



Dietary acculturation among African emigrant students in India: determinants and problems

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Abstract

Objective: Emigrants face a high level of food insecurity. There is a wide research gap in the domain of identifying the determinants and problems of dietary acculturation in the context of emigrant students. This article attempts to study the factors affecting the dietary acculturation of African emigrant students in India.

Design: For conducting a first-of-its-kind study for African emigrant students in India, we used field survey method, and the primary data were collected using a pre-structured questionnaire.

Setting: This was a field survey conducted in Punjab (a state of India).

Participants: One hundred and twenty African emigrant students participated in the survey.

Results: Results of logistic regression indicated that food awareness ($P = 0.027$) and food suitability ($P = 0.043$) were the major determinants of dietary acculturation. Lack of familiarity and lack of proximity to food access points are the major problems faced by the African emigrant students. African emigrant students prepared for dietary acculturation largely only after coming to India. There is a significant positive correlation ($P = 0.013$) between problems faced by the respondents and tendency to prepare for acculturation after coming to India.

Conclusions: Information regarding local food environment plays a significant role in dietary acculturation. There is a pertinent need to educate emigrant students regarding food availability and access by developing suitable educational content.

Keywords
Dietary acculturation
African emigrants
Students
India

The process of arriving to and settling in a new country involves many life changes; one of the changes that are most apparent on a daily basis relates to food. Acculturation pertains to adopting cultural traits; 'dietary acculturation' specifically refers to the process that occurs when members of a migrating group adopt the eating patterns/food choices of their new environment^(1–3). In addition to poor economic conditions, limited acquaintance with the new food environment often acts as a mediating factor for the high prevalence of food insecurity among the emigrants^(4–6). As part of dietary acculturation, emigrants may find new ways to use traditional foods, exclude other food and/or consume 'new' foods⁽⁷⁾. Adoption of less healthy food could lead to an increase in obesity and other health-related problems^(8,9).

As per the statistics of All India Survey of Higher Education (AISHE), Indian educational institutes host approximately 45 000 foreign students. Out of the total

foreign students in India, about 23 % come from Africa. For higher education, India ranks among the top five destinations for African students worldwide. Given the cooperation between India and African countries, the number of African students coming to India is likely to further increase in future. About half of African students in India hail from eastern Africa.

This study focuses on food-related problems of African students studying in Indian universities and attempts to understand the determinants of dietary acculturation in India. Available literature indicates that emigrants have high levels of food insecurity⁽¹¹⁾ and nutrition-related health problems^(12,13). A majority of dietary acculturation studies deal with immigrants in developed countries. Therefore, the current study in the context of African emigrant students in an emerging economy carries a significant importance in the research domain concerned with dietary acculturation.

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Background of the study

Dietary acculturation is multidimensional, dynamic and complex^(9,14) and does not appear to be a simple process in which a person moves linearly from one end of the acculturation continuum (traditional) to the other (acculturated)^(9,14). Available research evidence indicates that as part of the acculturation process, emigrants may retain traditional foods, exclude others, find new ways to use traditional foods and/or adopt the diets of the host country^(3,16). For example, among many Asian emigrants, rice remains an important staple, but cereal, bread, sandwiches and milk may replace other traditional foods⁽¹⁷⁻¹⁹⁾. Dietary acculturation is influenced by a number of factors and can result in considerably different patterns of dietary intake. Such factors include income and purchasing power, food availability, longer residence in the host country, fluency with the host language^(2,3,15) and food accessibility^(6,7,9,12,20).

One factor that makes food inaccessible/unavailable is the perceived or actual high price of healthy foods^(21,22). Additionally, food deserts – areas where residents cannot buy affordable and healthy foods – may lead to food insecurity^(6,23,24). Recent emigrants of Latin American origin, despite high levels of education, experienced food insecurity due to income-related factors^(25,26). Another contributing factor to the low access to food is lack of adequate transportation to undertake food shopping⁽²⁷⁻²⁹⁾. Proximity to food source can be an important determinant of dietary acculturation⁽³⁰⁾.

There is considerable support in the available literature to the assumption that emigrants enjoy healthier dietary practices prior to migration^(14,31-33). According to these researchers, the negative changes of dietary practices in these populations occur due to the acculturation process.

