# CHAPTER 3

# Nutritional sufficiency of traditional meal patterns

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## 3.1 Introduction

### 3.1.1 Definition and importance

Traditional foods include an array of food preparations or raw food commodities, the use of which is deep-rooted in once personal traditional practices and habits. These foods are best described as foods that have been consumed for ages and are a blend of culture, traditions, and customs. Such foods are generally based on local staples with more manual and less minimal industrial processing. The local climatic, agricultural, and economic conditions determine the production and processing of staples into traditional food products that represent culture and lifestyle (Anonymous, 2008). The resulting traditional product depicts heritage and represents a specific region where it is

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transmitted by their ancestors. The European Food Information Resource Network project defines traditional foods as those with specific features that distinguish them clearly from other similar products of the same category in terms of use of traditional raw material/primary products/traditional composition/traditional production and/or processing methods. Traditional food products are distinguished for their composition, production, and processing methods resulting in culinary depiction. They have evolved through trial and error over many centuries of cultural, social, economic, and sensory experiences (Achaya, 1994).

India has a rich treasure of traditional foods woven intricately into the fabric of culture over generations. Indian traditional foods vary with a broad base of food groups covering cereals, pulses, fruits, vegetables, dairy, and meat as well as their products, the majority of which are influenced by culture, region, and season exhibiting diversities (Achaya, 1994). The functional properties of Indian traditional foods emerged from the oldest medicinal system Ayurveda (Sarkar et al., 2015) and were specific to each food. Functional foods are foods that have a potentially positive effect on health beyond basic nutrition to provide optimal health and reduce the risk of diseases. Traditional foods are not just foods that nurture physical health and offer preventive nutrition but also take care of mental health (Prakash, 2015).

### 3.1.2 Regional variations in Indian traditional meal pattern

Traditional food choices usually depend on regional preferences that are governed by staples. About 30% of Indians are vegetarian. Even though the proportion of nonvegetarians is increasing, the quantity consumed is meager and is insufficient to contribute to nutritional benefits.

The geographic division of India into North, South, East, and West indicates the variations in the staple foods and their preparation methods. Food patterns in north India were strongly influenced by Central Asian and Mughlai cuisines. In Kashmir, the main course is rice with a delicious semisolid side dish prepared with a green leafy vegetable. States such as Punjab, Haryana, and Uttar Pradesh consume unleavened flatbread (chapati) prepared with a variety of flours such as wheat, rice, refined wheat flour, and Bengal gram flour. Besides chapati, varieties of wheat-based unleavened bread that vary in the method of preparation are also popular.

Western India has its unique taste with varieties of desserts. Rajasthan and Gujarat cuisines, though lack in fresh vegetables, are favored with an immense variety of cooked split lentils and pickles/preserves. Maharashtra combines both north as well as south cuisine, that is, rice and wheat or millet. Mumbai cuisine is marked with a variety of fishes available along the coastal line. The delicacies include Bombay Prawn and Pomfret. Goa is influenced by Portuguese cooking style with sweet and sour Vindaloo, duck baffad, sorpotel, egg molie, etc.

The Eastern India with Bengali and Assamese styles of cooking has rice and fish as staple food. A special delicacy known as "Hilsa" is prepared by wrapping staple in the pumpkin leaf and cooking. Bamboo shoot is commonly consumed. Milk-based sweets include those prepared with agglutinated milk and sweetener.

Southern states of India use spices, fishes, and coconuts as most of them have access to coastal lines. Tamil Nadu uses tamarind to impart tangy taste to the dishes. Andhra Pradesh and Telangana use rice as a staple with generous use of chilies for pungency. Kerala delicacies include lamb stew and "*Appams*" (pancake prepared with fermented rice batter and coconut milk), Malabar fried prawns as well as sweetened coconut milk. Another common dish is "*Puttu*," which is a glutinous rice powder steamed like a pudding in a bamboo shoot (Michel & Kumar, 2013).

*However certain common aspects of Indian dietaries are the following:*

- Chicken and goat meat are popular all over India, depending on affordability. Beef is consumed only by Christians and Muslims and pork by Christians only. Meat is usually not eaten on all days of the week, but occasionally. Fish is popular in coastal areas consumed nearly 7 days a week.
- Fruits are usually consumed fresh. Traditionally, the processing of ripened fruits is rare.
- Desserts made from milk, sugar, rice, or split legumes, using clarified butter (*ghee*), nuts, and spices such as cardamom, nutmeg, and mace are common on special occasions.
- Clarified butter may be served with rice as a flavor enhancer and to augment palatability. Sesame, peanut, mustard, coconut, and other vegetable oils are generally used for cooking. Pickles and crispy wafers (*papad*) are often used as accompaniments.
- Water is served with meals. "Milky" coffee and tea with sugar are consumed as popular beverages.
- Spices used include coriander seeds, asafetida, cumin seeds, mustard seeds, fenugreek seeds, cinnamon, clove, ginger, pepper, chili, garlic, turmeric, saffron, and cardamom. Religion and religious festivals in all groups in India play a major role in food avoidances or inclusions.

## 3.2 Historical overview

4.2.1 Old consumption pattern
4.2.2 The changing Indian diet with the progression of age

### 3.2.1 Old consumption pattern

The traditional food of India has been widely appreciated for its fabulous use of herbs and spices. Indian cuisine is known for its large assortment of dishes. The cooking style varies from region to region and is largely divided into South Indian and North Indian cuisine.

