


# Food and Migration: Dietary Acculturation among Migrants to the Kingdom of Saudi Arabia

Journal of Primary Care & Community Health  
Volume 11: 1–6  
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DOI: 10.1177/2150132720949771  
[journals.sagepub.com/home/jpc](https://journals.sagepub.com/home/jpc)  


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## Abstract

The Kingdom of Saudi Arabia has a large migrant workforce particularly from North Africa, other Gulf states and South Asia. Migration influences food behavior; however, the change is not often health conducive. This study aimed to investigate the dietary acculturation among 880 migrants and their families in a large University in the Kingdoms' capital city, Riyadh.

**Methods:** A cross sectional study design was used based on 2 questionnaires; Rosenmoller et al's and the WHO STEPS surveillance tool for chronic disease surveillance. Data on length of residency, dietary patterns, anthropometric and biochemical measurements were collected by trained interviewers. Descriptive statistics were reported as a percentage or mean, as appropriate. Chi-square test, Fisher's exact test or independent t test, Univariate and Multivariate logistic regression analysis were used to compare the significance between variables.

**Results:** Both male and female participants showed a similar mean age (39.7 and 38.5 years). Approximately 61% of them had <5 year's duration of residency. Significant gender differences were observed in blood pressure and biochemical measurements, with men showing higher mean systolic and diastolic blood pressure and dyslipidemia than women ( $P < .001$ ). Women had significantly higher BMI ( $P < .001$ ), showed higher mean food practice ( $P < .001$ ) and awareness scores than men.

**Conclusions:** Migration into Saudi Arabia from this subgroup showed marked changes in the food practice; acquisition of unhealthy dietary practices also co-existed despite improved awareness and the presence of comorbidities. Findings from this study have relevance to other migrant communities and public health policy.

## Keywords

dietary acculturation, food behavior, nutritional awareness, noncommunicable disease, migrants, public health nutrition, Kingdom of Saudi Arabia

Dates received 30 June 2020; revised 22 July 2020; accepted 22 July 2020.

## Introduction

International migrants live outside their country of origin either because of economic reasons, seeking a new and better quality of life, or due to reasons and circumstances outside their control. Data on global migration show year-on-year rise from around 53 million people in 1990 to a current estimate of 272 million.<sup>1</sup> Wealthy and developed countries tend to attract the most migrants; the majority live in the United States, Germany, Kingdom of Saudi Arabia (KSA) and the Russian Federation.<sup>1</sup> Adjusting to life in a different cultural setting, particularly to changes in diet and food-related behavior can be challenging on many levels, and may require compromises regarding what one will or will not eat. Alongside such changes is the possibility of increased morbidity in which diet may play a part. Several

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studies have reported the rapid deterioration in health status of migrants by the rising prevalence of comorbidities like dyslipidemia, metabolic syndrome, and cardiovascular disorders, over time.<sup>2-4</sup>

Migration changes lifestyle behavior including the pattern of nutrition intake. Evidence shows some of these changes are positive such as higher consumption of fruit and vegetable intake, but others documented negative impacts such as increased intake of carbonated drinks, fatty and processed food; thus compromising health.<sup>3,4</sup> There is not much literature documenting the influence of acculturation on the immigrants' dietary practices and food behavior in KSA.

This paper reports on an investigation into dietary issues among migrants to Saudi Arabia, a country with a gross domestic product of US \$786 billion in 2019.<sup>5</sup> Saudi Arabia has a vast international job market; 33% of employees are migrants.<sup>1</sup> The low cost and high affordability of abundant multi-cuisine food in this country poses a risk toward increased consumption of high-calorie food, processed food, and sweetened drinks, thus jeopardizing health. However, literature documenting migrants' dietary practices and food behavior is limited. Our earlier paper found an association between risk factors such as increased fast-food consumption, decreased daily intake of fruits and vegetables, and the incidence of cardiac events among migrant employees and their families in a large university in Saudi Arabia.<sup>6</sup> The goal of the study was to add to the knowledge about dietary acculturation of immigrants to the Kingdom of Saudi Arabia in relation to the duration of residency and presence of co-morbidity. This will be assessed based on nutritional awareness, types of food consumed, and label reading behavior during food purchasing.

## Methodology

**Setting, design and participants:** The present study is a sub-study of the larger Heart Health Promotion (HHP) prospective registry enrolling 4500 university employees and their family members.<sup>7</sup> Out of 1438 members of the 3 largest migrant groups: Gulf, North African countries and the South Asian region 880 (60%) agreed to participate in this cross sectional study. They were divided into 2 groups based on the duration of residency: <5 years and >5 years.

