



RESEARCH PAPER

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A survey on consumption behaviour of indigenous food: An experience from Guwahati, India

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Key words: Indigenous, Fruits, Northeast India, Food consumption behaviour, Health benefits

<http://dx.doi.org/10.12692/ijb/23.1.303-311>

Article published on July 16, 2023

Abstract

The present survey was conducted to assess consumption behaviour of indigenous food among adult population in Guwahati region, Assam, India, with a sample size (N=100) and random selection of subjects between the age 18-60 years. The data obtained through a pre-structured questionnaire reported the socio-demographic profile and nutritional status of the respondents. Maximum respondents had a normal BMI, with satisfactory knowledge behaviour on indigenous food and a positive attitude and practice towards it, such as to cure various ailments and preservation through different techniques. FFQ reported the frequent consumption of indigenous fruits and vegetables and fermented foods among maximum respondents.

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Introduction

Indigenous foods and dietary diversity can be powerful sources of nutrients within an ecosystem and play a major role in enhancing quality of diets and improving food and nutrition security. In natural ecosystems, indigenous plants grow spontaneously which have been serving mankind as food and medicine for generations (Mbhenyane, 2017). Assam is a state of Northeast India, a unique biodiversity hotspot which is home to many ethnic communities that represent multi-ethnic, multi-linguistic and multi-religious societies which is unique and these communities have been residing for hundreds of years (Sarma & Parasar, 2019). The culture of a society is reflected by food habits. Foods which originate from local plant or animal resources through gathering and harvesting and bear cultural meaning are known as traditional foods (Bora 2020; Gogoi, 2019). The state's population is constituted by a diverse population of people comprising of different tribes. In Assam and North East Region of India, Assamese people traditionally consume many wild herbs which are grown in Assam and have immense nutritional and medicinal values. The tradition of preparing ethnic foods by concerned communities is creative and acts as a bridge connecting the socio-cultural, spiritual, economic and their way of life. Within a state, such ethnic dishes are deeply connected to the socio-economic and cultural diasporas of various lesser-known communities (Borah & Borah, 2021; Sarma, 2020).

In the Assamese culture, traditional fermented foods have occupied an important place and Assamese people prepare varieties of fermented foods and beverages (Barooah *et al.*, 2020). Most of the communities residing in Assam ferment locally available biological resources such as cereals, legumes, bamboo shoots, milk and vegetables which signify rich culture and tradition. The staple food of Assam is rice and since ancient times, Assamese people used to make various rice preparations like *jalpan*, different rice cakes, rice beer etc. which are part and parcel of Assamese traditional food culture (Bora, 2020). For preparation of ethnic food, a rich tradition of indigenous fermentation is

inherited by the Rabha Hasongs, the Mishings and the Karbis, three major ethnic communities of Assam (Sarma & Parasar, 2019). Due to the influence of traditional herbal medicine, easy accessibility and low cost, leafy vegetables (greens) play a major role in the Assamese diet and wild plants are commonly used as leafy vegetables. Many indigenous plant species and their wild forms constitute the routine vegetables of the inhabitants of Assam which provide sufficient nutrients, novel nutraceuticals and medicinal value for the people (Choudhury *et al.*, 2017; Choudhury *et al.*, 2021). Banana plant grows abundantly across the state of Assam as a tropical fruit and is a common household ingredient amongst the people of Assamese community due to its easy availability and high nutritious content (Sarma *et al.*, 2020). In northeastern states of India, insects play an important role in the dietary system of various ethnic groups. On the basis of their traditional belief, taste, regional and seasonal availability, the members of various tribes choose the edible insects (Sangma *et al.*, 2016).

Indigenous and traditional crops are rich in micronutrients and many rural communities have access to it, which in long term can eliminate food insecurity as well as contribute to nutrient requirements (Mbhenyane, 2017). Bamboo shoots are rich in proteins, carbohydrates, vitamins, fibres, minerals and very low fat and are considered as one of the useful health foods (Nongdam & Tikendra, 2014). Antioxidants and high amount of polyphenols, flavonoids, phenolics, catecholines and many other important phytochemicals and phytosterols are found in banana peel and parts of the fruit (Sarma *et al.*, 2020). Vegetables are chief sources of vitamins, minerals, oil, carbohydrates and constitute a major part of daily food intakes and play an important role in well-balanced diet and maintain healthy living (Narzary *et al.*, 2013). Edible insects provide nutritional security and cure various body ailments (Sangma *et al.*, 2016). Different nutrients are present in wild edible fruits such as vitamin C, sugar, fiber, minerals and water (Borgohain, 2017).