The traditional meal pattern included breakfast, main meal, beverages, and light dinner. Indian bread—unleavened flats prepared with either wheat or sorghum, fermented rice-based traditional dishes, flattened rice, and puffed rice suitably seasoned or cooked constitute breakfast items. Rice or dry pan-roasted unleavened flatbread with boiled and seasoned split lentils, chicken, or fish was the main course of meals in most of the days. Vegetables included okra, a variety of gourds, eggplant, snake beans, various leaves, potato, and tapioca/cassava. Fruits included mangoes, tamarind, plantain, papaya, and those available seasonally (https://metrosouth.health.qld.gov.au/sites/default/files/content/heau-cultural-profile-indian.pdf). Indians loved fried snacks prepared with gram flour or split legumes employing various spices consumed with a hot beverage. More of peanuts, fewer cashews, and rarely other nuts in different forms are a delicacy. The beverages—water, coffee, tea, and juice—were part and parcel of Indian cuisine. However, deep-fried snacks were always restricted for special occasions such as festivals, thereby restricting the calorie intake.

Cultural differences existed between people belonging to different regions, religions and social groups, as well as between individuals within any culture. Takeaways were uncommon and also families eating out were rarely observed. Baked goods were rare so also a number of bakeries. The celebration of foods and religious food practices varied. For example, cakes and sweets were not eaten regularly. Practices varied according to region and occasion. Rice cooked with meat or vegetables and spices called Biryani is a popular festive food but was avoided during Hindu festivals. Meat and fish are also avoided on certain days of the week as part of religious observances. Religious traditions laid importance on fasting. In the Hindu tradition, people choose to fast for various purposes. Fasting or abstaining from food, itself has a significant place in Indian culture irrespective of religion.

### 3.2.2 The changing Indian diet with the progression of age

Major shifts in dietary patterns are occurring throughout the world from basic staples toward more diversified diets resulting in health consequences. Populations in those countries undergoing rapid transition are experiencing nutritional transition. The diverse nature of this transition may be the result of differences in sociodemographic factors and other consumer characteristics. Among other factors including urbanization and food industry marketing, the policies of trade liberalization over the past two decades have implications for health by virtue of being a factor in facilitating the "nutrition transition" that is associated with rising rates of obesity and chronic diseases such as diabetes, cardiovascular disease, and cancer (Kearney, 2010).

Over the past 50 years, India has changed remarkably with double the population (Roser, 2019) and so has its economy. This has impacted the food patterns of people. As a matter of course, diets vary and evolve over time. Factors such as

income, food prices, individual preferences and beliefs, and cultural traditions as well as geographical, environmental, social, and economic factors have all influenced changes in diet, both on an individual and on a national level. A very brief glance into some of the major changes in India's recent history can offer some insight into the factors affecting dietary changes in the past 50 years.

Not too long before the official start point for these figures, in 1961, India had faced one of the world's worst recorded food disasters, the Bengal Famine in 1943 (Alaeddini and Olia, 2004). Shortly after, by the end of World War II, poverty and hunger were in abundance and this resulted in various malnutrition-related epidemic disorders. Poverty drove people to walk long distances and eat a simple diet. The food imports therefore concentrated largely on cereal grains. This no doubt had a lasting impact on the eating habits of those affected. The upsurge of the Green revolution in the 1960s with a better package of practices in field crops resulted in enormous production of food grains thereby increased per capita availability of food grains adding to energy increment. A decade later in the 1970s, the "White Revolution" by the National Dairy Development Board made milk and other dairy products more easily and widely accessible. The usage of butter, cheese, and ghee enhanced the diet especially of the urban Indians, thus pushing up the averages for the national daily intake of dairy and animal products.

Many processed and convenience foods such as pickles and crispy wafers (*papad*) are now easily available as well as Western foods such as pizzas, burgers, and fries (Plummer, 2017). All such factors are playing their part in bumping up the national average of fat and sugar intake (Anonymous, 2017).

## 3.3 Geography and natural agricultural landscape of India

4.3.1. Cropping system and food grain production
4.3.2. Shift in food consumption patterns

### 3.3.1 Cropping system and food grain production

Indian soil types, rainfall, temperature, and climatic conditions determine the cropping pattern. Crop cultivation is decided by its suitability to agroclimatic conditions. In India, there are three distinct crop seasons namely *Kharif, Rabi*, and *Zaid*. This multiplies the availability of arable land and is the uniqueness of Indian agriculture. The *Kharif* season starts with Southwest Monsoon under which tropical crops are cultivated. The *Rabi* season starts with the onset of winter in October–November and ends in March–April. *Zaid* is a short duration summer cropping season beginning after harvesting of *Rabi* crops.

*Types of cropping systems in India*: There are two types of crop cultivation practices followed in India (Anwar, 2019).

- *Monocropping or Monoculture*: It involves the cultivation of the single crop on farm every year.
- *Multiple cropping*: It is the cultivation of two or more crops on farmland in one calendar year with scientific methods of management. It includes intercropping, mixed cropping, and sequence cropping.

The diversified agroclimatic zone is unfortunately not giving sufficient production in spite of intensive planning in Indian agricultural practices. Implementation of modern cropping patterns and cropping system can increase production and productivity. Farmers' inclination toward commercial crops can have better economic returns. The production of individual crops will noticeably increase, thereby attaining food and nutritional security.

In India, the agroecosystem is classified into different zones. Major crops cultivated in different zones include millets and oilseeds in Arid zone; rice, peanuts, and coconut with fish as major component in coastal zone; rice, wheat, cotton, and sugarcane in irrigated zone; rice, wheat, coarse cereals, oilseeds, and cotton in rainfed zone; rice, maize, wheat, fruits, and other horticulture crops in Hilly and mountainous region.