Methods

The population for the study consisted of all African emigrant students pursuing higher education in Punjab (a state of India). Based on the share of African students in the total population of foreign students and the share of the state of Punjab in hosting foreign students in India, we estimated the total population for the study at 550⁽¹⁰⁾. We selected three higher education institutes across the state of Punjab using simple random sampling. These selected institutes were Punjab Agricultural University (PAU), Ludhiana; Lovely Professional University (LPU), Phagwara; and Punjab College of Technical Education (PCTE), Baddowal. After preparing a list of African emigrant students from these higher educational institutes, we selected a sample of 120 students using simple random sampling. Given the finite population size, with 5% tolerance of variation at 95% confidence level, the sample size for the study would be statistically adequate⁽³³⁾. Findings of the study are based on the primary data collected using a pre-structured non-disguised

questionnaire. The questionnaire was personally administered to collect the data. We validated the data collection instrument by undertaking a pilot survey of ten respondents, and these respondents were excluded from the final sample. This questionnaire contained questions pertaining to various issues of dietary acculturation. Questions included the extent of adaptability, problems related to food access in India, extent of preparedness for food-related issues in India. We obtained the responses to various statements included in the questionnaire on a seven-point scale, with '7' representing 'strongly agree' and '1' representing 'strongly disagree'. We used factor analysis (statements given in Table 1) to extract the major dimensions related to food acculturation. We measured the extent of acculturation by combining scoring of statement S9 and reverse-scoring of statement S10, given in Table 2. For running logistic regression, the acculturation score for each respondent was transformed into categorical variables (above average and below average). We used SAS 9.3 software for data analysis.

The study, on which the present article is based, was duly reviewed and approved by a committee formed by the Dean of Postgraduate Research of PAU at synopsis

Table 1 Food-related issues faced by African emigrants (*n* 120)

Statements	Mean	SD	Z value
I cannot afford to eat properly (S1)	3.23	2.374	-3.575**
I am often hungry but I do not eat because I cannot afford enough food (S2)	2.23	1.899	-10.242**
I eat less than I think I should because I do not have enough money (S3)	1.90	1.552	-14.818**
I eat the same thing for several days in a row because I have a few different kinds of food on hand and I do not have money to buy more (S4)	3.29	2.367	-3.278**
I am reasonably aware about various Indian food options (S5)	4.31	2.195	1.538
I am reasonably aware about suitable local food eateries (S6)	4.03	2.247	0.122
I usually face hygiene issues related to food in India (S7)	5.95	1.810	11.804**
Normal Indian food feels very spicy to me (S8)	6.08	1.673	13.639**

Calculated mean compared against assumed mean = 4, that is, midpoint of the scale.

**Significant at 1%.

Table 2 Statements for measuring dietary acculturation

Statements	Mean	SD	Z value
I believe I have adapted to Indian food (S9)	3.04	2.247	-4.672**
I find it difficult to find suitable food options in India (S10)	5.38	2.276	6.658**

Calculated mean compared against assumed mean = 4, that is, midpoint of the scale.

**Significant at 1%.

Table 3 Extracted factors from principal components analysis

Factor	Factor name	Eigen value	% of variance	Items	Item loading
1.	Affordability (<i>Fac_afford</i>)	2.428	30.349	I am often hungry but I do not eat because I cannot afford enough food	0.818
				I eat less than I think I should because I do not have enough money	0.818
				I eat the same thing for several days in a row because I have a few different kinds of food on hand and I do not have money to buy more	0.812
2.	Awareness about local foods (<i>Fac_awi</i>)	1.545	19.307	I cannot afford to eat properly	0.640
				I am reasonably aware about various Indian food options	0.879
3.	Suitability and hygiene (<i>Fac_suit</i>)	1.471	18.381	I am reasonably aware about suitable local food eateries	0.854
				I usually face hygiene issues related to food in India	0.830
				Normal Indian food feels very spicy to me	0.814

stage as well as after the completion. Finally, the study was evaluated and approved by an external examiner appointed by the PAU.