The mode of food production, distribution, consumption and re-use of by-products of foods by

indigenous peoples describes indigenous food culture, which emphasizes food as an ethnic marker, construction of identities and cultures (Demi, 2016). The Boro Kachari tribe's meal pattern is three meals a day i.e. breakfast, lunch and dinner. Their staple food is rice and is usually savoured by a non-vegetarian dish. The Boro Kachari tribe consume a total of more than 82 leafy green vegetables, vegetables and root & tubers round the year and 11 species of edible insects or their products (Gogoi, 2019).

Associated with their customs and ethos, diverse ethnic groups of Kokrajhar district have their own traditional food habits. 12 fermented foods and 3 fermented beverages have been documented to be consumed by different indigenous ethnic communities of Kokrajhar (Narzary *et al.*, 2016). The Rabha Hasongs, the Mishings and the Karbis prepare starter cultures from rice or other cereals like millets, maize and lesser-known ethnic fruits. Plant extracts and condiments are used which are known to enhance the quality traits of the fermented products (Sarma & Parasar, 2019). Assamese people consume wild herbs in their meals apart from using as medicine for some ailments. *Paederia foetida*, *Hydrocotyle sibthorpioides*, *Polygonum microcephalum* and *Houttuynia cordata* are consumed mostly by Assamese families of rural areas of Nagaon district of Assam. *Alternanthera sessilis* is consumed by 65 percent Assamese families (Borah & Borah, 2021). Bamboo forms an indispensable part of several traditional speciality dishes and its use as food in India is mainly restricted to Northeastern part of the country. Fresh or fermented bamboo shoot is one of the most preferred traditional food items by different ethnic communities (Nongdam & Tikendra, 2014). Value addition of these indigenous food materials can provide industrially important products of commercial importance (Sarma & Parasar, 2019).

However, there is no significant reports in existing literatures about the consumption behavior of indigenous food in urban areas. Thus, the current study aims to document the consumption behaviour of indigenous food and its health benefits among adult population in Guwahati region, Assam, India.

The present study has been planned with the following objectives: -

1. To assess the socio-demographic profile and nutritional status of adult population of Guwahati region.
2. To investigate their knowledge behaviour, attitude and practices and pattern of consumption of indigenous food.

Materials and methods

Study area

The present study was conducted from December to February, 2021 throughout the different places of Guwahati city, Kamrup (M), Assam, India.

Selection of sample

Sample population refers to the group or section of the population from which information is to be obtained. It is the subset of the population that is selected for a particular study, and the members of a sample are the subjects. In the present study, a group of 100 (n=100) adults in different areas of Guwahati city were randomly selected to obtain desired information. Local residents especially adult population residing in different areas in the city were interviewed for collection of information.

Sample size

100 adults in the age-group of 18-60 were selected randomly for the study.

Method used

Pre-structured questionnaires were prepared for the collection of data, which was based on socio-demographic profile, food frequency consumption pattern and knowledge behaviour, attitude and practices on consumption of indigenous food and health benefits and the information received is documented in the study.

Statistical analysis

All the data collected via different parameters were statistically analyzed and results obtained were tabulated. For categorical variables, data were expressed as frequency (percentages).

$$\text{Percentage} = \frac{\text{Number of responses obtained}}{\text{Total number of respondents}} \times 100$$

Results and Discussion

The survey gave a detailed picture of socio-demographic profile, food frequency consumption pattern and knowledge, attitude and practices on consumption of indigenous food and health benefits among local adult population in Guwahati.

Demographic data

The demographic data includes the age, gender, educational status, family type, occupation and physical activity. The data pertaining to the socio-demographic profile is presented in table 1. The results depict that 48% of the respondents belong to male gender and 52% belong to female gender. 33% of the respondents belong in the age group of 18-30, 25% in 31-40 age group, 20% in 41-50 age group and 22% in 51-60 age group. Maximum numbers of respondents were graduates (45%), 40% postgraduates, 13% were higher secondary pass and only 2% were matriculates.

