



Consumption Pattern and Health Implications of Convenience Foods: A Practical Review

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors designed the study. Author BD performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author NS managed the analyses of the study. Both authors read and approved the final manuscript.

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ABSTRACT

Background: The present study was aimed to review the consumption pattern and health implications of convenience foods in regular life. The term 'Convenience food' is being widely used in the catering industry due to rapid progress in food technology. Consumption of convenience foods is inexorable in modern scenarios due to rapid urbanization, changing lifestyle, rising purchasing power and adaptation to western culture.

Methods: A constructive review work was done from available data sources and available literatures.

Results: The Indian 'Ready-to-Eat (RTE)' market reached at Rs 2900 crore and Rs 3500 crore in 2015 and 2016 respectively. RTE foods are growing at 40% per year. According to the World Health Organization, the trend towards surplus convenience foods provides the food industry with various commercial opportunities and profitable outcome for the food manufacturers. However, these foods are regarded as one of the least healthy dietary options, contributing to the

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health and diet-related diseases comparable to the risks associated with smoking, alcohol and drugs.

Conclusion: Excessive consumption of convenience foods is one of the major factors for the higher incidence of obesity and other non-communicable diseases.

Keywords: Convenience foods; diseases; health; obesity; ready-to-eat; urbanization.

1. INTRODUCTION

The emerging markets and increased migration from rural to urban areas has driven a great change in the food industry, particularly in China and India. With traditional foods and cooking methods being abandoned, the dietary pattern of the people is becoming more westernized with major emphasis on processed and packaged convenience foods. China has already overtaken the U.S. as the world's largest packaged foods market by volume in 2015. India's convenience food market is expanding rapidly at a compounded annual growth rate of 20% per year. It is expected that by 2020, the convenience food market will reach a size of over \$30 billion [1].

India is the world's second-largest producer of food next to China and has the potential of overtaking China and being the biggest food industry. It has the capacity producing over 600 million tons of food products every year. Demand for frozen, ready to cook and ready to eat food is increasing gradually, especially in metropolitan cities of India. About one-third of India's food industry comprises of processed foods [2]. Even the excise duty had been reduced from 16 to 7%, leading to an increase in the purchase of convenient foods [3].

Innovative and newer products in functional ingredients, convenience, and organic foods and advancement in areas of packaging technology are expected to provide a future growth opportunity for convenience foods. The frozen segment holds the highest share followed by other ready-to-eat foods. The meat/poultry segment is projected for the largest value share during the forecast period. The market is segmented into supermarkets, convenience stores, departmental stores, speciality stores, and online purchases. Hypermarket and supermarket segment aimed to account for the highest value share of 37% in 2016 and is expected to gain significant market share by the end of 2023 [4].

Convenience foods are termed as all type of foods, which have been pre-prepared

commercially in the industry and require minimum preparation and cooking by the consumer [5]. Convenient foods are classified as Ready to Eat (RTE), Ready to Use (RTU) and Ready to Drink/Serve (RTS). Ready to Eat (RTE) foods can be directly consumed from the package without any kind of preparation. e.g. biscuits, bread, snacks etc. Ready to Use (RTU) foods need minimal preparations like cooking, frying before consumption of the product. e.g. masalas, freshly cut veggies and breakfast cereals. Ready to Drink/Serve (RTS) foods can be directly consumed from the container without any kind of preparation. e.g. fruit juices carbonated beverages [6].

Demand for the convenience food market in India is increasing day by day. Need for convenience, rise in the number of working people increased health consciousness and wellness, advancement in the convenience food market and food technology are the key elements that have influenced the attitude and mindset towards convenience food products resulting in significant growth of the ready-to-eat market [7]. Modifications in lifestyle, rising purchasing power and adaptation to western culture has made consumers more attracted towards convenience foods [8].

