

Impact Of Relocation On Nutrient Intake, Food Consumption Patterns & Nutritional Status Of Arabic Students

Ziyad H.H. Abunamous¹, *M. Rajeswari¹, A. Pooja¹, V. Lakshmi²

¹Department of Food, Nutrition & Dietetics

²Department of Human Genetics

Andhra University, Visakhapatnam, Andhra Pradesh, India

Corresponding Author* rajeswariradhakrishna@gmail.com 9989165890

Abstract

A cross-sectional study was conducted to evaluate nutrient intake, food frequency patterns and nutritional status among 118 international Arabic students from two South Indian universities aged between 20 and 40 years. The Arabic students primarily comprised of African and Asian Arabics. Information was gathered through interview aided by food frequency questionnaire and a 24-hour recall method. Anthropometric data were used to determine the nutritional status. Results revealed a depressing pattern of food consumption such as frequent skipping of breakfast and meals, eating out and snacking. Except for milk and milk derivatives, practically all food groups were found to be under-consumed on a daily basis by a larger percentage of students. Asian Arabics consumed more beverages and bakery items compared to African Arabs. Body weight and BMI did not change after migration. The daily mean nutritional consumption for numerous nutrients in the current study was much lower than that of recommended intakes. The diets of African and Asian Arabs relocated to India for the purpose of studies is inadequate in key nutrients such as energy, calcium, vitamin A and vitamin C. The primary factors affecting student intakes were self-cooking, time restraints, academic stress and non-adherence to south Indian diet patterns. Universities should work to create initiatives that lessen the effects of dietary acculturation, monitor dietary intake and nutrition status as a pivotal stratagem towards preventing malnutrition.

Keywords: Food frequency, nutritional status, Relocation, South India, Dietary acculturation

Introduction

Food intake and prudent dietary habits have a significant impact on people's health. Individual food choices ingrained in the pattern of food consumptions, unfold in response to the changes of natural environment, physical need, lifestyle, and relocation to other country ^[1]. Relocation elicits the process of dietary acculturation ^[2].

International students may be exposed to cultural variations during their journey to accomplish higher education abroad. A foreign culinary culture is one of the changes the novice must adjust to, which could result in dietary habits changing ^[3]. The health effects of these modifications could include obesity and chronic illnesses ^[4,5]. Previous research on international students revealed that even a transient visit of as short as one or two years to a foreign country might cause significant and frequently ill-disposed changes to eating habits ^[6].

The number of international students engaged in higher education has been increasing during the last decade; According to UNESCO sources, more than 5 million students crossed national borders in 2017 to pursue higher education. Organization for Economic Co-operation and Development (OECD) has projected that the total number of foreign students will reach 9 million by 2025 ^[7].

The Arab international students who come from the Middle East and North Africa are among other international students in India though they are fewer in number compared with other country students. In general, “Arab” is a term that refers to persons who belong to the 22 North African and Middle Eastern member states of Arab League, speaking Arabic language as their mother language ^[8]. Like other ethnicities of international students, Arab international students eating preferences and food choices are usually influenced by the types of food available in their new living environment. However, their diet and food habits remain tied to their usual traditional food selections preferring to consume familiar foods available ^[9].

When other deterrents such as language, transportation, communication, and academic stress are present, it is typically challenging metamorphosis to a completely different environment, culture, and culinary preferences. Due to their encounter with cultural shock, overseas students may experience social isolation, sadness, and excessive eating

and drinking ^[10]. Health and wellbeing are considered as part of the factors influencing academic performance ^[11]. Indeed, changes in diet have long been reported as a welfare issue for international students worldwide ^[12-14].

Nevertheless, recent research is limited regarding the food habits and dietary health of international students when studying abroad ^[15]. Most studies have indicated decreased consumption of fruit and vegetable and increased consumption of fast food and sugary snacks were also reported ^[16-20]. Therefore, the health status of this population group becomes a critical public health concern. Several studies have shown the impact of migration on the diet of different population groups. However, there is limited data on the dietary habits of foreign Arab students in South Indian universities. Thus, the goal of this study was to explore the impact of relocation on nutrient intake, food frequency patterns and nutritional status.

Materials and methods

Study Design, Area and sample size

A prospective cross-sectional study was conducted on international students who were pursuing higher education from two South Indian universities. Sample size: Sample size of 118 was calculated using the Fischer's formula ^[21] $n = \{ [Z(1-\alpha/2)]^2 \times p \times (1-p) \} / d^2$, considering 50% response, 95% confidence level, and 9% degree of desired precision. The age group of the subjects selected was between 20 to 40 years.

