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DIETARY ADEQUACY OF MIGRATED NORTH EAST REGION COLLEGE STUDENTS RESIDING IN PUNE CITY, MAHARASHTRA

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ABSTRACT

Migration from home leads to unhealthy eating habits and consequently changes in the dietary pattern and dietary adequacy. The purpose of this study was to assess the nutritional status, pre and post migration and dietary adequacy of the participants migrated from Northeast region currently residing in Pune, Maharashtra. A total 100 college going students (18 to 25 years) across 3 universities in Pune, within 3 ethnic groups of NER using purposive sampling technique were recruited. Data was collected through interview method. The level of significance was set at p value <0.05 for all analysis. Significant associations were found between access to red meat a staple food and length of stay in Pune. Statistical significant difference for consumption of nutrients pre and post migration across genders and difference for consumption of micronutrients across three ethnic groups was observed. This baseline study on the migrated students showed change in the dietary adequacy.

KEYWORDS: ***North East Region, Dietary adequacy, Migrated students***

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INTRODUCTION

Migration is defined as a population movement encompassing any kind of movement of people, whatever its length, composition and causes [1.] Internal migration is the move from rural to urban area within the same country and this trend has been observed among the North East Indian region also. In the past, the natives of North East Region (NER) were traditionally hesitant to migrate for various reasons; but presently migration from rural to urban areas has been increasing gradually which may be influenced due to factors like lack of avenues for higher education and employment, socio political unrest and inadequate economic infrastructure in the NER [2.] Nutritional imbalance occurs with changes in dietary intake, and nutritional needs. Failure to adapt to the new environment could have qualitative and quantitative negative consequences towards their nutritional status [3, 4]. The migrated students may often be affected by food availability, cultural differences , social integration, and other factors in a new environment [5] and this not only causes a change in the constituents of foods, but also a shift from consumption of traditional foods to non- traditional foods to a greater extent [6]. Additionally, knowledge and dietary patterns may depend on the length of time; they have spent in their new environment [7]. These migrated students are influenced greatly by the new food culture and this leads to changes in their dietary pattern [8]. Migrated students away from home often develop unhealthy eating habits and consequently there is a change in the dietary pattern which compromises their dietary adequacy [9, 10].Migrated students may develop plan of action to manage the stay in their new environment, and it however remains unclear how they deal with the different dietary habits and its determinants [11- 15]. There are limited researches on the dietary adequacy of population studying outside the North East Region and hence the present study focuses on identifying this dietary adequacy.

MATERIALS AND METHODS

A cross sectional study was conducted from November, 2015 to March, 2016, at Pune, Maharashtra across 3 universities among migrated students from North East India region (NER) studying in Pune. A total of 100 college going students between the age group of 18 to 25 years were purposively selected for the present study and interviewed. Students suffering from chronic diseases were excluded from the study. The ethnic groups were categorised based on the diet diversity of the NER. Nagaland was considered as Ethnic group I. Manipur, Tripura and Mizoram as Ethnic group II. Assam, Arunachal Pradesh, Sikkim and Meghalaya as Ethnic group III. Statistical formula was used to calculate the sample size of the study[16].The study was approved by Independent Ethics Committee (IEC) of Symbiosis International University. Participants were asked to read the consent forms after verbally explaining the objectives of the study. Informed consent forms were attached with the questionnaires to validate the agreement of the participant to voluntarily participate in the present study. The data collected included the socio-demographic characteristics of the participants like information on age, gender, ethnicity, marital status, name of university, socio-economic status, medical history, type of accommodation and length of stay in Pune .Kuppuswamy's Socio-Economic Status Scale [17] was used to assess the socio-economic status of the participants. Anthropometric measurements included height which was measured to the nearest 0.1 cm using a 2 meter Seca stature meter. Weight was measured to the nearest 0.1 kg using Omron digital weight scale. Body Mass Index (BMI) was calculated using the measured height and weight, and the following formula was used: BMI= [weight (in kg) ÷ height (in cm)] kg/m2. BMI was graded according to the World Health Organization (WHO) BMI cut- offs for Asians. [18]. Waist circumference (WC**)** and Hip Circumference (HC) was measured using a non- stretchable tape. Waist- Hip Ratio (WHR) was calculated using the measured WC and HC, and the following formula was used: WHR= WC (cm) ÷ HC (cm), and was graded according to the World Health Organization classification for males and females [19]. Clinical parameter blood pressure was measured using Omron digital blood pressure monitoring device and classified according to the American Heart Association classification [20]. The dietary data form comprised of general diet information, Food Frequency Questionnaire (FFQ) and 24 Hour Diet Recall. General diet information was based on basic information related to type of diet, meal pattern, and dietary changes after migration, and food preferences were assessed. FFQ and 24 hour dietary recall method was used to assess the dietary and nutrient adequacy pre and post migration.