Table 1. Demographic data of the respondents (n=100).

Parameters		Number	Percentage (%)
Gender	Male	48	48%
	Female	52	52%
Age	18-30	33	33%
	31-40	25	25%
	41-50	20	20%
	51-60	22	22%
Educational qualification	Matriculate	2	2%
	Higher secondary	13	13%
	Graduate	45	45%
	Postgraduate	40	40%
Family type	Nuclear	75	75%
	Joint	20	20%
	Extended	5	5%
Occupation	Student	56	56%
	Employee	22	22%
	Others	22	22%
Physical activity	Sedentary	34	34%
	Moderate	45	45%
	Heavy	21	21%

Most of the respondents belong to nuclear family (75%), 20% in joint family and only 5% in extended family. Maximum number of respondents were students (56%), 22% were employed and 22% were engaged in other occupation. 34% of the respondents lead a sedentary lifestyle, 45% were moderate workers and 21% were heavy workers. Occupation and the

family income is an important determinant of the families' food purchasing pattern (Baruah & Bhattacharyya, 2019).

Nutritional status

Assessing of nutritional status involves two methods i.e., direct (deals with individuals and measure the objective criteria) and indirect (use community health indices reflecting nutritional influences). The methods include anthropometric measurements, biochemical, clinical and dietary assessment. Anthropometric measurements are systematic measurements of the size, shape and composition of the human body.

In the present study, the height, weight and BMI of the respondents were calculated. The body mass index (BMI) was calculated using the formula: weight (kg)/height (m²) (Konwar *et al.*, 2019). Table 2 results depict that most of the respondents were normal (35%), 14% were underweight, 22% were overweight and 29% were obese. To assess the nutritional status of any given population, Body Mass Index (BMI) is an important indicator (Goswami and Mini, 2015).

Table 2. Anthropometric assessment of the respondents (n=100).

Parameters		Number	Percentage (%)
Height	140-150	33	33%
	151-160	31	31%
	161-170	30	30%
	171-180	6	6%
Weight	30-40	15	15%
	41-50	25	25%
	51-60	13	13%
	61-70	22	22%
	71-80	20	20%
BMI	81-90	5	5%
	Underweight	14	14%
	Normal	35	35%
	Overweight	22	22%
	Obese	29	29%

Knowledge behaviour of respondents

Food practices and health are complex cultural construction and the traditional knowledge of particular community includes health care, natural resource management and food security (Saikia, 2018). Nutrition knowledge is believed to be important in order to promote healthier eating habits (Kigaru *et al.*, 2015).

Table 3 results depict the knowledge of respondents on the health benefits provided by indigenous food. 7% respondents had knowledge that indigenous food promote growth and development, 6% on boosting immune system, 5% knew that indigenous food supply vitamins, 1% knew that consumption of indigenous food provided a balanced diet and 81% responded that indigenous food has all the health benefits. A healthy diet can be followed by referring to a variety of health messages, experiences and food choices. Beliefs about food and health are important to understand people and cultures and for providing culturally appropriate and effective health care and advice (Saikia, 2018).

Table 3. Knowledge regarding health benefits on indigenous food consumption.

Parameters	Number	Percentage (%)
Promote growth and development	7	7%
Boost immune system	6	6%
Supply vitamins	5	5%
Provide balance diet	1	1%
All of the above	81	81%

The factors that determine the consumption of indigenous foods is given in fig. 1. From fig. 1, it is reflected that 13.5% respondents' consumption was influenced by culture, 12.5% by ethnicity, 23.4% were influenced by their parents and background while maximum number of respondents i.e., 45.9% were influenced by availability of foods and 0.05% were influenced by other factors such as diet concern, low cost.

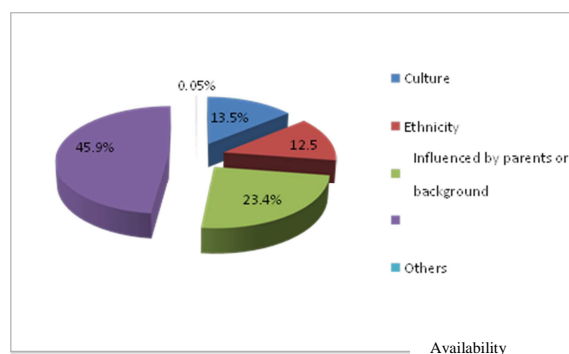


Fig. 1. Percentage distribution of factors associated with food consumption pattern by respondents.