In India, the different zones of agroecosystem are classified as follows (Sinha, 2014).

- The Arid zone—Gujarat and Rajasthan grow millets and oilseeds;
- Coastal zone—Andhra Pradesh, Tamil Nadu, Orissa, Karnataka, Kerala, Goa, and Maharashtra grow rice, groundnuts, and coconut with fish as a major component;
- Irrigated zone—Bihar, Haryana, Punjab, Uttar Pradesh, West Bengal, Karnataka, Andhra Pradesh, Telangana, and Maharashtra grow rice, wheat, cotton, and sugarcane;
- Rainfed zone—Assam, Bihar, Madhya Pradesh, Maharashtra, Orissa, West Bengal, Karnataka, Andhra Pradesh, Gujarat, Rajasthan, Tamil Nadu, Uttar Pradesh, and Gujarat grow rice, wheat, coarse cereals, oilseeds, and cotton.
- The Hill and mountainous region—North-Eastern states, Assam and West Bengal, Uttarakhand, Uttar Pradesh, Himachal Pradesh, and Jammu and Kashmir grow rice, maize, wheat, fruits, and other horticulture crops.

The food grain production including cereal and pulses increased from 52.56 to 301.93 million tons from 1950–51 to 2016–17 (Table 3.1). Looking into the country's projected population by 2050; the additional requirement will be to the tune of 430 million mouths to feed. Crop production has to be increased to meet the growing needs at an annual average of 2%, which is close to the current growth trend.

Agricultural crop production has been increasing every year, and India is among the top producers of wheat, rice, pulses, sugarcane, and cotton. It ranks first in milk production because of operation flood, and it is also the second leading producer of fruits and vegetables. About 25% of the world's pulses production was contributed by India in 2013. Apart from these, it also added to the world's 22% of rice production

**Table 3.1** Production* of major agricultural crops in India (million tons) (Anonymous, 2017a).

| Crops | 1950–51 | 1960–61 | 1970–71 | 1980–81 | 1990–91 | 2000–01 | 2010–11 | 2011–12 | 2012–13 | 2013–14 | 2014–15 | 2015–16 | 2016–17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cereals | 44.15 | 73.4 | 104.09 | 125.92 | 171.09 | 197.78 | 247.98 | 263.95 | 261.04 | 270.05 | 259.04 | 257.79 | 278.98 |
| Pulses | 8.41 | 12.7 | 11.82 | 10.63 | 14.26 | 11.08 | 18.24 | 17.09 | 18.34 | 19.25 | 17.15 | 16.35 | 22.95 |
| Oilseeds | 5.16 | 6.98 | 9.63 | 9.37 | 18.61 | 18.44 | 32.48 | 29.8 | 30.94 | 32.75 | 27.51 | 25.25 | 32.1 |
| Cotton# | 3.04 | 5.6 | 4.76 | 7.01 | 9.84 | 9.52 | 33 | 35.2 | 34.22 | 35.9 | 34.8 | 30.01 | 33.09 |
| Jute and Mesta $ | 3.31 | 5.26 | 6.19 | 8.16 | 9.23 | 10.56 | 10.62 | 11.4 | 10.93 | 11.68 | 11.13 | 10.52 | 10.6 |
| Sugarcane | 57.05 | 110 | 126.37 | 154.25 | 241.05 | 295.96 | 342.38 | 361.04 | 341.2 | 352.14 | 362.33 | 348.45 | 306.7 |
| Tobacco | 0.26 | 0.31 | 0.36 | 0.48 | 0.56 | 0.34 | 0.8 | 0.75 | 0.66 | 0.74 | 0.84 | 0.8 | -- |

*Fourth advance estimates #—million bales of 170 kg each; $—million bales of 180 kg each.

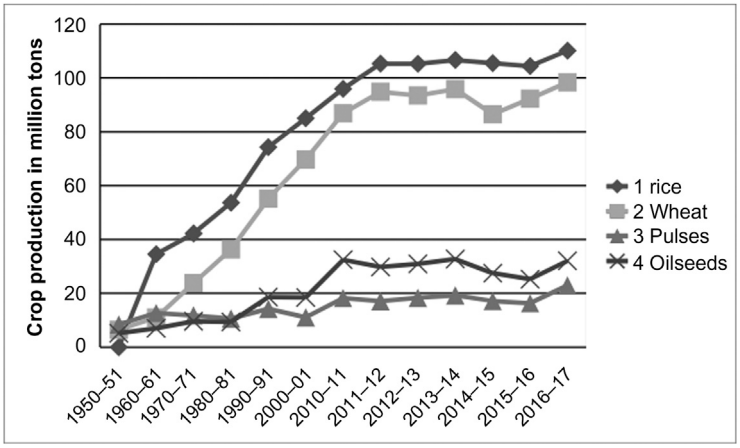


**Figure 3.1** Trends in agricultural crop production in India (million tons) (Anonymous, 2017a).

and 13% of wheat production. The green revolution in the 1960s and 2015–16 enhanced production of wheat and rice that accounted for 78% of the food grain production in the country (Fig. 3.1). However, productivity is less compared to China, Brazil, and the United States. The multiple cropping system and cropping in different seasons increase the economic returns for the sustainability of farmers.

### 3.3.2 Shift in food consumption patterns

Several changes have undergone over the past 50 years in the eating habits of the average Indian. The life expectancy has increased as indicated by statistics produced by FAOSTAT. The consumption pattern of countries across the world is analyzed over a period of the past five decades (1961–2011) by the Food and Agriculture Organization of the United Nations (Anonymous, 2019).

