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## A review on food safety in India with focus on food catering organizations in India

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### Abstract

Food safety and quality problems have become most frequent in India and other countries. Studies have indicated that with increasing awareness consumer today demand safe food. Food Safety and Standard Act is one law ensuring that all the food provided to consumer is safe. Food catering industries need to adhere to food safety standards to ensure safe food to consumers. The studies in past have indicated the presence of harmful chemicals and pathogens in the various food items especially street food. However, there is a striking paucity of reliable data in quality evaluation and food safety researches in catering organization are very few in India. More research needs to be done in catering organizations to get a clear picture about food safety in these organizations. With growing international trade, food safety has emerged as an important global issue in this new millennium. The solution they call for is high food quality and integrity, safety guarantees and transparency. Governments are imposing new legislation; retailers are making new demands on their supply chains. Food supply chains are reacting by implementing systems to improve their product quality in an attempt not only to guarantee the safety of the products, but also to raise the consumer community's awareness of their efforts. Such efforts are performed at the level of either an individual company or a complete supply chain network. Food safety (FS), therefore, is currently considered to be an important issue for all stakeholders in the area of food production as well as governments in setting new legislation regarding food safety. The World Health Organization (WHO) was also asked "to give greater emphasis on food safety... with the goal of developing suitable, integrated food safety systems for the reduction in health risk along the entire food chain, from primary producer to the consumer".

**Keywords:** Food safety, food hygiene, HACCP, FSSA and hazards

### Introduction

Quality control has become a cornerstone of food safety policy over the past decade in the food industry. Much of the focus has been on integral quality management systems. These systems include all steps in the food production chain, such as supply of raw materials, food manufacturing, packaging, transportation and logistics, research and development, maintenance of production equipment, and training and education of staff. Moreover, "Food quality is associated with a proactive policy and the creation of controls to maintain a safe food supply. The business community in the food supply chain regards the call for safety from their customers, consumers, government and other stakeholders as an important driving force for continuous innovation. These innovations have been focused on implementing systems to improve the product's quality, to guarantee its safety as well as to raise awareness of these innovations throughout their supply chain stakeholder".

One of the important tools used to ensure food safety against hazard infections is the HACCP system. HACCP was begun as a voluntary science-based system within the food industry and it helps provide greater transparency in the food supply chain. The application of HACCP systems is a means of assuring proper food handling, processing and retail sale to consumers. The use of HACCP systems in the fishery industry is now global.

Since it first emerged, the concept has increased in importance through its endorsement by Codex Alimentarius at the international level and by the EU and the US, two of the most important seafood importers. Currently, over forty countries have announced HACCP initiatives for the control of fish production, processing and distribution. Although quality control in general and HACCP in particular have been used in manufacturing industries for decades, they are clearly ineffective and almost totally incapable of detecting food safety

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defects that occur at a low incidence. Coming out with detailed proof of this is a research report that the global use and success of the HACCP system in the food processing industry has created a false expectation that it could be used successfully in all steps of the food supply chain. However, this is not necessarily true. There has been a lack of defining of critical control points (CCPs), which have the function of eliminating or controlling identified hazards. As a result, there is no effective use of HACCP in all steps of the supply chain. In order to ensure food safety in the supply chain, it is necessary to combine prerequisite programs along with HACCP, rather than only CCPs taken from an HACCP system.

In other words, in order to ensure food chain supply safety, a combination of HACCP implementation and other prerequisite programs is vital throughout the chain. The reasons for such an emphasis lie in the fact that the food industry is today not only responsible for ensuring the safety of food production through various measures aimed at safeguarding against its hazards (i.e., the hazards which have been considered in production and the measures put in place to ensure the safety of products), but it is also responsible for the development of further HACCP studies as a part of the food safety assurance system. Thus, the HACCP tool and prerequisite programs play an important role in supply chain FS from “farm to table,” especially in both raw and ready-to-eat food products. In addition, the implementation level of HACCP and other prerequisite programs is different from country to country according to each country’s own conditions. But to achieve FS objectives and promote international trade effectively and efficiently, the role of government and industry is crucial in terms of setting performance quality standards, regulatory issues, implementation of inspection and audit as well as risk assessment throughout the whole chain.

In developing countries like India, food safety remains a critical issue with the outbreaks of food borne illness resulting in substantial costs to individuals, the good industry and economy. Food borne illnesses are a widespread public health problem globally but developing countries bear the brunt of the problem due to the presence of a wide range of food-borne diseases. In India an estimated 4,00,000 children below five years age die each year due to diarrhea. Several millions more suffer from multiple episodes of diarrhea and still others fall ill on account of hepatitis A, enteric fever, etc. caused by poor hygiene and unsafe drinking water. However, in the context of widespread poverty and malnutrition in developing countries, programs directed towards the promotion of adequate access to food that satisfy calorie needs and minimize hunger and malnutrition have precedence over programs designed to ensure wholesomeness and quality of food. In short the emphasis so far has been more on food adequacy rather than on food quality.