## Data Collection

### Questionnaires

Two questionnaires were adopted for data collection:

- (i) Rosenmoller et al's<sup>8</sup> validated tool to measure dietary changes and acculturation. These included perceived changes in dietary practices in terms of dietary pattern, nutritional awareness, label reading and food purchasing

behavior since migration to Saudi Arabia. All responses were measured by 5-point Likert-scale ranging from "eat less" to "eat much more." To present the results comprehensively, the answers were summarized into 3 categories as "eat less," "no change," and "eat more." A scoring system of 1-14 was used to assess awareness and practice of healthy food options with a score of 1 for every positive habit that improved after migration.

- (ii) An adaptation of the WHO-STEPwise<sup>9</sup> approach to chronic disease risk factor surveillance following sequential steps in data collection; Step I—demographic questions; Step II—anthropometric measurements; and Step III—biochemical measurements

### Anthropometric Measurements

These included measuring height in meters and weight in kilograms using an electronic stadiometer. Waist circumference was measured using a flexible inch-tape. Body mass index (BMI) was calculated using the formula; weight in kilograms/height in meter<sup>2</sup>. BMI scores  $\geq 30$  kg/m<sup>2</sup> were considered obese.<sup>10</sup> Central obesity was defined based on a waist circumference  $\geq 102$  or  $\geq 88$  cm for men and women, respectively.<sup>10</sup>

### Biochemical Measurements

A twelve-hour fasting venous blood sample was collected for assessment of glycosylated haemoglobin (HbA<sub>1c</sub>) and lipid profile, in accordance with the World Health Organization (WHO) guidelines.<sup>11</sup> Major comorbid risk factors like hypertension, diabetes mellitus, and dyslipidemia were assessed using the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7),<sup>12</sup> the WHO and American Diabetes Association (ADA) criteria<sup>13</sup> respectively. Dyslipidemia was diagnosed according to the WHO and the Third Adult Treatment Panel (ATP-III) of the National Cholesterol Education Program (NCEP) criteria. Dyslipidemia included, raised levels of TC, LDL-C, or TGs; and low levels of HDL-C, or if the subject reported using medications to lower blood lipid levels.<sup>13</sup>

These data gathered, in the first quarter of 2014, by trained interviewers who also collected the blood sample and administered the questionnaires to the participants following the WHO guidelines.<sup>9</sup> The details on sampling methods, data collection, measurement and assessment of comorbidities have been published earlier by Alzeidan et al.<sup>7</sup>

**Data Analysis.** Statistical analysis was performed by using SAS/STAT (SAS institute Inc. NC, USA). Continuous variables were presented as mean and standard deviation (SD), and categorical variables were summarized as number and percentage. Comparison between variables and significance

**Table 1.** Socio Economic Characteristics, Comorbidity and Food Behavior & Awareness Score of Study Population by Gender.

| Variable                                 | Male N = 574 (65.23%) | Female N = 306 (34.77%) | P-value |
|--|-----------------------|-------------------------|---------|
| <b>Age, mean <math>\pm</math> SD</b>     | 39.78 $\pm$ 11.49     | 38.58 $\pm$ 12.29       | .150    |
| <b>Education levels, n (%)</b>           |                       |                         | <.001   |
| higher education (college and above)     | 539 (93.90%)          | 227 (74.18%)            |         |
| Basic education (primary to high school) | 35 (6.10%)            | 79 (24.51%)             |         |
| <b>Position</b>                          |                       |                         | <.001   |
| Academic                                 | 277 (48.26%)          | 45 (14.71%)             |         |
| Clinical                                 | 16 (2.79%)            | 10 (3.27%)              |         |
| Administrative                           | 7 (1.22%)             | 4 (1.31%)               |         |
| <b>Length of stay, n (%)</b>             |                       |                         | .003    |
| <5 years                                 | 373 (64.98%)          | 168 (54.90%)            |         |
| >5 years                                 | 201 (35.02%)          | 138 (45.10%)            |         |
| Length of stay, median (IQR)             | 4.0(5.0)              | 5.0(8.0)                | .07     |
| <b>Comorbidities</b>                     |                       |                         |         |
| SBP, mean $\pm$ SD                       | 121.9 $\pm$ 12.51     | 114.2 $\pm$ 13.85       | <.001   |
| DBP, mean $\pm$ SD                       | 74.49 $\pm$ 8.86      | 69.04 $\pm$ 8.60        | <.001   |
| High density lipoprotein, median (IQR)   | 0.99 (0.31)           | 1.23 (0.43)             | <.001   |
| Low density lipoprotein, median (IQR)    | 3.13 (1.17)           | 2.83 (1.06)             | <.001   |
| Triglycerides, median (IQR)              | 1.38 (1.09)           | 0.99 (0.82)             | <.001   |
| Total cholesterol, median (IQR)          | 4.90 (1.20)           | 4.60 (1.30)             | <.001   |
| BMI = >30, n (%)                         | 166 (28.92%)          | 119 (38.89%)            | .003    |
| <b>Food</b>                              |                       |                         |         |
| Behavior/practice score, mean $\pm$ SD   | 9.44 $\pm$ 1.58       | 9.83 $\pm$ 1.39         | <.001   |
| Awareness score, mean $\pm$ SD           | 6.90 $\pm$ 1.47       | 7.08 $\pm$ 1.33         | .085    |