An average Indian consumed a total of 2010 kcal in 1961 (Fig. 3.2). The diet covered 378 g of grains (43%), 199 g of vegetables, fruits, and starchy roots (23%), 108 g of dairy and eggs (12%), 108 g of sugar and fat (12%), 17 g of meat (2%), and 68 g as other foods (8%). With the progression of decades, the average Indian consumption of energy increased to 2458 kcal. The diet consisted of 416 g of grains (32%), 450 g of vegetables, fruits, starchy roots (34%), 235 g of eggs and dairy (18%), 129 g of sugar and fat (10%), 29 g of meat (2%), and 58 g as other foodstuffs (4%).

The per capita consumption of protein in the past 25 years has increased from 55 g per person to 59 g per person (from 1990 to 2015) with increasing protein from an animal source (9 g/day to 12 g/day). The contribution of dietary energy from cereals and roots has decreased from 66 g per day to 59 g per day. The average Indian is consuming more calories than it was observed 50 years ago. The intake of eggs, dairy, and plant produce has increased more than twice during this period. Although the Indian

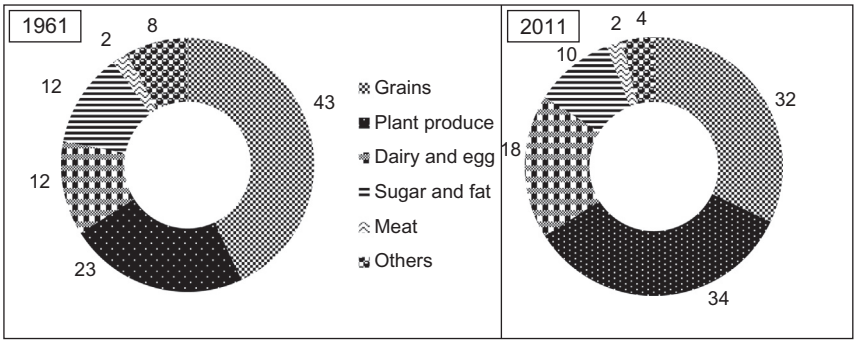


**Figure 3.2** Average daily food consumption of Indians in 1961 and 2011 (Anonymous, 2017b).

diet is vegetarian-based, the consumption of meat and animal-based products has increased. The consumption of grains has decreased. The per capita consumption of sugar and fat has increased. Still, India remains one of the countries with most vegetarian people in the world. The nation's life expectancy was only 42 years in 1960 compared to 68 years in 2015 indicating improvement in the quality of diets over the years (Roser, 2019).

About 8.7% of the world's diabetics (or 69.2 million people) live in India as reported by the World Health Organization (Anonymous, 2016). This implies that the quality of life has decreased with an increase in morbidity patterns and lifestyle disorders. Indian food is authentically proven to be healthy. It is rich in nutraceuticals, antioxidants, and bioactive compounds that Western countries aspire for. However, not all traditional Indian foods are the healthy and judicious selection is necessary. With an innovative marketing database, Indian consumers are updated with the latest research information about food when compared to 50 years ago with more choices. However, more choice does not imply better choice (Plummer, 2017).

In most of the communities, food is bound to cultural and religious practices. To build once own cultural competence, understanding the food and food practices of different cultures is a must. Nomadic people migrate quite often, which impose to change their food habits. The reductions in physical activity add to impaired health in the future. The common health problems, morbidity pattern, and nutrition-related chronic diseases such as type 2 diabetes and heart disease are showing an increasing trend (Guha, 2006).

The economic growth of India has envisaged an enormous increase during the past decades. India's average per capita calorie consumption has increased (Fig. 3.3), but protein intake has been fluctuating between 53 and 58 g (Fig. 3.4) with modest changes. However, the per capita fat consumption has registered a higher growth varying from 39 to 49 g. The diversifying diets with more fruit/vegetable and animal-based food share the increased calorie and protein source in the Indian diet with the decline of cereal and pulse consumption (Thakur, 2017).