STATISTICAL ANALYSIS

The data collected was entered into SPSS version 23.0 and DietCal version 5.0. SPSS was used for statistical analysis and checking for errors and Dietcal was used for nutrient calculation. One way ANOVA and t-test were used for analysis on dietary adequacy and nutrient intakes across various ethnic groups. The level of significance was set at p value <0.05 for all analysis.

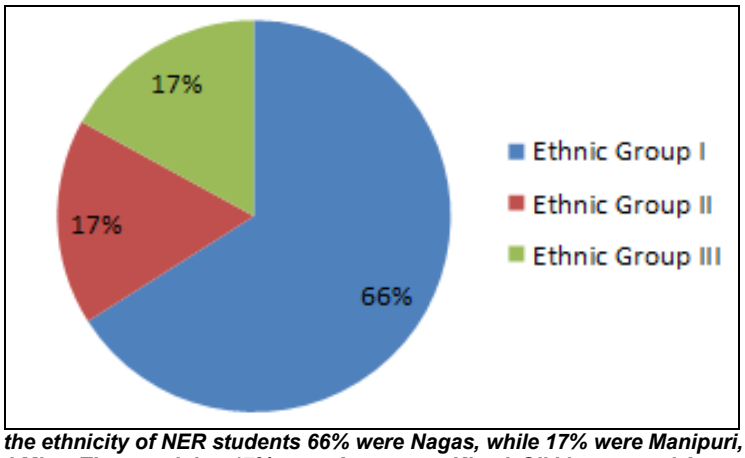
RESULTS

There was equal representation of both the genders and the mean age was 22.9± 1.8 years. 58% of the participants had been residing in Pune since 2 years and 42% participants for >2 years. A higher percentage of the participants (36%) belonged to the Lower Middle Socio-economic class. (Table 1)

Table 1
Socio demographic characteristics

Variables	Male (n=51)	Female (n=49)	Total (n=100)
		n(%)	
Age(years)			
18 to 20	7 (13.7)	4 (8.2)	11 (11.0)
21 to 23	16 (31.4)	26 (53.1)	42 (42.0)
24 to 25	28 (54.9)	19 (38.8)	47 (47.0)
Mean± SD	23.1± 1.9	22.8± 1.6	22.9± 1.8
Length of stay in Pune			
≤24 months	28 (54.9)	30 (61.2)	58 (58.0)
>24 months	23 (45.1)	19 (38.8)	42 (42.0)
Mean± SD	29.1± 14.5	26.9± 11.7	28.0± 13.2
Socio- economic class			
Upper (I)			
Upper Middle (II)	15 (29.4)	13 (26.5)	28 (28.0)
Lower Middle (III)	15 (29.4)	16 (32.7)	31 (31.0)
Upper Lower (IV)	18 (35.3)	18 (36.7)	36 (36.0)
	3 (5.9)	3 (6.1)	5 (5.0)

Figure 1
Ethnic Group classification of North East Region (NER)



Based on the ethnicity of NER students 66% were Nagas, while 17% were Manipuri, Tripuri and Mizo. The remaining 17% were Assamese, Khasi, Sikkimese, and Arunachali. (Figure 1)

Table 2
Anthropometric and Clinical characteristics across gender

Variables	Males	Females
	Mean± SD	Mean± SD
Height (cm)	166.5± 6.7	159.3± 7.5
Weight (kg)	63.7± 8.2	57.0± 12.7
BMI (kg/m^2)	22.9± 2.7	22.4± 3.9
WC(cm)	78.4± 7.8	73.8± 9.8
HC(cm)	88.4± 9.0	90.2± 8.8
WHR	0.87±0.08	0.81±0.09
SBP (mmHg)	127.8± 1.3	117.8± 1.3
DBP (mmHg)	79± 8.3	73.8± 9.9

The mean BMI among males was 22.9± 2.7 kg/m^2 and 22.4± 3.9 kg/m^2 among females which falls under the normal BMI category [18]. The mean waist circumferences (WC) and Waist to Hip ratio (WHR) in males and in females were in the normal category [19]. The systolic and diastolic blood pressure of males and females too were close to the normal. (Table 2)

Table 3
Length of stay and accessibility to staple food

Variables	≤ 24 months n (%)	>24 months n (%)	X^2 value	p value
Limited access to red meat	44 (75.9)	22 (52.4)		
Frequent access to red meat	14 (24.1)	20 (47.6)	5.985*	0.014
Received food items ≤ once in 6 months	39 (67.2)	18 (42.9)		
Received food items > once in 6 months	19 (32.8)	24 (57.1)	5.910*	0.015