Theoretical framework of research

The present study attempts to identify the impact of various explanatory variables on dietary acculturation among emigrant African students in India. The theoretical framework employed in the present study is given below:

$$P_i = E\{Y = 1|X_i\} = \beta_1 + \beta_2 X_i$$

$$P_i = E\{Y = 1|X_i\} = \frac{1}{1 + e^{-(\beta_1 + \beta_2 X_i)}}$$

$$P_i = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k)}}$$

$$L_i = \ln\left(\frac{P_i}{1 - P_i}\right)$$

$$\ln\left(\frac{P_i}{1 - P_i}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + u_i$$

$P_i = 1$ if acculturation score is above average; 0,

otherwise; $L_i = \log$ of OR;

$X_k =$ explanatory variables affecting acculturation.

We used binary logit model for investigating the determinants of dietary acculturation of African emigrant students in India. The extent of dietary acculturation is taken as the dependent variable, and independent variables include three factors related to food-related issues^(6,7,9,12,20) (obtained as factor scores as per Table 3), the extent of preparedness for food-related issues, the problems related to food access^(27–30), gender, duration of stay in India, marital status, proficiency in English language^(2,3,15) and dummy variables for being native to different parts of Africa. The description of variables used in model building is presented in Table 4. We used Cronbach's α and Hosmer and Lemeshow's goodness-of-fit test, respectively, for validation of factor analysis and binary logit model.

Results

The results obtained from the analysis of primary data are presented in this section. Table 5 presents the profile of respondents included in the study. The majority of respondents (60.8%) were from eastern Africa (Kenya, Uganda and Democratic Republic Tanzania) followed by 22.5% of respondents from southern Africa (Lesotho, Zimbabwe and Zambia). About 10% of respondents were from western Africa (Nigeria, Ghana and Sierra Leone) and 6.7% from central Africa (Democratic Republic of Congo). In all, twenty-one African countries are represented in the sample.

Determinants of dietary acculturation

This section presents the description of the model built for investigating the determinants of dietary acculturation. Table 4 enlists the variables used for model building along with their description.

The extent of acculturation (*Accul*), given in the bottom row of Table 4, is taken as the dependent variable. We used the remaining variables to explain the extent of dietary acculturation. The process of data reduction for these statements is presented as follows.

Data reduction

The factor analysis yielded the value of Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy as 0.661. A KMO value >0.50 is an indication of adequate sample size⁽³⁵⁾. The value of χ^2 for Bartlett's test of sphericity is pegged at 220.173 ($P < 0.0001$). We obtained three factors from principal components analysis.

Factor loadings and means are presented in Table 3. These seven factors explained 68.04% of variance in the dataset. Definitions for the extracted factors are provided as follows.

Affordability

This factor deals with the affordability of food by African emigrant students. Items under this factor include affording food to eat properly, being often hungry on account of affordability, eating less or eating the same thing for several

Table 4 Description of variables used for model building

Variable	Description
Factor Score_Affordability (<i>Fac_afford</i>)	Extracted from a factor analysis of statements presented in Table 1. Results of factor analysis are presented in Table 3.
Factor Score_Local Food Awareness (<i>Fac_awr</i>)	Extracted from a factor analysis of statements presented in Table 1. Results of factor analysis are presented in Table 3.
Factor Score_Suitability and Hygiene (<i>Fac_suit</i>)	Extracted from a factor analysis of statements presented in Table 1. Results of factor analysis are presented in Table 3.
Preparedness (<i>Prep</i>)	Extent of preparedness for food-related issues before coming to India, during transition and after coming to India. Preparedness score calculated by taking the mean across the three stages (presented in Table 7) for each respondent. Above-average score 1; otherwise 0.
Food Access Problems (<i>Prob</i>)	Problems faced in terms of mobility, proximity and familiarity to local environment. Food access problem score calculated by taking means of all problems (presented in Table 8) for each respondent. Above-average score 1; otherwise 0.
Duration of Stay (<i>Stay</i>)	Duration of stay in India in months
Gender (<i>Gen</i>)	Gender of respondent; male: 1, female: 0
Marital status (<i>Mstat</i>)	Marital status of respondent; married: 1, single: 0
Proficiency in English (<i>Profeng</i>)	Self-reported level of proficiency in English: 3, highly proficient; 1, not proficient at all
Native Area in Africa (<i>Dummy 1</i>)	Dummy variable representing native area of the emigrant in Africa: 1, if eastern Africa; otherwise 0
Native Area in Africa (<i>Dummy 2</i>)	Dummy variable representing native area of the emigrant in Africa: 1, if from southern Africa; otherwise 0
Extent of Acculturation (<i>Accul</i>)	Extent of dietary acculturation measured from combining rating score of statement S9 and reverse rating score of statement S10 presented in Table 2. Above-average score 1; otherwise 0.