Inclusion and Exclusion Criteria

The criteria for selection of subjects are the relocation of the students to India for the purpose of studies. Students with a length of stay > 6 months to > 2 years, who consented to participate in the study and signed consent form only were included in the study. Students who did not consent and those who were sick were excluded from the study.

Data Collection

A combined interview cum questionnaire method was used to collect participants' socio demographic information, dietary information, and anthropometry measurements. The questionnaire consisted of both open- and closed-ended questions. All the subjects

were surveyed in their regional language. The questions were developed in simple and communicable language

Anthropometric measurement

Anthropometric measurement of heights (cm) and weight (kg) was noted to determine the BMI as indicator of nutritional status. The weight and BMI data before relocation also was collected from the participants

Dietary Intake

Dietary data was collected using the 24-hour dietary recall method and Food frequency questionnaire (FFQ). Twenty-four-hour dietary recall was used to collect dietary information and the amount of food and beverages consumed over the past 24 hours. Participants were asked to recall all foods and drinks taken from when they woke up in the morning up to the time before they went to sleep at night. Portion size was estimated using cooked food for common food items and the estimated portion size was determined using kitchen digital scales. Measurement of food intake was taken by showing them the house hold katories and standard red cup set of capacity 80ml, 100ml, 150ml and 200ml respectively. Nutrient intake was computed from the data obtained from 24 hr. dietary recall

Frequency of consumption of foods

A modified Food Frequency Questionnaire (FFQ) was used to know the frequency of consumption of food groups ^[22]. The FFQ comprised a list of various food groups, namely cereals and cereal products, roots& tubers, meat and meat products, oils and fat, milk and milk products, fruits, vegetables, beverages, snacks and others. Each participant was asked to recall how often a certain food and drink was consumed per day, weekly twice or thrice, monthly and occasionally.

Data Analysis. Statistical analysis was carried out using SPSS version 23. Descriptive statistics such as frequency, mean and standard deviation was calculated and presented in tables and graphs. An independent t-test was used to test differences in nutrient intake among the participants. Significant differences were set at P value <0.05.

Results

Table 1 represents the demographic characteristics of the international students. In total, 118 students from two state universities participated in this study. The

participants in the study were predominantly male (87%) with a fewer female population (13%). A total of 60 students (51%) were in the age group of 26–30 years and 90 % of total participants were unmarried. The sample consisted of more African Arabic (51%) than Asian Arabic (49%) students. Majority of students (80%) belonged to middle income and 90 % were from rural background. Concerning education 53% were pursuing Master’s program and only 12% were pursuing PhD program in the respective universities. A higher percentage of student participants (82%) were from medium income families when compared to lower and high income. The length of stay was greater than 2 years for a sizeable percent of students (55 %).

Table 1. Demographic characteristics of the students

	Variables	Frequency % (N=118)
Gender	Male	87% (103)
	Female	13% (15)
Marital status	Single	90% (106)
	Married	10% (12)
Age	20-25 years	35% (41)
	26-30 years	51% (60)
	>30 year	14% (17)
Continents	Asia	49% (58)
	Africa	51% (60)
Educational level	Bachelors	35% (41)
	Masters	53% (63)
	Ph.D.	12% (14)
Monthly income	High income	6% (7)
	Medium income	82% (97)
	Low income	12% (14)
Community	Urban	10% (12)
	Rural	90% (106)
Length of stay in India	>6 months to <2 years	45% (53)
	>2 years	55% (65)

Table 2. Dietary and life style habits of participants

Variables	Frequency%(N=118)
Food habits	Vegetarian 10% (12)
	Non- vegetarian 90% (106)
Physical activity per day	Never 25% (29)
	<1 hour 55% (65)
	>1 hour 20% (24)
Preparing food by themselves	Yes 80% (94)
	No 20% (24)
Frequency of eating out	Daily 31% (37)
	Weekly 55% (65)
	Monthly 14% (16)
Sleeping habits	<6 hours 2% (3)
	6 hours 43% (51)
	8 hours 47% (55)
	>8 hours 8% (9)
Breakfast consumption	Yes 54% (64)
	No 26% (31)
	Sometime 20% (23)
Number of meals per day	1 time 10% (12)
	2 times 49% (58)
	3times 37% (43)
	>3times 4% (5)
Number of snacks per day	1 time 70% (83)
	2 times 26% (30)
	3 times 4% (5)
Smoking habits	Smoker 14% (17)
	Non-smoker 86% (101)
Water consumption per day	1 Lit. 31% (36)
	2 Lit. 43% (51)
	2.5 Lit. 17% (20)
	3 Lit. and more 9% (11)
Food Allergy	Yes 26% (31)
	No 74% (87)