However, there are certain demerits of convenience foods, they are particularly high in calories, sugar, salt, saturated and trans-fats which have adverse effects on an individual's health. These foods are loaded with preservatives, unnatural colouring, added flavourings, unappetizing substances and lack micronutrients which are required for normal growth of the body. The Food and Drug Administration (FDA) has maintained a list of over 3,000 chemicals which can be added in preparation of convenient foods to stabilize, texturize, preserve, sweeten, thicken, add flavour and attractive colour to attract consumers. The shocking part is that some of these additives have never been tested for safety but still being used in the foods and belong to the FDA's "Generally Recognized as Safe" (GRAS) list.

The shift from traditional homemade foods to convenient foods in today's era has increased

the incidence of the global obesity and various health complications. It is the need of the hour to guide consumers towards safe ready-meals [9]. 'Eat healthily and live healthily' and 'Avoid Junk, Accept Health! No Junk, Know Health!' must be aimed for every person [10]. Consumption of ultra-processed foods negatively affects the nutritional quality of diets. Nevertheless, sales of these ultra-processed products are rising rapidly globally though the impact of ultra-processed food consumption on non-communicable diseases (NCD's) has turned out to be a global epidemic [11].

2. GROWTH AND DEVELOPMENT OF THE CONVENIENCE FOOD INDUSTRY

With the change in the food consumption pattern, there has been wide growth and development in convenience foods sector. Moubarac et al. [12] assessed the changes in household food expenditures between 1938 and 2011 in Canada. The share of ready-to-eat products among total foods rose from 28.7% to 61.7%. Many types of baked goods and candies, is the convenient products like cake mixes, and ready-to-heat products were rarely bought until the 1950s. But these convenient and readymade products became the leading products to be purchased in the supermarkets by 2010.

Assessment of time trends regarding the contribution of processed foods in the total purchase of foods in various households of Brazil for three decades. The findings showed that the consumption of minimally processed foods and processed culinary ingredients has been steadily replaced by the consumption of ultra-processed food products, both in lower and higher-income groups. Ultra-processed foods contributed to more than one-quarter of total energy in the diet. The shift has occurred from local fresh foods to processed and packaged RTE foods [13]. According to a survey conducted in China and Mexico in 2011-12, about 30% of all foods consumed were the processed foods in China whereas a larger proportion (58%) of processed and packaged foods were consumed in Mexico. The higher proportion of processed foods were being consumed in the urban cities of China and Mexico.

Marron-Ponce et al. [14] assessed the trends of purchases of ultra-processed foods in Mexican households from 1984 to 2016. Ultra-processed foods growth and sales have doubled in the last three decades. A decrease of unprocessed or

minimally processed foods (from 69.8 to 61.4%) and processed culinary ingredients (from 14 to 9%) was observed whereas an increase in processed foods (from 5.7 to 6.5%) and ultra-processed foods (from 10.5 to 23.1%) was observed. Contribution of highly processed foods in the total diet among ten countries participating in the European Prospective Investigation into Cancer and Nutrition (EPIC) by Highly processed foods were contributing about 35-43% in Spain and Italy whereas 60% in the Netherlands, Sweden, Norway and Denmark. Moderately processed foods claimed nearly 20-25% of total food intake in Italy, United Kingdom, Netherlands, Germany, Spain, Sweden, Norway and Denmark. Women were found to be consuming more non-processed foods than men, up to 5-7% higher. Beverage consumption included exclusively highly processed commercial beverages (alcoholic beverages, tea and coffee), excluding water. Higher consumption of beverages was observed in the case of men as compared to women [15].

Baker and Friel [16] described fluctuations in food systems driven by transnational food and beverage corporations (TFBCs), manufacturing and foodservice sectors in Asia from 2000 to 2013. Ultra-processed food sales increased rapidly in most middle-income countries. The carbonated soft drink was the most purchased product, especially Coca-Cola and PepsiCo. Supermarkets and convenience stores dominated as distribution channels for packaged food. Secondly, the food and beverage manufacturing sector had become the leading firms of economic globalization. e.g. Coca-Cola, Nestle and PepsiCo. Thirdly, the foodservice sector had expanded itself globally. e.g. McDonald's, KFC, Pizza Hut, Subway and Burger King.