Table 5 Profile of respondents

Parameters	Male (n 57)	%	Female (n 63)	%	Total (n 120)	%
Age (years)						
18–22	7	12.3	41	65.1	48	40
23–27	37	64.9	21	33.3	58	48.3
>28	13	22.8	1	1.6	14	11.7
Zones of Africa						
Central Africa	5	8.8	3	4.8	8	6.7
Southern Africa	10	17.7	17	27.1	27	22.5
Eastern Africa	33	58	40	63.6	73	60.8
Western Africa	9	15.9	3	4.8	12	10
Degree						
Undergraduate	36	63.2	55	87.3	91	75.8
Postgraduate	21	36.8	8	12.7	29	24.2
Marital status						
Single	53	93.0	59	93.7	112	93.3
Married	4	7.0	4	6.3	8	6.7
Proficiency in English						
Poor	0	0.0	1	1.6	1	0.8
Average	22	38.6	20	31.7	42	35
Very good	35	61.4	42	66.7	77	64.2

days because of shortage of money. This factor explained 30.349 % of variance in the data.

Awareness about local foods

This factor deals with the awareness about the availability of local foods in India to African emigrant students. Variables represented by this factor include being aware about various Indian food options and being aware about suitable local food eateries. This factor explained 19.307 % of variance in the data.

Suitability and hygiene

This factor deals with issues related to the suitability of food and hygiene practices. Variables represented by this factor

include facing hygiene issues in India and issue of spiciness of Indian foods. The variance explained by this factor was 18.381 %.

Anderson–Rubin scores for the extracted factors were calculated and used as the explanatory variables in the model for exploring the determinants of dietary acculturation. Cronbach’s α was used for determining the validity. The value of Cronbach’s α (0.757), for the statements included in factor analysis, is acceptable⁽³⁶⁾.

Model for dietary acculturation

The results of the logistic regression model are presented in Table 6. Pearson’s statistics ($P = 0.0954$) as well as Hosmer and Lemeshow’s goodness-of-fit test ($P = 0.767$) indicated a good model fit. Of all the explanatory variables of dietary acculturation, awareness about local food options showed a significant positive impact on the likelihood of dietary acculturation of the respondents. This indicates that respondents with relatively higher levels of awareness about the local environment were likely to have relatively easy dietary acculturation. On the other hand, the factor relating to suitability and hygiene had a significant negative impact on the process of dietary acculturation. Issues such as spiciness of Indian food and hygiene contributed adversely to dietary acculturation. Table 6 indicates that only these two factors significantly impacted dietary acculturation.

OR estimates indicated that with a unit increase in ‘*Fac_awr*’, the likelihood of above-average dietary acculturation increased by 0.616 times; and further, a unit increase in ‘*Fac_suit*’ decreased the likelihood of above-average dietary acculturation score by 1.543 times.

The respondents were enquired about the stage at which they prepared for food-related issues. They

Table 6 Determinants of dietary acculturation: model summary (dependant variable *Accul*)