The dietary and life style habits of the study participants are delineated in Table 2. Information on food habits revealed that 90% of subjects were non vegetarians and 10 % were vegetarians. It is interesting to note that 80 % of subjects were preparing food themselves, 54% were consuming breakfast daily and 55% were eating out on weekly basis. Snacking was found to be common and 70 % of the students were in to one time snacking daily. Findings of the present study in addition, unveiled that majority of subjects (49%) had only 2 meals per day while healthy sleeping patterns of 6 to 8 hours and daily physical activity were observed in notably higher percentage of study participants.

Table.3. Frequency of consumption of food groups by students

	African Arabic (N=60)				Asian Arabic (N=58)			
	Daily	Weekly	Monthly	Occasional ly	Daily	Weekl y	Monthly	Occasionall y
Cereals	28(47%)	10(17%)	14(23%)	8(13%)	28(48%)	10(17%)	16(28%)	4(7%)
Pulses	18(30%)	28(47%)	6(10%)	8(13%)	8(14%)	35(60%)	12(20%)	3(5%)
Roots and Tubers	31 (52%)	16(27%)	5(8%)	8(13%)	32(55%)	20(34%)	5(9%)	1(2%)
Green leafy vegetables	13 (22%)	21(35%)	19(32%)	7(11%)	8 (14%)	24(41%)	24(41%)	2(4%)
Other Vegetables	17 (28%)	25(42%)	10(17%)	8(13%)	19 (33%)	25(43%)	8(14%)	6(10%)
Fruits	26 (43%)	25(42%)	4(7%)	5(8%)	19 (33%)	25(43%)	8(14%)	6(10%)
Nuts and oilseeds	11 (18%)	20(33%)	24(40%)	5(9%)	6(10%)	11(19%)	35(60%)	6(10%)
Sea food	2 (3%)	11(18%)	39(65%)	8(13%)	3(5%)	15(26%)	36(62%)	4(7%)
Meats and poultry	29 (48%)	19(32%)	7(12%)	5(8%)	21(36%)	30(52%)	2(3%)	5(9%)
Milk and its products	44 (73%)	10(17%)	1(2%)	5(8%)	39(67%)	16(28%)	2(3%)	1(2%)

Table 3 reveals the frequency of consumption of food groups by the international students. Cereal, roots & tuber consumption frequency was similar in both African as well as Asian Arabic groups and found to be low as only 47% and 32% respectively consumed on daily basis. Arabians are far from being a homogenous group with respect to pulse consumption. For instance, the daily pulse consumption was lower in Asian Arabic students (8%) compared to African Arabic students (18%) never the less weekly consumption was higher in Africans (47%) and Asian (60%) students. In African

Arabic students' sea food consumption was lowest (3%) on daily basis followed by nuts and oilseeds (18%) and green leafy vegetables. An analogous situation was observed in Asian Arabic students. On the contrary, monthly consumption was notably higher for sea foods in both the groups. On a similar note, monthly consumption of nuts and oil seeds was higher in Asian Arabic students (60%) compared to Asian students (40 %). The daily consumption of other vegetables was slightly higher (33%) in Asian Arabic students than the African Arabic students (28%). The daily consumption of fruits was higher in African Arabic students (43%) than the Asian students (33%). Similarly daily Meat and poultry consumption was higher in African students (48%) than the Asian students (36%). It is intriguing to note that intake of milk and milk products was highest among all food groups on daily basis in both the groups accounting for 73% in African students and 67% for Asian students.