Hwang and Choe [17] surveyed in South Korea to find the relation of socio-demographic factors with convenience foods. It was found that low-income groups purchased cheap convenient foods as a substitute for their meal. They found it cheaper than buying different ingredients and preparing. Higher-income groups purchased more ready-made foods and used it as a part of their diet. Younger people bought more convenient foods than older people. In low-income groups, young ones preferred cheapness, easiness, variety and taste over freshness, quality and nutrition of the food. Moubarac et al. [18] described the food consumption patterns in Canada based on types

of food processing using the NOVA classification. The findings showed that about 48% of calories consumed by Canadians came from ultra-processed foods. Consumption of these foods was more prevalent among children and adolescents.

The contribution of ultra-processed foods in the total diet of U.K. people was assessed by Rauber et al. [19]. About 30.1% of calories arise from unprocessed or minimally processed foods, 4.2% from culinary ingredients, 8.8% from processed foods, and 56.8% from ultra-processed foods. They found that more than half of the energy in the diet of U.K. people came from ultra-processed foods in the form of packaged bread and packaged pre-prepared meals. It was further observed that share of ultra-processed foods in the diet of U.K. people is similar to other countries, such as the United States where 58% of total energy comes from ultra-processed foods and Canada where 48% comes from these foods. However, some countries still prevail where the share of freshly prepared meals is more than ultra-processed foods in the diet such as France (35.9% of total energy) and Brazil (20.4% of total energy).

3. ATTRIBUTES AFFECTING THE CONSUMPTION OF CONVENIENCE FOOD

Wales [20] analyzed consumer's behaviour towards convenience foods. Along with easiness in preparation, time and effort saving, the major factors for the shift to convenient foods included external strains, stress and social responsibilities. The process of cooking at household level involves planning, purchasing, preparation, cooking, eating and disposal of waste. This prolonged time and effort consuming process led to a rise in the need for readymade meals to avoid the mess. Buckley et al. [21] also revealed that 'convenience' was the main reason to choose ready-to-eat meals. With less time to prepare meals from scratch, 83 % of the world's consumers feel that ready-to-eat (RTE) meals are useful when there is no time to prepare. Time, unpredictable events and lack of cooking ability come under the limitations which led to prefer convenience food provisioning practices [22].

Vijayabaskar and Sundaram [2] explored the market for Ready-to-Eat/Cook products in Southern India. They determined the influential forces behind the purchase of RTE products. The

major attraction factors for these products were found to be convenience, availability, less time to cook and availability at the doorstep. Convenience, taste and availability of these foods attracted the youth of India [23]. Bhatt and Bhatt [24] also showed that the factors for choosing packaged foods over natural foods including health, convenience, proximity, mood, price, brand, and sensory appeal. Moreover, three factors namely health, convenience and mood have a remarkable relationship with age, whereas the remaining four factors namely proximity, price, brand, and sensory appeal had an important relationship with a monthly income of the family.

Srinivasan and Shende [25] stated that about 81% of women used these foods due to the unavailability of food ingredients, while around 70% of women did not know the preparation of a recipe. It was found that even non-working women were not left far behind in selecting such products for their families. More than 80% of women avoided going to market for purchasing food ingredients. Convenience was the dominant factor influencing the attitudes of working women followed by additional factors such as sensory variables, mood, health issues, price influence and familiarity with the food products. Increased stress, time shortage and maintaining work-life balance were the chief reasons behind bend towards convenience foods. It was found that instead of preparing the meal from scratch, people preferred instant foods [26].

The demand for convenience foods is growing around the world irrespective of socio-income groups, especially for the Indian middle class. Kaur et al. [27] focused on the market of convenience foods and its relation with new Indian middle-class of Delhi. Convenience products like pre-cut vegetables, bottled and canned products, frozen meat and snacks, ready to cook or ready to serve foods were the most frequently purchased foods by the middle class. The factors like consistent quality, labour saving, long shelf life and replica of the mother's recipe have attracted the new middle class. It has been reported that Northern regions in India are dominating in the consumption of Ready to Cook (RTC) foods.