testing was done using chi-square test or Fisher's exact test or independent *t* test, as appropriate.

Univariate and Multivariate logistic regression analysis carried out to determine the factors influencing better practice and awareness, with high practice and awareness scores as the dependent variable and other covariates including, age, presence of comorbid conditions and 5-year median length of stay as independent variables. A *P* value of <0.05 was considered statistically significant.

Ethical considerations: The initial study was approved by the institutional review Board (IRB) of the University (reference number 13–3721). The study was conducted in accordance with the guidelines of Helsinki Declaration. The study participants were informed of the purpose of the study and all the procedures involved in completing the questionnaire and obtaining the clinical measurements. Written consents were obtained prior to start of the study. Anonymity was maintained to preserve confidentiality. Participation was voluntarily and participants were informed about their rights to withdraw at any stage of data collection and analysis.

## Results

A total of 574 males and 306 females responded. Their mean age was 39.7  $\pm$  11.49 (male) and 38.5  $\pm$  12.29 years (female); 78% originated from North African or other Gulf states and 22% from South Asia. Socio-demographic

details, mean values of blood pressure, biochemical measurements, prevalence of chronic diseases, food practice, and awareness scores are summarized in Table 1. Male participants had significantly higher educational levels than the female (*P* < 0.001), some of whom were family members of the employees. More male (65% vs 55%) were resident for <5 years. More female (45% vs 35%) were resident for >5 years.

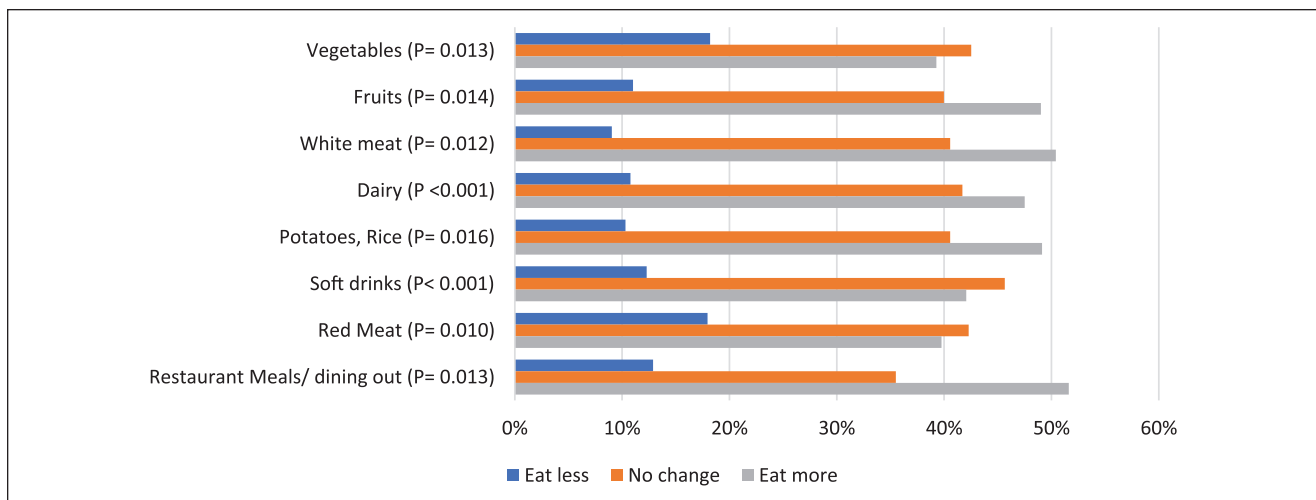
Significant gender differences were observed in blood pressure and biochemical measurements. Males showed higher mean systolic and diastolic blood pressure and dyslipidemia than females (*P* < .001). BMI was significantly higher in females (*P* = .003), they obtained higher mean practice (*P* < .001) and awareness scores for food choices than males (*P* = .085).