Table.4. Frequency of consumption of junk foods by selected students

	Africa (N=60)				Asia (N=58)			
	Daily	Weekly	Monthly	Occasionally	Daily	Weekly	Monthly	Occasionally
Beverages	39(65%)	11(18%)	5(8%)	5(8%)	49(84%)	7(12%)	-	2(4%)
Bakery Items	30(50%)	21(35%)	5(8%)	4(7%)	42(72%)	10(17%)	5(9%)	1(2%)
Fast Foods	21(35%)	18(30%)	18(30%)	3(5%)	20(34%)	20(34%)	15(26%)	3(6%)

The results of frequency of consumption of beverages, bakery items and junk foods are demonstrated in Table no.4. Our study found an increased consumption of beverages and bakery items in Asian Arabics in consonance to native country dietary habits. Akin to this, daily consumption of beverages and bakery items is higher in African Arabics as well but lower than Asians. Frequency of daily fast-food consumption showed analogous results for both the groups. This finding supplements other studies that mention an increase in the consumption of convenience food or fast food by international students ^[23,24]. An increase in the consumption of sugar and sugar-sweetened beverages was also reported by Zhang et al., similar to our findings for African and Asian Arabic students ^[25].

Table.5. Weight and BMI of selected students

	Africa (N=60)						Asia (N=58)					
	Post relocation			Before relocation			Post relocation			Before relocation		
	Mean ± S. D	Median	C.L 95.0 %	Mean± S. D	Median	C.L 95.0 %	Mean ± S. D	Median	C.L 95.0 %	Mean± S. D	Median	C.L 95.0 %
Weight (Kg)	70.5±11.73	71	3.030	69.51±11.7	70	3.022	72.46±14.97	74	3.937	72.93±13.9	75	3.660
BMI	23.54±3.490	23.73	0.901	23.27±3.865	23.37	0.998	24.37±4.508	23.34	1.185	24.52±4.08	24.69	1.073

Table 5 portrays the anthropometric changes in Arabic students before and after relocation. No significant changes were observed in weight as well as BMI in both the groups pre and post relocation. Compared with their Asian counterparts, African Arabs experienced considerably a slight change in body weight with no impact on BMI.

Table.6. Nutrient intake of selected Arabic International Students

Nutrients	Africa (N=60)	Asia (N=58)	<RDA (%)	≥RDA (%)
	Mean± S. D	Mean± S. D		
Energy	1604.6±351.62	1499.17±342.27	93%	7%
Protein	64.29±19.75	60.02±22.27	41%	59%
Fat	65.51±17.78	62.11±15.71	1%	99%
Calcium	549.65±219.13	485.19±239.96	98%	2%
Iron	9.52±2.82	8.83±3.78	36%	64%
Vitamin C	68.27±75.02	68.89±66.03	81%	19%
Vitamin A	350.35±267.68	343.25±351.32	97%	3%

Table 6 illustrates the nutrient intake data of the study participants. In current study, per day mean nutrient intake for many nutrients was considerably lower than the RDA according to the Dietary Reference Intakes (DRI) of The Institute of Medicine of The National Academies (2003) never the less nutrient intake of African Arabs was higher than Asian Arabic students with respect to energy, protein, fat, calcium, iron and vitamin A. Vitamin C intake was similar in both the groups ^[26]. With reference to meeting RDA, out of the total study participants, a greater percentage did not meet RDA for Energy (93%), Calcium (98%) Vitamin A (97%) and Vitamin C (81%). It is encouraging to note that 59% of study participants were able to meet RDA for protein and 64% for Vitamin C. As expected, 99% of study population were found to meet RDA for fat clearly indicating the inclination for fast food intake.

Discussion

This cross-sectional study aimed to understand the impact of relocation on the diet and nutritional status of international students. This is the first study perhaps to examine the dietary acculturation of international students in southern part of India

Accumulating evidence shows that international students are inclined to adopt unhealthy dietary behavior, such as skipping meals, increased intake of high-calorie foods (such as packaged food), and decreased fruit and vegetable consumption owing to dietary acculturation ^[27-29]. The current study also identified similar sub optimal food choices and dietary behaviors among the study participants Among the unhealthy dietary habits, skipping meals was found to be a common practice as majority of students had 2 meals per day and a minor proportion had only one meal. Likewise, skipping breakfast, eating out and snacking on regular basis in greater number of study population portrayed a bleak food consumption pattern

Among university students, a recent evidence-based study found that skipping breakfast was linked to 10 of 15 health risk behaviours, nine of which were indications of poor mental health and poor academic performance. Regularly skipping breakfast was linked to low levels of fruit and vegetable intake, frequent soft drink consumption, high fat and cholesterol intake, current binge drinking and low levels of physical activity.

Additionally, skipping breakfast frequently or infrequently was linked to poor academic performance and sleeping disorders ^[30].