Parameter [†]	B	SE	P value	Wald χ^2	OR	95 % Wald confidence Limits for OR	
Intercept	-0.4520	1.2220	0.7115	0.1368	–	–	–
<i>Fac_afford</i>	-0.1471	0.2051	0.4734	0.5141	0.863	0.577	1.290
<i>Fac_awr</i>	0.4726*	0.2143	0.0275	4.8612	1.604	1.054	2.442
<i>Fac_suit</i>	-0.4342*	0.2148	0.0432	4.0883	0.648	0.425	0.987
<i>Prob</i>	-0.6840	0.4126	0.0974	2.7481	0.505	0.225	1.133
<i>Prep</i>	0.4122	0.4180	0.3240	0.9727	1.510	0.666	3.426
<i>Gen</i>	0.4470	0.4213	0.2887	1.1257	1.564	0.685	3.570
<i>Mstat</i>	-0.8987	0.8229	0.2748	1.1928	0.407	0.081	2.042
<i>Profeng</i>	0.2446	0.4074	0.5482	0.3605	1.277	0.575	2.838
<i>Stay</i>	-0.0143	0.0141	0.3108	1.0273	0.986	0.959	1.013
<i>Dummy 1</i>	0.1377	0.4743	0.7716	0.0843	1.148	0.453	2.908
<i>Dummy 2</i>	-0.6884	0.6495	0.2892	1.1235	0.502	0.141	1.794

Binary logit model built using Fisher's scoring optimisation technique. Pearson's goodness-of-fit statistics 127.6477 (df 108, $P=0.0954$), R^2 0.1905, area under ROC curve 0.7402. Hosmer and Lemeshow's goodness-of-fit test: χ^2 4.9116 (df 8, $P=0.767$).

[†]Refer to Table 4 for the description of variables used for model building.

*Significant at 5 % level.

Table 7 Preparedness for dietary acculturation

Stages	Mean score	SD	t value	P value
Well before coming to India	2.27	1.69	-4.756**	≤0.0001
During the transit/just before	2.16	1.43	-6.439**	≤0.0001
After coming to India	3.99	1.49	7.280**	≤0.0001

Calculated mean compared against assumed mean = 3, that is, midpoint of the scale.

**Significant at 1 % level.

responded on a rating scale of 5 to 1, where '5' presented 'planned/prepared intensively'; and '1', 'did not plan/prepare at all'. Table 7 shows the mean score for preparedness for food-related issues well before coming to India as 2.27. The mean preparedness score for during the transit/just before entering India is 2.16. The mean preparedness score after reaching India is 3.99. All the mean preparedness scores were statistically different from midpoint of the scale. The results indicate that African emigrant students prepared for food-related issues largely after landing in India only.

The respondents were enquired about the sources of information they used for the preparedness for food-related issues during their stay in India. The majority of respondents prepared for food-related issues after coming to India, and the major source of information were acquaints/students residing in India (59.2 %) and natives/fellow students (41.7 %). Very little importance (5.8 %) was given to the use of leaflet, guide or brochure as a source of information for the preparedness of food-related issues.

The respondents were enquired about various food-related issues on a rating scale of '5' (most often) to '1' (seldom). Table 8 shows that the lack of familiarity with local food markets is a major problem in accessing food. The mean score for this problem was pegged at 4.26

Table 8 Problems relating to accessing food in India

Problems	Mean score	SD	t value	P value
Lack of familiarity	4.26	1.45	9.529**	≤0.0001
Lack of proximity	3.23	1.38	1.849	0.067
Lack of mobility	2.68	1.37	-2.529*	0.013

Calculated mean compared against assumed mean = 3, that is, midpoint of the scale.

**Significant at 1 %; *significant at 5 %.

($P \leq 0.0001$). Lack of proximity to food markets is another major problem with a mean score of 3.23.

Lack of mobility, although less severe, is also reported as a problem, with a mean score of 2.68 ($P=0.013$). Correlation analysis indicated that there was a positive and significant correlation ($r=0.227$, $P=0.013$) between lack of familiarity with local foods and preparedness for dietary acculturation after coming to India. Similarly, there was a positive and significant correlation ($r=0.241$, $P=0.008$) between experiencing lack of proximity to food access points and doing preparations after coming to India.

The respondents revealed that Indian foods are spicier compared with African foods. Further, they consumed fresh animal-based foods in their native countries, but had to rely on frozen animal-based foods in India. Common roots and tubers consumed by emigrants in India are potatoes, carrot and onions, while in Africa they consume cassava, yams, carrots, sweet potatoes and Irish potatoes. Green leafy vegetables consumed by African emigrants in India are spinach and amaranthus leaves, while in Africa they consume cassava leaves, pumpkin leaves, sweet potato leaves, amaranthus, spinach and other indigenous leafy vegetables. In India, the emigrants largely consume wheat and rice, while in Africa they additionally consume sorghum, maize, millet and teff.