The association between the length of stay, age, gender, and comorbidity status of the study participants is shown in Table 2. Longer duration of residency was associated with higher mean age (*P* < .001). Comorbid conditions like diabetes, hypertension, metabolic syndrome, and BMI increased with longer duration of residency (*P* < .001). Age therefore, is the main determinant for comorbidity. The awareness about healthy eating (*P* = .004) also improved with longer residency.

Approximately 40% of participants made no changes in dietary practices, this was more pronounced for the consumption of vegetables, soft drinks, and red meat. For other food

**Table 2.** Association between the Length of Stay, Age, Gender, and Comorbidity.

|                                | ≤5 years     | >5 years      | P-value |
|--------------------------------|--------------|---------------|---------|
| Age, mean ± SD                 | 36.26 ± 9.84 | 44.33 ± 12.89 | <.001   |
| Gender                         |              |               | .003    |
| Male                           | 373 (70%)    | 201 (59%)     |         |
| Female                         | 168 (31%)    | 138 (41%)     |         |
| DM, n (%)                      | 38 (7.02%)   | 55 (16.22%)   | <.001   |
| MeT—NCEP-ATPIII, n (%)         | 95 (17.56%)  | 107 (31.56%)  | <.001   |
| BMI = >30, n (%)               | 146 (27%)    | 139 (41%)     | <.001   |
| Co-morbidity, n (%)            | 142 (26.25%) | 151 (44.54%)  | <.001   |
| Food practice score mean ±SD   | 9.51 ± 1.53  | 9.68 ± 1.53   | <.110   |
| Food awareness score mean ± SD | 6.86 ± 1.51  | 7.14 ± 1.27   | .004    |

**Figure 1.** Overall changes in food behavior of participants.

items a significantly higher proportion of participants mentioned eating more (Figure 1). Females were significantly more likely than males to report an increase in choosing low-fat food options, reading food labels, and understanding the nutritional information on food products. However, females were less likely than men to dine out more after migration.

Length of residence was associated with both positive and negative changes in food behavior. Those with >5 years residency ate less desert/candy/sweets ( $P = .008$ ), high fat/fried food ( $P = .037$ ), red meat ( $P = .039$ ), and soft drink ( $P = .025$ ), but had lower fruit ( $P = .044$ ) and white meat ( $P = .011$ ) consumption than those with < 5 years residency. Food purchasing behavior by examining ingredients while buying ( $P = .033$ ), finding low fat options ( $P < .001$ ), healthy dining out ( $P = .048$ ) also improved with longer duration of residency.

Univariate analysis examining the predictors of higher nutrition practice scores showed, being female (0.001), the presence of diabetes (0.01), hypertension (0.013), or any single comorbid (0.006) condition significantly linked with higher dietary practice scores. Similarly, awareness score

demonstrated significant association in females, among those with diabetes and those with longer length of residency. The multivariate logistic regression analysis showed only presence of diabetes as the independent factor that was associated with higher awareness score with an adjusted odds ratio and 95% confidence interval; OR (95% CI) of 1.98 (1.23-3.21) and  $P$ -value = .005.

## Discussion

### Dietary Acculturation by Duration of Residency

Our participants showed marked improvements in the consumption of fruits, white meat improved label reading behavior, and search for low-fat options during food purchase, which can be regarded as the manifestation of positive dietary acculturation after migration into Saudi Arabia.

High consumption of carbonated drinks, and sugary food demonstrated a significant negative consequence, as well as an increased consumption of red meat, fried food, potatoes and rice in the early years of migration. Although awareness

of healthy food improved substantially with migration, it did not necessarily translate into practice; which echoes the result of a similar study in the Netherlands<sup>14</sup> but is inconsistent with studies in United States<sup>15</sup> and United Kingdom.<sup>16</sup>