Food safety programs have become increasingly necessary due to technological advances in food and agricultural sectors and also due to social changes introducing new food habits. In the past, food was consumed by those who produced it or by their immediate neighbors. Increased world production, urbanization, industrialization and migration have however introduced new food safety problems into our food supply.

In India too, ensuring food safety has been recognized as an important component in protecting the health of the people. Among the developing countries, India and Sri Lanka were the earliest to enact modern food laws. Based on the experiences of the west, a most comprehensive definition of

food adulteration has been given for PFA (Prevention of Food Adulteration) Act 1955 of India. Historically, the regulatory process of food laws was to discourage fraudulent practices of food adulteration which changed with the advent of globalization in July 1991 in India. This in turn brought changes in the domestic economy thereby leading to absorption of labour, increasing incomes and overall prosperity. The impact of higher incomes in turn had an impact on dietary patterns, which was evident by greater demand for processed food.

The domestic food processing industry in India which has been reeling under uncertainties for years is now facing fierce competition from the developed and some of the developing countries. This could be due to the wide variations in the usage of food additives and consequent technologies. With the government's economic policy and the influx of imported food items containing ingredients not permitted under the PFA Act in India, the regulatory authorities are flooded with requests to liberalize food laws and permit the use of a greater variety of food additives. In addition, traders are more readily going in for importing ready-to-eat foodstuffs containing various additives. Here again the Indian food laws may vary from the laws of the exporting country. However, being a signatory to the World Trade Organization (WTO), India cannot stop the entry of foreign products and thereafter has to incorporate the standards suggested by Codex Alimentarius Commission unless scientific basis is provided to do so. In order to ensure that the food sectors match up to the best global standards, the Government of India enacted an integrated food law called the Food Safety and Standards Act in August 2006 and in addition a Food Safety Authority is being established shortly. The FSSAI is country’s apex food regulator, has formulated a strategy comprising four annexures to take up the task of harmonizing India’s food standards with those laid by Codex Alimentarius Commission, established by the United Nations, WHO, and the FAO. Also the objective of FSSAI is to make food safety a nationwide movement, to lay down science based standards for food articles and to regulate their manufacture, storage, distribution, sale and import to ensure the availability of safe and wholesome food for human consumption.

### Methodology

The status of food safety in the new millennium was reviewed by assessing data published in journals, websites and published data from universities in the form of doctoral theses and dissertations at the post-graduate level. For this, literature for the years 1995-2013 was reviewed. The inclusion criteria for reviewing the literature on food safety was to address all issues that had a direct or indirect bearing on food safety issues such as food-borne diseases, pathogenic organisms, food contaminants and adulterants, Hazard Analysis and Critical Control Point (HACCP), risk assessment, hygiene and sanitation, food standards, knowledge, attitudes, beliefs and practices (KABP), street food, food additives and food safety education. The food can only be called healthy and nutritious when it is wholesome and is free from hazards. Food safety standards along with HACCP become important. In this review article an attempt is made to collect data on the status of food safety. The findings of the selected studies have been discussed under following topics:

- Food borne illnesses and their prevalence
- Hazards identified
- Food safety of catering establishments-adherence to food hygiene and safety practices.

### Food Borne Illnesses and Their Prevalence

Food borne diseases are an important cause of morbidity and mortality and are a growing global concern. The World Health Organization estimates that upto 30 percent of individuals in developed countries become ill from food or water each year. It is estimated that each year 1.8 million people die as a result of diarrheal diseases and most of these cases can be attributed to contaminated food or water. More than 200 known diseases can be transmitted through food. In India an estimated 4 lakh children below five years age die each year due to diarrhea. Several millions more suffer from multiple episodes of diarrhea and still others fall ill on account of hepatitis A, enteric fever, etc. caused by poor hygiene and unsafe drinking water. The actual number is expected to be greater since most of the cases of food borne illnesses are self-limiting, of short duration and few patients of those ill seek medical attention.

It must be kept in mind that food borne illnesses is a composite result of a mosaic of causes, including a roster of the composite organisms (bacteria, viruses) with vastly different capabilities and limitations. Bacteria species like *E. coli*, species of *Salmonella*, *Shigella*, *S. aureus*, *Staphylococcus* are commonly associated with food borne diseases. The recent studies during 1995-2013 showed that increased episodes of microbial attacks due to microorganism like *Salmonella*, *Campylobacter jejuni* or Norwalk virus. Consumption of rancid biscuits characterized by vomiting, abdominal pain and diarrhea among the affected children, consumption of rice and soup contaminated with lead and copper, consumption of mouldy sorghum and maize containing fumonisin mycotoxins characterized by abdomen, borborygmi and diarrhoea are some of the reported incidences. The most popular outbreak was the epidemic dropsy in Delhi in the year 1998, due to consumption of contaminated mustard oil characterized by pitting edema, skin erythema, limb tenderness, diarrhea and hepatomegaly with a few others developing open angle glaucoma and cardiac failure in about 14% of them.