Horning et al. [28] investigated the reasons for the purchase of packaged and processed meals instead of preparing meals at home. The basic reason for purchasing pre-packaged and processed meals included lack of time (57%) and

family preferences (49%). Due to lower cooking self-efficacy and meal-planning ability of the parents, increased purchase of processed foods was reported. Raimundo [29] also reported that convenience foods helped in saving time and effort – both physical and mental effort at every stage of food provisioning, starting from planning of meals to preparing the meals from scratch and finally cleaning up. Changing eating habits in stressful lifestyles and changing attitudes towards the idea of traditional cooking has shifted Brazilian people's needs from raw foods to conventional foods. Easy availability and accessibility were found to be highly correlated to purchase convenience-processed foods followed by time pressure and cooking skills [30].

4. CONSUMPTION OF CONVENIENCE FOODS

The demand for convenience foods among the elderly generation of Korea was analyzed by Park et al. [31]. The rice cakes, bread, tuna cans, Korean side-dishes, beverages, meat, cup-noodles and seafood were the most frequently used ready meals by elderly people. Moreover, 96, 59 and 46.5% of the elderly had the experience to use Ready-to-Eat (RTE), Ready-to-Heat (RTH) and Ready-to-Cook (RTC) foods respectively. Haldiram was perceived as the best brand of RTE food products in terms of price and easy availability whereas Amul in terms of variety. Amul brand was regarded as the most nutritious and MTR brand as least nutritious [23].

Kowsalya and Sathyapriya [32] analysed the demand of people of Tamil Nadu for RTE food products. About 41% preferred consuming RTE foods for breakfast. The research portrayed that MTR brand was the most commonly used brand followed by ITC, Knorr, Krishna, Everest, Aachi, Bakers and Bambino brand respectively.

Kaur and Singh [33] conducted a study in Punjab to witness consumer behaviour on the purchase of processed cereal food products. The subjects were selected from three belts of Punjab-Ludhiana from Majha, Jalandhar from Doaba, Amritsar from Malwa based on convenience sampling. The findings showed that females aged 21-35 years consumed more instant cereal foods as compared to other age groups. Increased intake of processed cereal foods especially for breakfast was witnessed in the form of cornflakes, porridge than in lunch and dinner. The data revealed that people in Punjab will not shift to traditional foods in spite of the

increase in prices rather they will search for another retailer who will sell the RTC and RTE products at cheap rates.

Marketing Federation (Markfed) Punjab had achieved remarkable success in the food industry, especially ready to eat segment. Kumar et al. [34] outlined the feedback regarding consumer behaviour towards RTE products of Markfed. The results portrayed that Markfed had young, highly educated and salaried class consumers. Most of the male consumers used RTE products of Markfed only once in a month whereas female customers, who preferred these products daily. Customers preferred canned curries & vegetables of Markfed as their first choice followed by mixed fruit jam, honey, and pickles while tomato ketchup, Gulab sharbat and vinegar were preferred the least.

5. EFFECT OF CONVENIENCE FOODS ON THE HEALTH

Mhurchu et al. [35] outlined that apart from table salt, more than one-third of the total sodium consumption (37%) comes from the highly processed food categories: bacon, bread, milk, cheese, and sauces. Ali et al. [36] examined the consumption of ultra-processed foods in Malaysia. Ultra-processed foods exceeded WHO upper limits for sodium, added sugar and saturated fat. Moreover, they contained less fibre than recommended. These products were seen as more fatty, sugary, and salty foods than other foods. The increased consumption of processed foods had a significant impact on nutritional status.

According to Banerjee et al. [37], 72% working and 94% non-working women knew that intake of convenience food may lead to obesity and cancer-like diseases. Out of the total subjects, 68% working and 74% non-working women were aware of the nutritive value and weight of food products. It was also indicated that the nuclear family was one of the factors that made people more independent and compelled them to use more convenient products [38].