These findings are consistent with Tiedje et al's<sup>17</sup> study highlighting improved awareness in healthy food in a diverse group of immigrant population to the US, but failed to correlate with healthy practices. With Americanization, however, they gradually adapted to improved dietary practices.<sup>17</sup> Given the low practice scores compared to the awareness scores, our study also demonstrated a weak correlation between awareness and practice, indicating that improved knowledge does not necessarily reflect on healthy practices among recent immigrants. This is an issue of concern since the findings could have implications for migrants' health over time regardless of their economic background. Several studies have documented mixed findings, due to the diverse nature of human adaptability, depending on age and duration of residency.<sup>15,16</sup> Migration to affluent countries enables migrants to gradually adapt to the host's environment. Qualitative analysis of Arab immigrants to western nations has reported greater nutritional awareness with a simultaneous inclination toward soft drinks and fast food.<sup>18</sup> Wandel et al<sup>19</sup> demonstrated a stage-wise pattern of changes in relation to duration of stay by Asian migrants in Oslo, reporting increased fat intake in the form of oil and meat initially, followed by reduced consumption over time. These findings are similar to Lesser et al's<sup>20</sup> study of the dietary behavior of South Asians migrants to wealthy western nations which reported an increase in using healthier methods of food preparation and increased consumption of carbonated drinks and fried convenience food. Saudi Arabia is highly westernized in terms of the easy availability of ready-to-eat, processed, and fast food. The newer migrants in our study were at a greater risk of unhealthy dietary acculturation, while older people with longer duration of residency had better nutritional awareness in determining food preferences and healthy dietary choices. The participants reported media and advertisement as the main source of nutrition information.

### **Chronic Disease Status and Dietary Acculturation**

It is well documented that new immigrants enjoy better health status than the rest of the population, termed as "healthy immigration effect,"<sup>21</sup> but the decline in health status with the passage of time has been strongly linked to challenges in dietary acculturation and stress.<sup>21</sup> In addition, an unhealthy dietary lifestyle has strongly been associated with chronic diseases as a major risk factor.<sup>4,22</sup> Our finding of a high prevalence of all the 3 major chronic diseases; diabetes, hypertension, and obesity among immigrants with longer residency, is a matter of concern. This finding may suggest better awareness and practices particularly in women, but

the multivariate analysis showed that only diabetes had an influence on awareness of a healthy diet. The possible explanation for this finding could be the efforts of the national diabetes control program, which prioritizes mass education on diabetes prevention. Furthermore, healthy practices did not appear to be influenced by the presence of individual comorbid conditions. Investment is therefore needed for confidence building and skills development at a population level to enable the translation of nutritional knowledge into practice.

However one should not overlook the impact of aging, as comorbidity increased in older participants. The food practices remain an individual's choice and depend on the individual's personal perception and attitude toward health. The present study showed an inclination toward eating out after migration particularly among male participants. These findings certainly have important implications for health policy makers. The increased affordability and availability of almost every kind of multinational companies selling fast foods in KSA place the entire population *en masse* at risk of obesity and other cardiovascular disorders.

### **Limitations and Strengths**

Generalizability of the results is one of the limitations of this study as the study participants were enrolled from a single center. We therefore recommend future research involving a large representative sample of the population. In addition the cross sectional study design could only report the frequency at one point in time. Cohort design is recommended to determine the changes in dietary pattern and the incidence of comorbidities in the immigrants. However, to our knowledge, this is the first study in the Kingdom of Saudi Arabia that has examined the effects of migration on dietary acculturation. The results have the potential to inform communities and populations about food consumption practices over time as well as the relationship to gender and potentially gender related roles during acculturation. It could also have significant implications for dietary practice and serve as an important source of data for public health nutrition intervention program.

### **Conclusion**

This study provides significant new knowledge regarding changes in food practice among the migrant population in the Kingdom of Saudi Arabia. Healthy and unhealthy dietary practices co-existed despite improved awareness and the presence of comorbidities. New migrants and male gender were at risk of higher consumption of soft drinks, high fat/fried food, and red meat. Females showed better awareness and food purchase behavior. These findings have implications for public health nutrition policy and practice not only for the migrant population but also for the host community; as it could serve as a reflection of their dietary habits. There

is a need to work closely with media and control food advertisement and to standardize dietary regulations for ready to eat, and high-fat food to prevent a further epidemic of chronic diseases.

### Acknowledgments

We are thankful to all participants of this study, as without their involvement and enthusiastic participation we were not able to complete this study. Thank you also to our trained interviewers/research assistants for their help with data collection. Our gratitude to Prof Paula McGee for her valuable comments and proof reading of the transcript and to Dr. Karolina Biernat for her technical support.

### Author Contributions

Fatemeh Rabiee and Rasmieh Alzeidan designed the study, Rasmieh Alzeidan was the research coordinator and main person for data collection. All authors but in particular Anhar Ullah contributed to data analysis and interpretation of data. All authors contributed to writing of this paper.

### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: King Abdulaziz City for Science and Technology (KACST), research grant number MS 34-5 (Riyadh, Saudi Arabia). The funder had no role in study design, data collection, data analysis, or writing-up the manuscript.

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