A Prospective study by Aljefree et al. (2022) on university students helped shed light on the impact of snack consumption. Snacks consumed contribute to the intake of daily energy and nutrients, and thus affect the overall quality of the diet. Consumption of potato chips, popcorn, and biscuits as snack items were highly associated with obesity risk, whereas salad intake was associated with a decreased obesity risk. Thus, the African and Asian Arabic students demonstrated a unique amalgamation of dietary and life style behaviour each predicting future health consequences ^[31].

Food items consumed by the students showed marked changes following relocation. The frequency of consumption of food groups did not differ in African and Asian students showing a similar trend in dietary behaviours and food consumption patterns. The daily consumption of almost all food groups was remarkably low in greater proportion of respondents except for milk and milk products. The frequency of non-vegetarian food consumption had reduced in both the groups with a considerable decline noted in sea food consumption representing a trend towards the food habits of the host country India, which is predominantly vegetarian ^[32]. This could also be due to non-adherence to south Indian cooking patterns and recipe differences.

Indians are possibly the only nationality in the world that can be easily identified as herb and spice connoisseurs. Use of spices is more in south Indian cuisine as spices in Indian cuisine is keenly understood to provide intoxicating mix of colors, flavors, and aromas but also provide medicinal benefits ^[32]. But the Arabic students of the present study expressed that the spicy nature of south Indian food is the reason for less intake of food.

Present study reveals diminished consumption of fruits and green leafy vegetables by both the groups contrary to their intake in the home country. A recent prospective study by Morris et al (2018) affirms the fact that consumption of approximately 1 serving per day of green leafy vegetables and foods rich in phyloquinone, lutein, nitrate, folate, α -tocopherol, and kaempferol may help to slow cognitive decline with aging. Lower consumption of fruits and vegetables contribute to not only deficient anti-oxidants,

fiber and vitamins in the diet but also might hinder crucial metabolic functions including cognitive decline ^[34].

Expanded evidence from mechanistic reviews elicited the health impacts of sweetened beverages (SSB) in different ways particularly on the brain. Some of the mechanisms by which soft drinks can exert adverse effects include an increase in glutathione-S-transferase level, increased levels of gamma-aminobutyric acid (GABA), glutamate and dopamine alteration in brain waves on electroencephalography (EEG) eventually leading to stroke and dementia. They can increase the oxidative stress by a decreasing monoamine oxidase and acetylcholine esterase and antioxidants such as glutathione and catalase. Also, the consumption of sodium benzoate (found in beverages) on impairing memory, motor coordination and reduced glutathione (GSH) ^[35].

Nutritional status (body weight and BMI) did not change after migration for any group (except African students). One possible reason is the short length of stay in the host country. A previous study on the immigrants in the US and Australia showed an increase in body weight or BMI only after 10–15 years of stay in the host country ^[36-39].

By and large a gloomy nutrient intake status and a severe deficiency in the intake of Energy, Calcium and Vitamin A were observed. A major reason for deficient nutrient intake as expressed by vast majority of the participants is lack of time. As a result of non-provision of food in the hostels, all the student participants were engaged in cooking. This justifies the diminished intakes of sea foods, meat and green leafy vegetables which require an elaborate processing and cooking time. Other reasons expressed by the participants include, academic stress, financial constraints, low adaptability to south Indian cuisines, low availability of Halal meat and unfamiliar foods. For instance, students from Palestine admitted daily consumption of cereals, pulses and vegetables in the native country but due to time constraints they cook only one or two meals. Similarly, Olive oil is the staple oil in Palestine but expensive in India. In addition, the usual diet is salty and comprises solid fats such as cheese which is again expensive in south India. Use of red chillies in south Indian recipes is another factor that limits the food intake in Arabic students as they use only green chillies including pickles. Thus, relocation precipitated many changes in the dietary patterns of students participants.

Conclusions

The current investigation has spawned significant and rewarding information about permeating unhealthy dietary & life style behavior, imprudent food frequency patterns, low food intakes and, consequently, nutrient deficiencies in the international student participants relocated to south India for pursuit of higher studies. Therefore, it is crucial to create nutritional interventions for international students of various ethnicities. This may include provision of adequate on-campus educational nutrition programs to enhance knowledge of the food environment in their host country. Nutrition education about the nutrient profile of south Indian cuisines, medicinal properties of spices and other balanced diets may buffer the negative influence of fast-food consumption. Universities with a pragmatic approach must offer students important chances to adopt a balanced diet and create healthy eating habits, which serve as a solid foundation for excellent health throughout life.