There was a significant association between access to red meat and length of stay (X^2 = 5.985, p <0.01) and also there was a significant association between frequency of food items received from native place and length of stay (X^2 = 5.910, p <0.01). (Table 3)

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Table 4
Dietary adequacy pre and post migration in males and females

Nutrients	Males		Females	
	Pre Mean± SD	Post Mean± SD	Pre Mean± SD	Post Mean± SD
Energy (kcal)	2053±5.5	1888±4.5	1903±5.7	1695±4.8
Carbohydrates(g)	240.6±4.6	228.3±5.6	217.2±6.8	213.7±5.8
Proteins(g)	95.2±3.9	78.3±3.1	90.5±3.9	64.6±2.5
Fats(g)	74.7±2.7	69±2.2	70.6±2.9	57.8±2.4

The Recommended daily allowance (RDA) for males and females is 2425 Kcal and 1875 kcal respectively based on ICMR guidelines this suggest that the dietary adequacy of males and females was 15.3% and 1.5% deficit pre migration and this deficit increased further to 22.1% and 10.1% respectively post migration. The average percentage daily consumption was calculated with respect to the energy intake i.e., pre-post migration for both genders. The consumption of carbohydrates in males and females increased post migration and contributed to 48% and 50% of energy respectively. A high consumption of protein pre migration was observed in males and females, and the intake was drastically decreased post migration providing 17% and 15% of the energy respectively. The decrease in protein consumption maybe in context to the consumption of red meat which was high before migration, limited access to red meat after migration could be one of the reasons for decrease in protein intake. Fat consumption after migration was also reduced in males and females providing 32% and 31% respectively. (Table 4) and this difference in consumption of nutrients pre and post migration was also statically significant. (Table 5).

Table 5
Paired t- test for pre and post migration consumption of nutrients across gender

Nutrients	Males			Females		
	Mean± SD			Mean± SD		
	Pre	Post	t-value	Pre	Post	t-value
Energy (kcal)	2053±5.5	1888±4.5	-2.284*	1903±5.7	1695±4.8	-2.579*
Protein (g)	95.2±3.9	78.3±3.1	-4.682***	90.5±3.9	64.6±2.5	-5.313***
Fat (g)	74.7±2.7	69±2.2	-1.683	70.6±2.9	57.8±2.4	-2.920**
Total Carotene (µg)	7576.1±5.1	8256.7± 4.1	.994	8346.3±5.6	9832.1±6.6	2.275*
Beta- Carotene (µg)	2098.7±2.0	3183.6± 2.0	3.703***	2202.9±2.4	3797.5±3.0	4.883***
Thiamine (mg)	4.7±1.2	4.6± 1.2	-3.599***	2.9±1.2	2.6±1.2	-4.631***
Niacin (mg)	19.7±2.9	17.5± 2.9	-3.665***	15.3±2.7	11.5±2.7	-5.837***
Riboflavin (mg)	10.9± 3.4	10.9± 3.5	-2.251*	5.9±3.4	5.8±3.4	-2.196*
Calcium (mg)	894.5±4.1	724.6± 3.6	-5.021***	834.4±3.6	662.4±2.7	-4.249***
Iron (mg)	22.9±8.9	17.8± 8.6	-4.754***	23.5±9.6	17.9±9.6	-4.924***
Chromium (mg)	0.06±0.02	0.05±0.01	-2.044*	0.05±0.02	0.06±0.02	.746
Choline (mg)	478.8±4.2	393.1± 2.3	-1.728	518.2±4.5	365.5±2.1	-2.965**
Potassium (mg)	1575.6±7.7	1322.7± 5.8	-2.843	1478.5±7.2	1189.7±4.8	-3.201**
Manganese (mg)	2.2±0.7	2.1±0.6	0.74005	2.3±1.1	1.9±0.6	.96280*
Monosaturates (mg)	1.1±0.12	0.8±1.4	-1.791	1.5±1.5	0.3±0.4	-5.908***
PolyUnsaturates (mg)	0.4±0.04	0.3±0.5	-1.947	0.5±0.4	0.1±0.1	-6.518**
Insoluble Dietary Fibre (g)	12.4±3.2	11.9±2.7	-1.495	13.4±5.4	12.3±4.0	-2.240*

**** The mean difference is significant at the 0.05 level, ** significant at the 0.01 level and *** significant at the 0.001 level.***