Poti et al. [39] revealed that Ready-to-Eat (68.1%) and Ready-to-Heat (15.2%) products supplied the majority of energy as they contained higher saturated fat, sugar, and sodium content than unprocessed foods. Singh et al. [40] revealed the association of obesity with increased intake of convenience foods. It stated that with changing dietary habits and the rise in

consumption of ready-made meals, the prevalence of obesity was also increasing. Excessive sugar and saturated fat in convenience foods lead to an increased risk of obesity [41]. Martins et al. [42] carried out a study to analyze the sodium content and labelling of processed and ultra-processed foods marketed in Brazil. Around 58% of products had high sodium (Na) content (>600 mg/100 g). Moreover, more than half of the products had at least one sodium-containing food additive. Ultra-processed food consumption was also found to be linked with the metabolic syndrome and dyslipidemia in Brazil [43].

Malhan et al. [44] reported the growing demand for fast foods among people in spite of the realization of its effects on health. The addition of additives and preservatives decrease the quality of food. Excess sodium in RTE foods could lead to cardiovascular and kidney diseases. Processing of food removes fibre and vitamins from the food. The presence of trans fat harms gastro system and may cause inflammation in the body. In Spain, it was observed that increased intake of ultra-processed foods increases the risk of overweight, obesity and hypertension [45]. According to Shetty et al. [46], more than 2/3rd of the students were found to consume less fibre and more saturated fat intake by consuming more processed foods. Half of the students agreed that increased ready foods consumption, skipping of diet and lack of physical activity led to obesity and poor health. The correlation between the levels of total cholesterol, triglycerides and HDL cholesterol with unhealthy eating habits was confirmed in a study by Banica et al. [47].

According to Huh et al. [48], frequent consumers of instant noodles, high-fat and processed meats, sweets and confectionery and carbonated beverages had higher plasma triglyceride levels, diastolic blood pressure, and fasting blood glucose levels than the infrequent consumers. The overall diet exceeded WHO upper limits for fat, saturated fat, free sugars and Na density, with less fibre than recommended. Ultra-processed foods were termed as unhealthy due to more amount of fat, sugar, salt and energy-dense than unprocessed/minimally processed foods. Due to low nutrition value, consumption of ultra-processed foods has been related to obesity and diet-related chronic diseases [49]. In France, a study revealed the link between consumption of ultra-processed foods with

increased risk of breast, prostate, and colorectal cancer [50].

Louzada et al. [51] estimated the nutritional quality of the overall diet. About 58.1% energy came from minimally processed foods, 10.9% from processed culinary ingredients, 10.6% from processed foods and 20.4% from ultra-processed foods. The study concluded that excessive saturated and trans fats in the diet was due to increased consumption of processed foods which increased the risk of obesity, dyslipidemia and CHD, and further leading to diabetes and metabolic syndrome.

Nardocci et al. [52] demonstrated that individuals with higher consumption of ultra-processed foods had 32% higher chances of being obese, especially abdominal obesity. Higher consumption of soft drinks/sweetened beverages was positively correlated with body fat whereas showed that higher consumption of ready-to-eat cereals was negatively correlated with body fat. Costa et al. [11] reported a positive correlation for the increase in waist circumference of those children consuming more ultra-processed food. The ill effect of ultra-processed foods on abdominal obesity at merely 8 years of age is a huge area of concern as it may be a risk factor for impaired glucose metabolism in later life. The study concluded that any substantial improvement of the quality of diet would be possible only if there is a lower consumption of ultra-processed products and much higher consumption of homemade meals.

6. CONCLUSION

Convenience foods industry is getting adapted to Indian types of requirements and is growing leaps and bounds in India. With the busy lifestyle of Indian people coping both home and work, the demand for convenient foods has risen steadily. Therefore, they need to be made aware of the nutritional facts of these foods and their effect on the health and nutritional status. Consumption of convenience foods has been regarded as the major factor behind the increased incidence of non-communicable diseases across the globe. It is recommended that on the part of producer/ manufacturers, these convenience foods must include healthy and good quality ingredients with minimum use of chemicals and preservatives so that a better nutritional status can be maintained.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by the personal efforts of the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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