Table 4 results depict the knowledge of respondents regarding prevention of disease by consuming indigenous food. It is evident from the above table 4

that 16% of the respondents used indigenous food to prevent jaundice, 17% to prevent obesity while 15% respondents believed that indigenous foods can prevent hypertension. Maximum number of respondents (32%) used indigenous food to prevent diabetes, which is very common, 15% used to prevent colon cancer and rest of the respondents (5%) believe all naturally found foods are helpful in diseases including CVD and migraine. For treatment of various diseases and disorders, such as cancers, heart disease, diabetes, liver ailments and other age-related diseases, green leafy vegetables provide nutrient and phytochemicals (Choudhury *et al.*, 2021).

Table 4. Knowledge regarding prevention of disease by consuming indigenous food.

Parameters	Number	Percentage (%)
Jaundice	16	16%
Obesity	17	17%
Hypertension	15	15%
Diabetes	32	32%
Colon cancer	15	15%
Others	5	5%

Attitude of respondents

There is need to have a positive attitude towards healthy eating rather than only nutrition knowledge alone which is not sufficient to change dietary habits (Kigaru *et al.*, 2015). From table 5, it is evident that adult population is more likely to intake indigenous foods in their daily life. 68% of the respondents think about eating more locally available foods, whereas 32% do not think of seating indigenous foods in next six months. 91% of the respondents have attitude towards influencing people to consume indigenous foods instead of processed foods and only 9% respondents have poor attitude towards it. 63% of the respondents believe that indigenous food has many advantages as traditional medicine, 68% believe that adequate fiber intake can lose weight while 37% and 32% are ignorant towards traditional medicine and fiber intake respectively. 16% of the respondents have allergic reaction to any kind of local fruits or vegetables but 84% respondents do not suffer from any allergy. Although 93% of the respondents consume more fruits in summer while 7% consume same amount in all season including summer. The results also reported that 58% of the respondents are

more likely to consume indigenous food, 11% are not likely to consume indigenous food and 31% are very likely to consume indigenous food. Awareness of the importance of indigenous plants should be created among rural and urban people to provide guidance regarding cultivation and marketing of such foods (Choudhury *et al.*, 2021).

Table 5. Attitude based questions with responses (yes/no).

Parameters	Yes	No
Are you thinking about eating more serving of local fruits/vegetable starting sometime in the next six months	68	32
Do you feel that you can influence the people around you to eat indigenous foods	91	9
Do you believe that adequate fiber intake can lose weight	68	32
Do you feel indigenous food have many advantages as traditional medicine	63	37
Do you have any allergic reaction to any local foods	16	84
Do you think you eat more fruits in summer	93	7
How likely do you think you eat indigenous food instead of fast foods	Likely 58 Not likely 11 Very likely 31	58% 11% 31%

Practice of respondents

Eating habits such as form of consumption of indigenous food, preservation techniques, usage of parts of indigenous plants were used to assess dietary practices of the respondents. A food frequency questionnaire (FFQ) on consumption pattern of locally available indigenous fruits and vegetables was also used to assess dietary practices.

Table 6 results reported that 25% of the respondents consumed indigenous fruits in raw form, 15% consumed in cooked form while 36% of the respondents consumed in ripe form and only 24% consume with peel. People used to preserve indigenous food since traditional times. The study reported that 28% of the respondents used to preserve foods by using salt, 35% preserve by sun drying, 18% use vinegar to preserve food and 16% of the respondents use all the methods to preserve while 3% preserve food by other methods. The study revealed that people develop different kinds of products from locally available fruits and vegetables.

55% of the respondents developed jam & jelly, 40% developed pickle and only 5% developed wine by using different kinds of fruits and vegetables. There is a need to preserve and popularize wild edible fruits as overexploitation due to deforestation has resulted in decline of plant species (Borghain, 2017).