Table 6
One way ANOVA for nutrient intake across ethnic groups

Nutrients	I	II	III
		Mean± SD	
Vitamin B12 (mg)	0.8±0.6*	1.1±0.5	1.2± 0.5*
Vitamin A (mg)	231.4±1.3*	318.4±1.2	333.5±129.8*
Free folic acid (mg)	75.3±3.2*	96.9±3.2*	100.8±3.4*
Vitamin C (mg)	158.2±6.7*	204.8±6.2*	190.1±8.5
Iron (mg)	15.97±8.9*	23.3±5.9*	19.9± 9.7
Phosphorous (mg)	987.8±3.0*	1223.8±3.3*	1096±3.0
Potassium (mg)	1181±5.5*	1548.4±4.7*	1262.9±4.4
Soluble Dietary Fibre (g)	3.9±1.0*	4.7±1.3*	4.2±1.3

****The mean difference is significant at the 0.05 level***

There was significant difference between the ethnic groups as determined by one way ANOVA. A tukey's post hoc test was carried out to compare the nutrient intake across the 3 ethnic groups. It was observed that Ethnic Group II had a higher intake of vitamin C, iron, phosphorous, potassium, and soluble dietary fibre. Ethnic group III had a higher intake of free folic acid, vitamin B12 and vitamin A. (Table 6).

DISCUSSION

Migration and health operates simultaneously and is mediated by multiple factors. Migration to a new environment generate changes in dietary pattern and pose a greater risk of developing unhealthy eating habits following migration [6,12,21]. The population from NER traditionally follows a typical meal consisting of boiled rice, boiled vegetables and non- vegetarian preparation. Red meat such as pork and beef are widely consumed in NER and is considered as one of the staple food [22-24]. However, in this present study, the consumption pattern of red meat was changed following migration. In the beginning, foods specific to their native region are not readily available and it becomes challenging to adopt new dietary behaviours [11] but, as the duration of time progressed in Pune, the migrated participants were able to explore places where the food options were similar to their traditional food, and subsequently access to red meat increased. The frequency of access to red meat was observed to be increased over a period of time as one can get acquainted with the place following a 2 year stay post migration. The frequency of receiving food items also increased with the length of stay since they possibly develop strategies which include food procurement from their native place and purchasing strategies, to cope with the duration of stay [7]. Maximum individuals reported to have made dietary changes across genders after migration [14]. There were significantly higher mean intake of energy, vitamin A, thiamine, protein, fat, carbohydrate, calcium and sodium in males as compared to females in studies conducted on migrated students [25, 26]. Increases in the trends of convenience foods, dining out and portion were observed with increase in the length of residence [7, 12, 14, 27, 28]. In the present study, there were changes in the consumption of nutrients across genders, and among females there were more significant differences which portray that they may have faced more difficulty in adjusting to the new environment in comparison to males. NER is an ethnically and linguistically diverse region, and each ethnic group has traditionally diverse food habits. As observed in the present study, EG III has the highest consumption of vitamin B12, vitamin A, and free folic acid. This can be attributed to their traditional eating habits of not just red meat but also chicken, eggs and fishes, green leafy vegetables, fruits specific to their place, black gram, and lentils. EG II has the highest consumption of vitamin C, iron, phosphorous, potassium, and soluble dietary fibre which may be attributed to their traditional eating habits of citrus fruits, passion fruit, red meat, dried and fermented food items, and bamboo shoots. EG I had the lowest consumption of all the nutrients. These observations indicate that though all these ethnic groups are confined to the same region, their traditional habits are distinctly different. Migratory changes may be detrimental or beneficial for the migrant. The internal migration from rural to urban shift increases the possibility of adapting westernized food habits, as well as the risk of non- communicable diseases. The dietary pattern and dietary adequacy in the new host environment influences the nutritional status, which directly affects health. It is a difficult task to adapt to a whole new culture and tradition, but with proper nutrition education and information, there are possibilities of positive impact on health. The findings in this present study show that dietary adequacy can be linked with nutrition transition. Poor availability and access to traditional food sources have deprived the dietary adequacy of the migrated students. If this persists, then there might be a possibility of higher dietary inadequacy among migrated population in the coming years. The adjustment has to be adopted by these migrated populations at a much faster pace so that they can cope up better and not be subjected to nutritional disequilibrium.

CONCLUSION

The present study was a baseline study where observations among the migrated students were done. In the future, longitudinal nutrition intervention studies can be conducted which will allow the migrated populations to make healthier choices with the available food options. There were changes observed in the dietary adequacy of the migrated students due to the unavailability of traditional foods which resulted in unfavourable eating habits, and therefore posing a risk to the their health status. This research implies on designing nutrition education intervention studies for migrated population to gain further insight on changes in dietary behaviours to bring about a positive outcome in dietary adequacy among the migrants.

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CONFLICT OF INTEREST

Conflict of interest declared none.

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