At present, the reporting and surveillance of food-borne diseases in developing countries is grossly neglected. The exact extent of the problem of food-borne diseases in developing countries including India has not been fully understood. Although most of the studies showed the incidence of food-borne diseases, they either lacked data on the organisms involved or the food. The actual scenario of food-borne diseases can emerge only with proper emphasis on surveillance and with the establishment of a national food-borne disease surveillance system.

### Hazards Identified

Food hazards are biological (microbes like bacteria, fungi, yeast, etc.), chemical (like pesticides, allergens, etc.) or physical agents (paper, timber, tin, glass, metal, etc.) or physical condition of a food with potential to cause harm or an adverse health affect when the food is eaten.

Various research studies conducted across India reported incidences of microbial outbreaks across the country, pathogenic microorganisms like Coliform, *Staphylococcus*, *Salmonella* and *Vibro*, etc. were found in different foods. *Staphylococcus* spp., Coliform, *Salmonella* spp and *Vibro cholera* in seafood, meat eggs and fish, *E. coli*, *Enterobacter* spp in milk and milk products, fecal coliforms and *E. coli* in water and juice. *Bacillus cereus* in cooked food, *S. typhi* in vegetable salads, fruits and sprouts, *Bacillus* and *E. coli* in spices. Studies also showed some of the emerging pathogens

water borne pathogens in food products. They were *Listeria monocytogenes*, *Campylobacter jejuni*, *Salmonella*, *E. coli*, *Vibrio cholera*. Studies also indicated use of non-permitted artificial colors and flavours in various food products. Also, foods like milk, oil, red chilli powder, turmeric were also found adulterated. Very limited data is available on the microbial contamination in catering organization and were limited to hostels, college cafeterias and street foods. But few studies also indicated improper food hygiene in the organizations under the study. Microbial testing of food served in college cafeterias indicated high microbial load in the food served there. The similar study done in hostels indicated high bacterial count in foods, swab samples of hands of employees and cooking surfaces also indicated microbial contamination. Also a research study indicated deviation from the standard operating procedures in hotels hence, food hygiene and safety implementation is best in the prime catering organizations while small scale caterers have shown a vast deviation.

Street food and is an important part of Indian food industry. Everyday million of people consume food from the street food vendors. Microbial examination of various food items served by street vendors in various parts of India indicated the presence of microbes in most of the food sold as well as use of non-permitted colors and sweeteners. *S. aureus*, *E. coli*, Enterococci were found in milk lollies, sweets deep fired savouries in Karnataka. In Tamil Nadu, fried fish, sugarcane juice, gulab jamun and atherosai (made from rice flour and sugar) were detected with *vibrio* and *E. coli*. A study in Hyderabad showed that most of the street food vendors were selling snack preparations which contained non permitted synthetic colors or were using unhygienic practices, while other studies in same place showed high contamination with *E. coli* in pineapple juice indicating fecal contamination of water used and high yeast and mould counts in sugarcane juice. Also, high coliform count and spread plate count was found in other street foods of the city. Most of the street foods recipes are simple and required very few utensils. Hence, poor hygiene and inadequate sanitation is a bottleneck of street food vending. Inadequate water availability, location near garbage, exposure to atmosphere pollutants, poor personal hygiene of personnel involved, all precipitate to higher incidences of health problems.

### Food Safety of Catering Establishments-Adherence to Food Hygiene and Safety Practices

Food hygiene and food safety form an integral part of every catering industry and high standards are needed to protect the health of consumers. When a food service opens its doors, a responsibility to serve "safe food" is incurred. The professional operator also realizes that way to assure long term success, it is imperative to value the quality of the food and service being provided to the customers.

The constant quest for products and service quality is a major challenge for food service establishments. Food hygiene and food safety has become an issue of great interest to everybody in the food sector when the United States FSIS Pathogen reduction or popularly known as the HACCP rule was published in July, 1996. These combine the concepts of HACCP systems with FSIS requirements for written Standard Operating Procedures (SOPs). Thus HACCP and SOPs have thus become an important part of the food hygiene and safety systems in food catering units, especially the larger ones like hotels.