Fig. 2 depicts the parts of indigenous plants used for disease control by respondents. Indigenous plants are used to cure various diseases. The present study reported that respondents use different plants as traditional medicine. 20% of the respondents used fruits for disease control, 31% used leaves, 10% used flowers and 7% of the respondents used stem for controlling disease. In Assam and North-east India, the herbs grown have immense medicinal values. Medicinal plants are consumed for their inherent medicinal properties (Borah & Borah, 2021).

Table 6. Practice based questions with responses (yes/no).

Parameters	Number	Percentage (%)	
What form do you consume indigenous fruit	Raw form	25	25%
	Cooked form	15	15%
	Ripe form	36	36%
	With peel	24	24%
	Using salt	28	28%
How do you preserve fruits and vegetables	Sun drying	35	35%
	Using vinegar	18	18%
	All	16	16%
	Others	3	3%
What kind of products do you usually develop	Jam & jelly	55	55%
	Pickle	40	40%
	Wine	5	5%

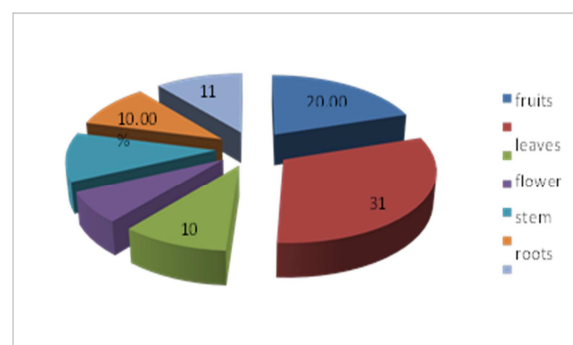


Fig. 2. Percentage distribution of indigenous plant parts used for disease control by respondents.

Locally available indigenous fruits and vegetables were selected and used in the food frequency questionnaire to assess the consumption pattern.

From the food frequency table 7, 20% of the respondents consumed amlokhi daily, 24% consumed per week, whereas 28% of the respondents consumed per month. 20% of the respondents consume silikha daily, 18% consumed per week and 19% consumed per month. 18% of the respondents consumed bananas daily, 17% consumed per week, 35% consumed per month and rest 30% consumed rarely. 2% of the respondents consumed sweet potatoes daily, 30% and 16% consumed per week and per month respectively. 8% of the respondents consumed Borthekera daily, 14% consumed per week, 28% consumed per month and 41% consumed rarely. 13% of the respondents consumed olive per week, 18% consumed per month and 63% consumed rarely. 1% respondents consumed wood apple daily, 10% consumed per week and some consumed per month, 70% consumed rarely. Being excellent sources of micronutrients with medicinal properties, wild fruits have an important role in providing nutrition (Borgohain, 2017). 51% of the respondents consumed coconut per month and 50% of the respondents consumed modhu-xuleng per month. Bor manimuni was consumed daily by 15% respondents and soru manimuni was consumed daily by 17% respondents.

Soru manimuni is used for treating various ailments such as flu, fever, cough, gastrointestinal disorders (Borah & Borah, 2021).

34% respondents consumed mosundori haak and 20% respondents consumed tenga mora per week. Kolmou haak was consumed rarely by most of the respondents (66%) and 20% never consumed. 35% of the respondents consumed bhedai lota per month. For food, nutritional and medicinal values, traditional leafy vegetables are used and consumed (Choudhury *et al.*, 2021). Sandah guri, a breakfast cereal, was consumed monthly by 27% respondents and rarely by 40% respondents. Silkworm was consumed by 40% respondents per month and 36% never consumed. Xukan maas was consumed monthly by 40% respondents and rarely by 31% respondents. 45% respondents consumed rice beer monthly and 30% consumed per week. Poita bhat consumption was seen in 41% respondents monthly and 20% per week. Fermentation is an easy technique which is used in developing countries for preservation of food along with enhancement of nutritional value (Narzary *et al.*, 2016).

Table 7. Food frequency consumption pattern of respondents.