References

1. Montanari, M. *Food is Culture*; Columbia University Press: New York, NY, USA, 2006.
2. 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
3. Satia-Abouta, J. (2003). Dietary acculturation: Definition, process, assessment, and implications. *International Journal of Human Ecology*, 4(1), 71-86.
4. Gilbert, P. A., & Khokhar, S. (2008). Changing dietary habits of ethnic groups in Europe and implications for health. *Nutrition Reviews*, 66, 203-215
5. Papadaki, A., & Scott, J. A. (2002). The impact of eating habits of temporary translocation from a Mediterranean to a Northern European environment. *European Journal of Clinical Nutrition*, 56, 455-461.
6. Papadaki, A., & Scott, J. A. (2002). The impact of eating habits of temporary translocation from a Mediterranean to a Northern European environment. *European Journal of Clinical Nutrition*, 56, 455-461.
7. Annual Status of Higher Education (ASHE), 2021 | In states and union territories of India, pg no 13.

8. Britto, P. R., & Amer, M. M. (2007). An exploration of cultural identity patterns and the family context among Arab Muslim young adults in America. *Applied Development Science*, 11(3), 137-150.
9. Gilbert, P. A., & Khokhar, S. (2008). Changing dietary habits of ethnic groups in Europe and implications for health. *Nutrition Reviews*, 66, 203-215
10. Winkelman, M. (1994). Cultural shock and adaptation. *Journal of Counseling & Development*, 73(2), 121-126.
11. Ansari WE, Stock C. Is the health and wellbeing of university students associated with their academic performance? Cross sectional findings from the United Kingdom. *International journal of environmental research and public health*. 2010 Feb;7(2):509-27.
12. Edwards, J. S. A., Hartwell, H. L., & Brown, L. (2010). Changes in food neophobia and dietary habits of international students. *Journal of human nutrition and dietetics*, 23(3), 301-311.
13. Hannigan TP. Homesickness and acculturation stress in the international student. *Psychological aspects of geographical moves: Homesickness and acculturation stress*. 2007:63-72.
14. Macrae M. The induction of international students to academic life in the United Kingdom. In *Overseas students in higher education 2002* Jan 4 (pp. 139-154). Routledge.
15. Hartwell, H. J., Edwards, J. S., & Brown, L. (2011). Acculturation and food habits: lessons to be learned. *British food journal*, 113(11), 1393-1405.
16. Alakaam, A. A., Castellanos, D. C., Bodzio, J., & Harrison, L. (2015). The factors that influence dietary habits among international students in the United States. *Journal of International Students*, 5(2), 104-120.
17. Edwards, J. S. A., Hartwell, H. L., & Brown, L. (2010). Changes in food neophobia and dietary habits of international students. *Journal of human nutrition and dietetics*, 23(3), 301-311.
18. Kremmyda, L. S., Papadaki, A., Hondros, G., Kapsokefalou, M., & Scott, J. A. (2008). Differentiating between the effect of rapid dietary acculturation and the effect of living away from home for the first time, on the diets of Greek students studying in Glasgow. *Appetite*, 50(2-3), 455-463.

19. Perez-Cueto, F., Verbeke, W., Lachat, C., & Remaut-De Winter, A. M. (2009). Changes in dietary habits following temporal migration. The case of international students in Belgium. *Appetite*, 52(1), 83-88.
20. L. Reeves, C. Jeya Henry, S. (2000). Dietary change, energy balance and body weight regulation among migrating students. *International journal of food sciences and nutrition*, 51(6), 429-438.
21. M. A. Pourhoseingholi, M. Vahedi, and M. Rahimzadeh, "Sample size calculation in medical studies," *Gastroenterology and Hepatology from Bed to Bench*, vol. 6, no. 1, pp. 14–17, 2013.
22. R. M. Zack, K. Irema, P. Kazonda et al., "The validity of an FFQ to measure nutrient and food intakes in Tanzania," *Public Health Nutrition*, vol. 21, no. 12, pp. 1–10, 2018
23. Lee, J., Gao, R. R., & Kim, J. H. (2015). Acculturation and changes in dietary behavior and anthropometric measures among Chinese international students in South Korea. *Nutrition research and practice*, 9(3), 304-312.
24. Zhang, X., Colee, J., Dahl, W., Bliznyuk, N., Choi, C. C., Alyousif, Z., ... & Mathews, A. E. (2017). Impact of acculturation and acculturative stress on diet and body weight among international students moving from China to the United States. *The FASEB Journal*, 31, lb464-lb464.
25. Zhang, X., Colee, J., Dahl, W., Bliznyuk, N., Choi, C. C., Alyousif, Z., ... & Mathews, A. E. (2017). Impact of acculturation and acculturative stress on diet and body weight among international students moving from China to the United States. *The FASEB Journal*, 31, lb464-lb464.
26. The National Academies Press: Committee on Use of Dietary Reference Intakes in Nutrition Labeling. *Dietary Reference Intakes: guiding principles for nutrition labeling and fortification*. http://www.books.nap.edu/catalog/10872.html?onpi_newsdoc121103 [Website] 2003.
27. Almohanna, A., Conforti, F., Eigel, W., & Barbeau, W. (2015). Impact of dietary acculturation on the food habits, weight, blood pressure, and fasting blood glucose levels of international college students. *Journal of American College Health*, 63(5), 307-314.

