term of domains and intensities.

In our study, the international students reported lower sugar consumption in the US versus their home country, which was unexpected. A previous study showed that sugar and sweets were increased in the international students after

coming to the US [13]. Moreover, the international students showed a reduction in fruit and vegetables. This finding is supported by many studies that reported changes in dietary pattern of immigrants after coming to the US such as an increase fat intake and decrease fruit and vegetables [13,14]. Patil et al. [15] suggested a possible explanation of the dietary changes of the new immigrants after moving to the US may be the cost of fruits and vegetables, the taste of the native food, transportation challenges, and language issues. They reported that cooking skills may be an issue that affects the dietary pattern of the immigrants after coming to the US. This did not seem to be an issue in our participants, as the move to the US showed a 62.5% increase in the frequency of cooking.

## Conclusion

International students from the Gulf countries had low physical activity and less healthy dietary pattern and eating behaviors after moving to the US which may increase their health risk. The findings of this case series suggests that establishing an educational program for the international students to improve their health status after coming to the US may be warranted. However, additional research with long term follow-up is needed.

## Author Contributions

ZA and AEM designed the study. ZA carried out the study. ZA analyzed the data and wrote the manuscript. All authors reviewed and approved the final manuscript.

## References

1. Andrade MS. International students in English-speaking universities. 2006;5(2):131-54.
2. Institute of International Education. International students by academic level, 2014/15-2015/16. Open Doors Report on International Educational Exchange. Available from: <https://www.iie.org:443/Research-and-Insights/Open-Doors/Data/International-Students/Academic-Level/2015-16>.
3. Institute of International Education. Top 25 places of origin of international students, 2014/15-2015/16. Open Doors Report on International Educational Exchange. Available from: <https://www.iie.org:443/Research-and-Insights/Open-Doors/Data/International-Students/Leading-Places-of-Origin>.
4. Tseng M, Fang CY. Stress is associated with unfavorable patterns of dietary intake among female Chinese immigrants. *Ann Behav Med*. 2011;41(3):324-32.
5. Satia-Abouta J, Patterson RE, Neuhouser ML, Elder J. Dietary acculturation: applications to nutrition research and dietetics. *J Am Diet Assoc*. 2002;102(8):1105-18.
6. Satia JA, Patterson RE, Kristal AR, Hislop TG, Yasui Y, Taylor VM. Development of scales to measure dietary acculturation among Chinese-Americans and Chinese-Canadians. *J Am Diet Assoc*. 2001;101(5):548-53.
7. Pan YL, Dixon Z, Himburg S, Huffman F. Asian students change their eating patterns after living in the United States. *J Am Diet Assoc*. 1999;99(1):54-7.
8. Hung SS, McPhee SJ, Jenkins CN, Nguyen KP, Fordham DC, Ha N-T. Dietary intake patterns of Vietnamese in California. *J Nutr Educ*. 1995;27(2):63-8.
9. Otero-Sabogal R, Sabogal F, Perez-Stable EJ, Hiatt RA. Dietary practices, alcohol consumption, and smoking behavior: ethnic, sex, and acculturation differences. *J Natl Cancer Inst Monogr*. 1995(18):73-82.
10. National Cancer Institute. Dietary Screener Questionnaires (DSQ) in the NHANES 2009-10: DSQ. Available from: <https://epi.grants.cancer.gov/nhanes/dietscreen/questionnaires.html>.
11. IPAQ Group. International Physical Activity Questionnaire. Available from: <https://sites.google.com/site/theipaq>.
12. Institute of Medicine. Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids. Washington, DC: The National Academies Press; 2005.
13. Msengi CM, Msengi IG, Harris S, Hopson M. International students: A comparison of health status and physical health before and after coming to the United States. *Int Educ*. 2011;41(1):59-75.
14. Despues D, Friedman HS. Ethnic differences in health behaviors among college students. *J Appl Soc Psychol*. 2007;37(1):131-42.
15. Patil CL, Hadley C, Nahayo PD. Unpacking dietary acculturation among new Americans: results from formative research with African refugees. *J Immigr Minor Health*. 2009;11(5):342-58.