Discussion

Dietary acculturation encompasses both physical and emotional adjustments. A number of factors influence the process of adjusting to new environmental settings. The results of the study throw up a number of issues in the context of dietary acculturation. Awareness about the local food environment plays a significant and positive role in dietary acculturation. Knowledge about local foods is helpful for emigrants to have smoother acculturation. Limited acquaintance with the new food environment is identified as a mediating factor for a high prevalence of food insecurity among the emigrants^(6,11). On the other hand, spiciness of food and hygiene issues are negatively related to dietary acculturation. In the context of African emigrant students, economic factors did not play a significant role in dietary acculturation. This finding is in contrast to a number of studies that emphasised on the role of economic factors in dietary acculturation^(21–23,25). This contradiction may be on account of the fact that the respondents of the current study were individual students rather than families. Usually, emigrant students are financially well supported. Also, the individuals have lesser dietary requirements compared with a whole family.

Early preparedness can be instrumental in better dietary acculturation. The majority of respondents reported they prepared regarding food-related issues only after landing in India. These findings are supported by a number of previous studies^(37–39). The respondents clearly indicated a dearth of information about local foods. The majority of respondents prepared for food-related issues after coming to India, and the major source of information used by them was acquaints/students residing in India. This is on account of inadequate information available in the domain. There is a pertinent need to create information repositories for emigrant African students in India so that they are well apprised about the local foods. Lack of preparedness may lead to problems in terms of getting familiar with the local food environment and accessing the food.

Lack of familiarity and proximity to the local food market are the major food access problems faced by African emigrant students. This could be due to the fact that our respondents did not have access to any written material addressing their food-related issues. The written or printed matter they had come across focused more on climate, geographical details, places of visit and few Indian delicacies. Usually such documents do not contain details about native eating habits and food preferences and familiarity with Indian foods. The respondents were not familiar with foods available in Indian markets. They were in the habit of consuming more animal-based foods but were not able to find fresh animal products in India. Other factors affecting our respondents' familiarity about local food markets include distance to food markets, lack of personal conveyance and limited ability to use local transportation on account

of language barriers. Host academic institutions can play a vital role in this context. There is a need on the part of host academic institutions to provide adequate orientation to incoming students so that they can get familiar with local food markets and the means to access these markets.

Dietary acculturation may be desirable for getting adequate food intake in the host country. But a number of studies have also pointed at the downside of dietary acculturation. In addition to the health risks due to food insecurity, acculturation may affect emigrants' health^(6,7,20,40,41). Studies on acculturation and health status have shown that acculturation can have negative effects such as obesity^(31,42) and diabetes⁽³³⁾.

Conclusion

Information regarding local food environment plays a significant role in dietary acculturation. Major dietary acculturation issues for African emigrant students in India include awareness about local food environment as well as the suitability of food and hygiene issues. Major problems in accessing the food include lack of familiarity with the local environment and lack of mobility. Awareness about local foods can be helpful in assessing food suitability and making a smooth dietary acculturation. There is a need on the part of emigrant students to access prior information concerning Indian food environment as well as eating behaviours so as to be well prepared on matters concerning food before coming to India. At the same time, the host country and educational institutions should play their part in ensuring adequate support for smoother dietary acculturation. Given the diversity and complexity of food environments, there is a pertinent need on the part of both native and host countries to jointly create and disseminate effective knowledge solutions for ensuring smooth dietary acculturation for emigrant students. Future research in the domain of dietary acculturation may include impact assessment of dietary changes on the health of emigrants in Indian conditions. This could be done by measuring and comparing the health status in pre-emigration and post-emigration phases.

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human subject participation: This study was conducted according to the guidelines laid down in the Declaration of Helsinki, and all procedures involving study participants were approved by the statutory committee as per the guidelines of Dean, Postgraduate Studies, Punjab Agricultural University, Ludhiana. Verbal consent was witnessed and recorded from the respondents.

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