28. Lee, J., Gao, R. R., & Kim, J. H. (2015). Acculturation and changes in dietary behavior and anthropometric measures among Chinese international students in South Korea. *Nutrition research and practice*, 9(3), 304-312.
29. Zhang, X., Colee, J., Dahl, W., Bliznyuk, N., Choi, C. C., Alyousif, Z., ... & Mathews, A. E. (2017). Impact of acculturation and acculturative stress on diet and body weight among international students moving from China to the United States. *The FASEB Journal*, 31, lb464-lb464.
30. Pengpid S, Peltzer K. Skipping Breakfast and Its Association with Health Risk Behaviour and Mental Health Among University Students in 28 Countries. *Diabetes Metab Syndr Obes.* 2020 Aug 18;13:2889-2897. doi: 10.2147/DMSO.S241670. PMID: 32884315; PMCID: PMC7443458.
31. Aljefree NM, Shatwan IM, Almoraie NM. Impact of the Intake of Snacks and Lifestyle Behaviors on Obesity among University Students Living in Jeddah, Saudi Arabia. *Healthcare (Basel).* 2022 Feb 21;10(2):400. doi: 10.3390/healthcare10020400. PMID: 35207013; PMCID: PMC8872185.
32. Green, R., Milner, J., Joy, E. J., Agrawal, S., & Dangour, A. D. (2016). Dietary patterns in India: a systematic review. *British Journal of Nutrition*, 116(1), 142-148.
33. Joseph E and Voeks R (2021) Indian Diaspora Gastronomy: On the Changing Use of Herbs and Spices Among Southern California's Indian Immigrant Women. *Front. Sustain. Food Syst.* 5:610081. doi: 10.3389/fsufs.2021.610081
34. Morris MC, Wang Y, Barnes LL, Bennett DA, Dawson-Hughes B, Booth SL. Nutrients and bioactive in green leafy vegetables and cognitive decline: Prospective study. *Neurology.* 2018 Jan 16;90(3):e214-e222. doi: 10.1212/WNL.0000000000004815. Epub 2017 Dec 20. PMID: 29263222; PMCID: PMC5772164.
35. Anjum I, Jaffery SS, Fayyaz M, Wajid A, Ans AH. Sugar Beverages and Dietary Sodas Impact on Brain Health: A Mini Literature Review. *Cureus.* 2018 Jun 7;10(6):e2756. doi: 10.7759/cureus.2756. PMID: 30094113; PMCID: PMC6080735
36. Da Costa, L. P., Dias, S. F., & Martins, M. D. R. O. (2017). Association between length of residence and overweight among adult immigrants in Portugal: A nationwide cross-sectional study. *BMC Public Health*, 17(1), 1-10.

37. Goel, M. S., McCarthy, E. P., Phillips, R. S., & Wee, C. C. (2004). Obesity among US immigrant subgroups by duration of residence. *Jama*, 292(23), 2860-2867.
38. Koya, D. L., & Egede, L. E. (2007). Association between length of residence and cardiovascular disease risk factors among an ethnically diverse group of United States immigrants. *Journal of general internal medicine*, 22(6), 841-846.
39. Menigoz, K., Nathan, A., & Turrell, G. (2016). Ethnic differences in overweight and obesity and the influence of acculturation on immigrant bodyweight: evidence from a national sample of Australian adults. *BMC Public Health*, 16(1), 1-13.