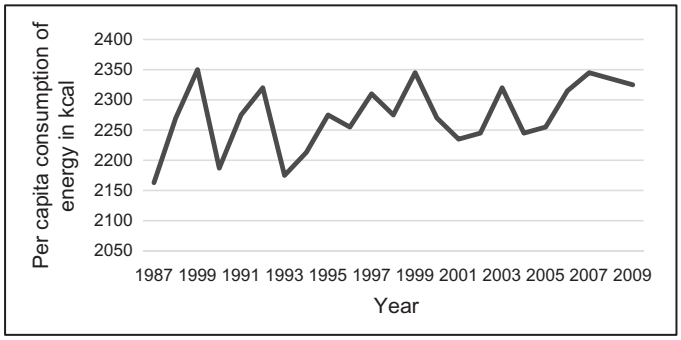


**Figure 3.3** Trends in per capita consumption of energy (kcal) in Indians (Anonymous, 2017).

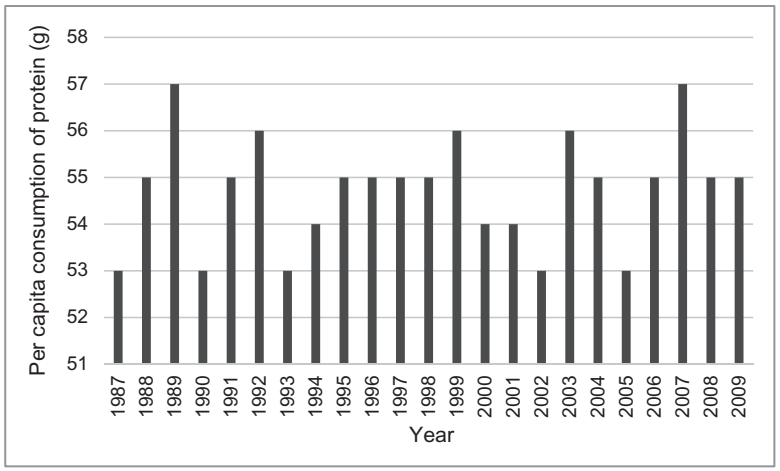


**Figure 3.4** Trends in per capita consumption of protein (g) in Indians (Anonymous, 2017).

## 3.4 Cultural depiction of food consumption

With a rich heritage, Indian dining etiquette has the foundation of traditions handed from generation to generation without proper documentation. Behind every tradition are centuries of invasions, conquests, religious beliefs, political changes, and social customs. People from the Indus valley cooked wild grains with herbs and plants, most of them are staples today. The Mughals saw food as an art and introduced the fragrance of rose water, the texture of yogurt and clarified butter, and the use of spices. Further, Mughals showed that eating is meant to be pleasurable (David, 2009).

Indian food is different from the rest of the world not only in taste but also in cooking methods. It is a perfect blend of various cultures and ages. Just like Indian culture, food in India has also been influenced by various civilizations, which have contributed their share in its overall development and the present form. Foods of India are

better known for their spiciness. Throughout India, be it North or South, spices are used generously in cooking. Every single spice used in Indian dishes carries one or the other nutritional as well as nutraceutical properties.

Ayurveda endorses the habit of eating food with hands. It is a sensory experience and eating with hands evokes emotion and passion. Vedic knowledge denotes hands as the most precious organ. The thumb indicates space, the forefinger—air, the middle finger—fire, the ring finger—water, and the little finger—earth. Eating with fingers stimulates these five elements and helps in bringing forth digestive juices in the stomach. The nerve endings on the fingertips are known to stimulate digestion. Feeling the food becomes a way of signaling the stomach that the food is reaching the stomach. Besides India, eating with hands is a common practice in some parts of Africa and the Middle East.

An authentic Southern meal is mostly served on a plantain leaf, especially in Kerala. Eating food on a plantain leaf is considered healthy. Placing hot food on the leaves emanates several nutraceuticals that enrich the food. Plantain leaves contain large amounts of polyphenols: a natural antioxidant found in many plant-based foods. It also adds to the aroma of food and enhances the taste. Traditionally, water is sprinkled on the plantain leaves before use as an act of purification. The use of plantain leaves dates back to a time before metal became a mainstay. People found it more hygienic to use fresh leaves that were disposable instead of wooden utensils. They could easily carry dishes such as curries or chutneys. Moreover, sitting on the floor and eating was recommended, as the repeated bending of the spine was known to improve blood circulation.

The Bohri Muslim community follows a tradition of eating from one huge platter/plate. The meal begins by sitting around the platter and passing the salt. Every dish sits in the center of the plate and the members pull out their share.

The Royal Feast—"*Wazwan*" is royal cuisine and culture of Kashmir. In the Kashmiri language, "*waz*" means a highly skilled cook and "*wan*" refers to shop. Traditionally, it consists of 36 courses and each of them is unique. The complexity and variety of food are not to be matched elsewhere. The meal ends on a sweet note with "*Phirni*"—a dish of milk and rice cooked to a pudding consistency and flavored with nuts and dry fruits, along with "*Kahwa*"—a green tea flavored with spices.

## 3.5 Traditional foods and their composition

### 3.5.1 Food groups under Indian traditional meal pattern

Indian traditional foods are based on cereal, pulse, oilseeds, fruits, vegetables, herbs, spices, and dairy products. These foods serve energy-yielding, bodybuilding, and protective functions. Whole grain cereals and millets are the most important sources of macronutrients, viz. carbohydrate, protein, and fats. These are traditionally used for

preparing varieties of food products consumed during all meals of the day. Pulses and legumes have been an integral part of the traditional Indian food system. They serve as sources of protein besides energy and micronutrients (vitamins and minerals). Oilseeds apart from fat-soluble vitamins A, D, E, K, also provide protein, B-vitamins, and essential minerals. The products exclusively derived from cow or buffalo milk are essential traditional foods in India. Milk is an important source of nutrition for infants and children and is equally ubiquitously consumed by adults. It is used as such or as curds (Indian yogurt) and as an ingredient in a variety of beverages such as tea/coffee, sweet porridge, and many regional sweet preparations such as *Rasgolla*, *Sandesh*, and *Pedha* prepared with coagulated or condensed milk. Vegetables and fruits provide vitamins B, C, and K, β-carotene, and minerals such as calcium, phosphorus, potassium, iron, and zinc as well as fiber. Many fruits such as plantain, apple, pineapple, papaya, citrus fruits, and guava form part of traditional Indian food and are never subjected to cooking, thereby enhancing nutrient availability. Animal foods are rich in protein with essential amino acids that aid in bodybuilding and maintenance. In addition, many spices and their blends that enhance the aroma of food are used.

### 3.5.2 Traditional foods and their composition

Traditionally foods are consumed not only to meet physiological requirements but also as a means for pleasure and to provide emotional and social satisfaction wherein the family members sit together for sharing a meal. India is the country where multiple recipes form one meal (served on a plate called "*thali*"), and one course comprises several side dishes. The *thali* is a wholesome meal that is found in many regions such as Rajasthan, Gujarat, or down South, complete with light and delicious curries, local greens, cooked split legumes, rice, and Indian bread. Accompaniments such as homemade chutneys, pickles, and crisp wafers are a must. It defines the system of Indian meals prepared and eaten in most households across the country. The beauty of the *thali* is that while it is a significant part of our culture, it offers a scientific approach to nutrition. A view at any plate meal represents the food pyramid of today with carbohydrates from grains, fiber from fruits and vegetables, and nutrients from dairy products such as curds. It is a balanced diet where variety is at its best (Vasudeva, 2017).