Vernacular name (Assamese)/ English name	Scientific name	Daily (In season)		Per week		Per month		Rare		Never	
		N	%	N	%	N	%	N	%	N	%
Amlokhi/ Indian Gooseberry	<i>Phyllanthus emblica</i>	20	20%	24	24%	28	28%	25	25%	3	3%
Silikha/ Chebulic Myrobalan	<i>Terminalia chebula</i>	20	20%	18	18%	19	19%	33	33%	10	10%
Malbhog kol/ Banana	<i>Musa assamica</i>	18	18%	17	17%	35	35%	30	30%	0	0%
Mitha alu/ Sweet potato	<i>Ipomoea batatas</i>	2	2%	30	30%	16	16%	45	45%	7	7%
Borthekera/ Garcinia	<i>Garcinia pedunculata</i>	8	8%	14	14%	28	28%	41	41%	9	9%
Jolpai/ Indian olive	<i>Elaeocarpus serratus</i>	0	0%	13	13%	18	18%	63	63%	6	6%
Bel/ Wood apple	<i>Aegle marmelos</i>	1	1%	10	10%	10	10%	70	70%	9	9%
Madhuriam/ Guava	<i>Psidium guajava</i>	10	10%	25	25%	13	13%	42	42%	10	10%
Narikol/ Coconut	<i>Cocos nucifera</i>	11	11%	20	20%	51	51%	16	16%	2	2%
Modhu-xuleng	<i>Polygonum microcephalum</i>	4	4%	25	25%	50	50%	11	11%	10	10%
Bor-manimuni/Asiatic pennywort	<i>Centella asiatica</i>	15	15%	23	23%	24	24%	28	28%	10	10%
Soru-manimuni/Lawnmarsh penny-wort	<i>Hydrocotyle sibthorpioides</i>	17	17%	28	28%	25	25%	20	20%	10	10%
Mosundori/ Fish mint	<i>Houttuynia cordata Thumb</i>	7	7%	34	34%	32	32%	25	25%	2	2%
Tenga-mora/ Roselle	<i>Hibiscus sabdariffa</i>	5	5%	20	20%	15	15%	35	35%	25	25%
Kolmou/ Water spinach	<i>Ipomoea aquatica</i>	0	0%	4	4%	10	10%	66	66%	20	20%
Bhedai-lota/ Stink vine	<i>Paederia foetida</i>	9	9%	21	21%	35	35%	28	28%	7	7%
Sandah guri/ Roasted rice flour		5	5%	18	18%	27	27%	40	40%	10	10%
Polu-leta/ Silk-worm	<i>Bombyx mori</i>	4	4%	10	10%	40	40%	10	10%	36	36%
Xukan maas/ Fermented fish		5	5%	14	14%	40	40%	31	31%	10	10%
Apong/laupani/ Rice beer		2	2%	30	30%	45	45%	11	11%	12	12%
Poita bhat/ Fermented rice		14	14%	20	20%	41	41%	15	15%	10	10%

Conclusion

Indigenous foods are nutrient-rich and have a long history of supporting health and wellness. The present study aimed to assess the food consumption behaviour towards indigenous food among adult population. The economic statuses, education level of person are determinants of health and directly or indirectly influence the consumption pattern of an adult. Maximum numbers of respondents were found to have knowledge regarding indigenous foods. Indigenous food is used as traditional medicine and maximum respondents have used it to cure various ailments though few were ignorant about herbal medicine and its benefits. Traditional medicine has many advantages as they are easy to obtain and strengthen overall immune system. Most of the respondents preserved indigenous foods by using different preservation methods. Majority of the respondents developed jam, jelly and pickles, which is very healthy as they used only locally available fruits and vegetables. The study concludes that adult population had a good knowledge, positive attitude and healthy dietary practice towards indigenous food. Dietary habits are the broad spectrum emerging from daily food consumption pattern over a long period of time and are developed due to availability, accessibility and affordability and are affected by geographical, cultural, psychological and religious influences. Hence, managing a healthy lifestyle can be done by increasing indigenous food consumption pattern among people and maintaining a good relationship with health, culture and traditional food.

Acknowledgement

the authors acknowledge the financial assistance received through seed grant no: Adtu/DR/Seed/2021/15. This work is a part of PhD work of the first author.

Conflict of interest

The authors report no conflicts of interest. The authors are responsible for the content and writing of the paper.

Funding: Not applicable

Ethics approval: Not applicable

Consent to participate

All authors have read and approved the manuscript and that all are aware of its submission to this journal.

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