Plate meal or "*thali*" with assorted delicious regional dishes is a common consumption pattern for lunch/dinner. One dish for a meal is rarely found in Indian cuisine in any part of the country. The *thali* signifies cultural significance besides being a complete meal in itself. Local delicacies are prepared and served traditionally across the geographical borders. Typical *thali* comprises a main dish (generally a staple cereal/millet), which basically is a source of major nutrients, while several side dishes including snacks, sweets, and dessert serve as the treasure of micronutrients and nutraceutical components, thus providing nutritional benefit to the consumer. Indian plate meals are seasonal and traditional local

delights that concentrate on the typical method of preparation, which generally is elaborate. Each Indian *thali* is unique in terms of ingredients used, method of preparation, combination of dishes served, and style of consumption (Sarkar, 2018).

West Bengal, Sikkim, Assam, Arunachal Pradesh, Meghalaya, Manipur, Nagaland, Mizoram, Tripura, and Orissa are the states of East India. The typical character of this region is that these are surrounded by beaches and mountains; thus seafoods constitute a major component. Rice is the major crop grown due to the heavy rainfall received. People are both vegetarians and nonvegetarians with a strong influence on Chinese and Mongolian cuisine. Several green leafy vegetables and fruits are included in their meals, thereby balancing the nutritional requirements. Method of preparation being simple, foods are generally boiled or steamed. Fish followed by pork finds a place in the East Indian *thali*. Sweet dishes are a part of every meal. Rice, vegetables, fruits, mustard seeds, and oil are common ingredients while cumin seeds, onion seeds, mustard seeds, fennel seeds, and fenugreek seeds are the most preferred spices. Chilies grown here are less pungent, and both green and red varieties are used. Sweet dishes are based on milk, coconut, and gram flour. *Momos* (steamed, meat-, or vegetable-filled wontons) and *Thukpa* (a clear soup) are popular dishes. Tomato pickle, fish curry, and puffed rice spicy snack are also commonly seen on menus. *Sandesh* (made of coagulated milk and sugar) and *Rasgolla* (coagulated milk dumplings in syrup), as well as creamy rice pudding—*Kheer* are common sweets and desserts.

The states included in the western region are Rajasthan, Gujarat, Maharashtra, and Goa. Rajasthan and Gujarat have hot, dry climates, while Goa and Maharashtra are coastal and partly arid. Coastal regions of Goa have a lush green coastline with abundant availability of fresh fish and seafood. Coconut is the major oil crop. Vindaloo—a fiery, spicy dish and Xacuti—a curry prepared with complex spicing including white poppy seeds, coconut, and red chilis are local dishes that testify the fact that it was a Portuguese colony until the 1960s. All states of Western India have a diverse style of food preparation and consumption. In Maharashtra, coastal areas cuisine includes fresh coconut-based hot and sour curries with fish and seafood. Part of Maharashtra uses a lot of dry coconuts. Goan food is rich, piquant, and strongly flavored by coconut, red chilies, and vinegar. Gujarati food being sweetish and vegetarian, Rajasthani food is hot and spicy with non-vegetarian dishes based on red meat. Gujarati *thali* (a large plate) consists of many different vegetable dishes, rice, unleavened flat Indian bread, sweets, and a fried crispy snack based on Bengal gram flour known as Farsan. In Gujarat and Rajasthan, corn, lentils, and gram flour, dry red chilies, fermented milk, yogurt, sugar, and nuts constitute staple ingredients; in Maharashtra, fish, rice, coconut, and peanuts; in Goa, fish, pork, and rice. Sunflower, canola, peanut oil, and ghee are commonly used cooking oils. Dry red chilies, sugar, sesame seeds, coconut, nuts, and vinegar are the common spices used.

South Indian states, namely, Andhra Pradesh, Tamil Nadu, Kerala, and Karnataka are bordered by the coastal belt. The rainfall is abundant and areas have a hot, humid

climate. The specialty of South Indian meals is the serving of meals on a plantain leaf. The states witness a huge supply of rice, fish, fresh fruits, and vegetables. The cuisine of Andhra Pradesh is known for its spiciness, while Tamil Nadu has largely vegetarian "*Chettinad*" cuisine. Malabari cooking is from Kerala, Regal Nizami food is from Hyderabad. Hyderabadi food is full of nuts, dried fruits, and exotic, expensive spices like saffron. Rice is combined with spicy red gram soup with vegetables (*Sambaar*) or hot sour soup (*Rasam*) or yogurt. The meal is accompanied with fryums—deep-fried crispy lentil pancakes. Either boiled rice or "*Idlis*" (steamed cakes made from rice batter), "*Dosas*" or "*Uttapams*" (pancakes made from a batter of rice and black gram flour), and dumplings of millets are used as the main part of a meal. Dhals (decorticated lentils) are also a part of most meals. Vegetable oils such as coconut, sunflower, or groundnut are cooking oils. The use of pure clarified butter on the table is a common practice thus augmenting energy intake. Curry leaves, mustard, coriander, cumin seeds, Asafetida, pepper and peppercorns, tamarind, chilies, and fenugreek seeds are frequently used spices.

North Indian region includes Jammu and Kashmir, Himachal Pradesh, Punjab, Uttaranchal, Uttar Pradesh, Haryana, Bihar, Jharkhand, Chattisgarh, and Madhya Pradesh. Temperature variations could be extreme in some areas with too hot summer and too cold winters. There is an abundance of fresh fruits and vegetables. Mughlai and Kashmiri's styles of cooking are popular and prevalent. North Indian curries are generally thick, moderately spicy and creamy gravies with generous use of nuts and other thickeners. Dairy products such as milk, cream, cottage cheese, ghee (clarified butter), and yogurt play an important role in the cooking of both savory and sweet dishes. Wheat-based products are generally preferred over rice-based items for the reason that the climate is suitable for production of wheat and not rice. Hence, North India is famous for "*tandoori roti*" and "*naans*" (bread made in a clay tandoor oven), stuffed "*paratha's*" (flaky Indian bread with different kinds of vegetarian and nonvegetarian fillings), and "*kulchas*" (bread made from the fermented dough). Rice is also made into elaborate *biryanis* and *pulaos* (pilafs). Vegetable oils such as sunflower and canola are common cooking oils. Mustard oil is rarely used and only in some states of the region. Ghee is normally reserved for cooking on special occasions. Coriander seeds, cumin, dry red chilies, turmeric, cardamom, cinnamon, cloves, and aniseed/fennel constitute important spices. "*Mutter Paneer*" (a curry made with cottage cheese and peas), "*Samosas*" (spicy deep-fried snack with different kinds of fillings), and "*chaat*" (hot-sweet-sour snack made with potato, chickpeas, and tangy chutneys) are common dishes.

### 3.5.3 Sufficiency of traditional foods in terms of nutrients

A wide variety of traditional food combinations exists across the northern, southern, eastern, and western states of India. A typical day starts with a beverage (tea/coffee or

milk), followed by a traditional breakfast, lunch, evening tea with snacks, and dinner. The traditional meal pattern is always associated with a variety of accompaniments and is nutritious. Depending on the single-serving size, the traditional food combinations yield 60–604 kcal of energy. The carbohydrate, protein, fat, calcium, and iron contents are in the range of 20.5–85.0 g, 1.4–21.6 g, 1.4–28.1 g, 2.4–235.9 mg, and 0.44–22.8 mg, respectively.

On average, traditional East Indian thali provides 1100 kcal of energy, 27 g protein, 25 g fat, 50 mg calcium, and 14 mg of iron. The Western Indian thali provides 1100 kcal, 34 g protein, 50 g fat, 110 calcium, and 10 mg of iron. The South Indian thali provides 1400 kcal of energy, 25 g protein, 55 g fat, 180 mg calcium, and 8 mg iron. On an average, North Indian thali provides 1345 kcal of energy, 45 g protein, 60 g fat, 280 mg calcium, and 25 mg iron Thus irrespective of region, Indian traditional thalis provide 1100–1400 kcal of energy, 25–45 g of protein 25–60 g of fat, 50–280 mg of calcium, and 8–25 mg of iron.

### 3.5.4 Benefits of traditional foods for health, social, and economic aspects

The food groups categorized under Indian traditional meal patterns exert a wide range of health benefits. Today, there is growing recognition that food plays more roles than just being a source of macro- and micronutrients. The Functional Food Centre (Anonymous, 1998) defines functional food as "natural or processed foods that contain known or unknown biologically active compounds"; these foods, in defined, effective and nontoxic amounts, provide a clinically proven and documented health benefit for the prevention, management, or treatment of chronic diseases. Apart from providing functional as well as nutraceutical benefits, traditional foods help to mitigate the hidden hunger of micronutrients.

A significant determinant of the health effects of whole grains is their nondigestible carbohydrate component. The nondigestible carbohydrates of food act as dietary fibers especially, β-glucan and resistant starch, are perhaps the most important functional components that modulate the glycemic index of food (Tappy et al., 1996). The functional components of cereals, viz. rice bran with γ-oryzanol and wheat bran with insoluble fiber helps in the management of lifestyle disorders. Pulses and legumes aid in combating protein-energy malnutrition. Pulses alone or in a combination of cereals reduce the glycemic index of food that is beneficial for diabetics. The isoflavones and dietary fiber present in pulses serve as functional components. Oilseed and their oil do contain functional components. Flaxseed is rich in ω-3 fatty acids, and rice bran oil contains γ-oryzanol as a functional component.

Probiotics are commonly consumed as a part of fermented food products such as yogurt, fermented milk, and curds and form functional components. Curd (Indian yogurt), a popular fermented product prepared from milk using lactic acid bacteria,

is rich in B complex vitamins, folic acid, and riboflavin and confers a wide range of health benefits due to the presence of probiotic bacteria (Sarkar et al., 2015). The so-called "healthy bacteria" have been classified as probiotics and are defined as live microbial food ingredients that are beneficial to health. Many fruits form part of traditional Indian food and are rich sources of flavonoids, minerals, vitamins, carotenoids, electrolytes, and other bioactive compounds that have an impact on human health. Among fruits and vegetables—carrot with dietary fiber, carotenoids, cruciferous vegetables with dithiolthiones, green leafy vegetables with β-carotene and lutein, tomato with lycopene, grapes with resveratrol, alliums with sulfur compounds, and a wide range of polyphenols and glucosinolates designate as functional foods. The components present in fruits and vegetables are essential for digestion, bone development, hematopoiesis, immunity development, etc. Among animal foods, fishes such as tuna, salmon, and mackerel are rich in ω-3 fatty acids and thus aid in reducing low-density lipoprotein levels, increase high-density cholesterol levels, and thereby reduce the problems of cardiovascular diseases.

Spices and herbs used in Indian traditional cuisine bring to food a large number of bioactives that render foods functional, besides improving the palatability. These include turmeric—curcuminoids, pepper—piperine, clove, and cinnamon—eugenol, ginger—gingerol and shogol, fenugreek—disogenin, 4-hydroxy isoleucine, and galactomannan, garlic—flavonoids, diallyl sulfate, alliin, ajoene, and allicin, and cinnamon—cinnamtannin B1. The sulfur compounds confer a wide array of therapeutic effects including antimicrobial, anticancer, antidiabetic, antiinflammatory, and antioxidant activities as well as the ability to improve cardiovascular health (Rivlin, 2006; Milner, 2010; Bayan et al., 2014). They also exert beneficial effects against nauseating discomforts, platelet aggregation and cardiovascular diseases, dyslipidemia, inflammation, oxidative stress, and hypertension (Singletary, 2010). In addition, reports indicate antimutagenic property in vivo (Nirmala et al., 2007) and in vitro (Panpatil et al., 2013). Spices are known to possess gastroprotectant, hepatoprotectant, and antidiabetic effects in addition to hypocholesterolemic activity (Singletary, 2010; Meghwal and Goswami, 2012) and reduced risk of cardiovascular diseases (Canene-Adams et al., 2005) and hypertension (Ranasinghe and Galappaththy, 2016). They are used as a general tonic or stimulant, food preservative, cosmetic agent, carminative, diuretic, blood purifier, antiphlegm, and remedy for cough, cold, sinusitis, pain, and intestinal and liver disorders (Krishnaswamy, 2006).

Apart from serving as functional foods, the traditional foods of India seem to be exerting nutraceutical effects. Nutraceuticals are natural phytochemicals that render foods functional. These include ω-3 fatty acids that are neuroprotective and anticardiac; curcumin in turmeric has anticancer, antioxidant, antidiabetic, and antiinflammatory activities and neuroprotective properties; resveratrol, a stilbenoid type of plant polyphenol found in a variety of berries, particularly in the skin and seed of grapes,

is known for antioxidant potential (Ungvari et al., 2009); quercetin is a naturally occurring polyphenol found in onions, apples, black and green tea, beans, grapes, berries, vegetables, and fruits and affords protection against certain types of cancer, inflammatory conditions, cardiovascular diseases, diabetes, and aging as well as aiding in bone formation (Boots et al., 2008; Brackman et al., 2010); piperine, an alkaloid found in black pepper, provides inhibitory potential against detoxification enzymes and inhibition of intestinal p-glycoproteins responsible for efflux of drugs (Patil et al., 2011); eugenol, a phenolic compound found in medicinal plants, exhibits antimutagenic, anticancer, antifungal, antiviral, antibacterial, antiparasitic, antiinflammatory (Raja et al., 2015), and antidiabetic effects (Srinivasan et al., 2014). The immense health benefits, nutraceutical contents, and bioactives in Indian traditional foods reduce the medical expenses of communicable as well as noncommunicable diseases, morbidity, and mortality rate that adds to the family income. The economic benefits reflect savings for a better future. Apart from this, reverting back to traditional meal patterns can create opportunities for entrepreneurship, eating outlets or eateries leading to the growth of the economy.

Traditional meal patterns served social functions too. These foods have always been the central part of our community, social, cultural, and religious life. It has been an expression of love, friendship, happiness at religious, social, and family get together.

## 3.6 Future for traditional foods

Indian traditional foods vary in processing methods, ingredients, and combinations. Traditionally, the ingredients used in Indian diets are manually processed including grinding, milling, and retained more natural ingredients. The increasing population, urbanization, industrialization, and women working outside homes have a created high demand for convenience foods and ready-to-eat foods. The foods ingredients are now being mechanically processed; they induce heat or alterations in nutrients with structural modification and thereby can reduce the nutrient bioavailability. For example, oils obtained from cold-pressed cakes have better fatty acid content compared to those obtained from hot press cakes. Modification of the structure of the nutrients during processing is another example. The structure of starch and protein get modified due to the generation of heat that affects the nutritional profile. Traditional foods are also now available in the market. However, they may not provide the same nutritional profile that was endorsed in ancient times. These market available traditional foods are prepared with ingredients that are not organic, unlike olden days. The organic agriculture has been modernized into inorganic cultivation, to get more yields with less land, the resources including land, water, and fertility are burdened with the application of heavy pesticides and insecticides. The residual effect of these chemicals is evidenced by

various research studies. Moreover, to attract consumers, food products are adulterated and promoted with changes in color, size, taste, etc. The Indian culture is more inclined toward a sit-down eating pattern with family or friends, different from the counterparts from the developed world who are likely to grab their foods on-the-go or adopted to sit around the table and eat. Particularly, in metropolitan cities among the younger generation, the sit-down eating pattern is slowly vanishing. Many processed and convenience foods such as pickles and crisp wafers that were prepared at home without additives are now easily available in markets loaded with food additives crossing the permissible limits. The popularization of junk foods such as pizzas, burgers, and fries that are entering into a go-grab pattern is gaining momentum over traditional patterns. All such factors are playing their part in accelerating fat and sugar consumption at the national level. This is reducing the health benefits and nutraceutical content of traditional foods. However, reverting back to traditional foods may not fetch the same nutritional benefits, as the processing of food ingredients in traditional methods causes drudgery on the part of processors. Hence, it is high time to revisit the originality of traditional foods, which are better than the novel foods with respect to health.

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