HACCP is defined by many authors. Some definitions refer directly to food safety, reflecting the predominant use to date of the HACCP approach in the food sector. Other definitions are more generic: a step-by-step approach to the identification and assessment of hazards and risks associated with the manufacture, distribution, and use of products. For instance, HACCP is defined as a systematic approach to the identification, assessment and control of hazards. In 1998, the Bureau of Indian Standards laid down the Food Hygiene-HACCP-System and guidelines for its application as ISO 15000. HACCP studies were carried out to examine the international trade requirements of agricultural produce. Other studies were also carried out to identify, evaluate and control hazards at various food production stages. The findings of these studies reveal that the HACCP system is now being promoted as a basis for regulatory food control and as a standard for international trade. A microbial study revealed that a number of microorganisms were detected from the hand swabs of handlers for coliforms in the range of  $1.7 \times 10^4$  to  $2.2 \times 10^7$ . Another study showed that by the application of HACCP to selected recipes, the selected food was completely devoid of organisms like *Bacillus cereus* and *Staphylococcus aureus*.

In catering organizations a special emphasis is given on food safety and hygiene as a small incidence of food poisoning can lead to severe consequences. Catering organizations like hotels, restaurants showed more adherences to food hygiene and safety practices. While in case of street food and community caterings like langars, etc. no food hygiene and safety norms were adopted. Lack of food safety awareness among the workers resulted in high microbial loads. In a few studies, the Critical Control Points (CCPs) for deterioration of the quality of food was identified as coliform contamination from the hands of the food handlers and this was reduced drastically when the food handlers used soap to wash their hands. A number of studies were carried out to study the quality of water, hygiene and sanitation on institutional/industrial canteens, school canteens, and sanitary conditions in dhabas (in India, highways are dotted with local restaurants/eateries popularly known as dhaba, which generally serve local cuisine, and also serve as truck stops), effect of hand washing agents on bacterial contamination, microbial studies of hostel food services. The overall hygiene in selected industrial canteens was unsatisfactory while in most of the hotels and restaurants, washing facilities were inadequate. *E. coli* contamination was high (96.5% isolation) in food served in school canteens. None of the food handlers had any training in food hygiene and only in 35% of the canteens drinking water was either filtered or boiled. In dhabas, the total bacterial count was high in food, serving utensils, hands and nails of the food handlers and the cloth used to clean the dishes. Some of the microorganisms identified were *E. coli*, *Enterobacter*, *S. aureus*, *B. cereus*, but were within their permissible limits. In catering organizations, the food handlers are most of the time in contact with food. Hence, there is the need to educate food handlers on GMP/GHP and also that application of HACCP in the Indian context is possible and would yield the desired results of improving the safety of food.

Regular training and monitoring plays an important role in assuring food safety in a catering organization. It helps the employees to imbibe the basic hygiene practices in their day to day work. Studies carried on in one of the cities of India to assess food safety in institutional catering, industrial canteens, and hospital catering and selected commercial and non-

commercial food service institutions indicated that about 20% of the personnel who had undergone training in institutions showed good scores when evaluated for their awareness on food safety. This was evident from their post-cooking storage practices, food handlers' hygiene and garbage disposal. A similar study carried out in industrial canteens showed a majority of the food handlers to be in the habit of washing hands, wearing uniforms and aprons while cooking and there were no incidence of food-borne disease outbreaks, indicating that the food handlers who undergo training maintain good standards of hygiene. A study also indicated that improvisation of existing physical facilities, sanitation hygiene and work schedule of a private canteen, educating and training the personnel brought about a greater awareness among the personnel which in turn improved the canteen. Also, these studies revealed that most of the food handlers lacked training in food hygiene which was evident by the microbial count from their hand washings. Since food handlers in bigger eating establishments cater to a larger number of people, they are epidemiologically more important than domestic food handlers in spreading of food-borne diseases implementing food hygiene and safety standards at every stage of food production in all type of catering organizations is important. In India, FSSA was launched in 2006 to ensure that HACCP and other food safety standard are adopted by all food catering organization. Even a street food vendor has to be certified under FSSA to make sure that food hygiene and safety is maintained at every level. This act has been enforced in most of the parts of India but still there are few states where it is not enforced yet. The delay in the enforcement of act is leading to delay in adoption of food safety. This act is aiming to bring a bright future to the world food safety in India.

### Conclusion

The present review on food safety research in India indicates that there is a striking paucity of reliable data on important issues like HACCP, risk assessment and KABP. In India there have been hardly any studies to evaluate the food hygiene and safety implementation in the catering organization. Also, there is a serious threat of microbial contamination of food due to poor food hygiene and safety knowledge of food handlers. In India it is envisaged that in the future there would be a more serious focus on risk assessment, early warning/rapid alert situations as the exporters of agro products and processed food have been facing the stringent food safety standards in the developed country markets Indian government has had laid down a FSSA to tackle this problem and avoid confusion caused by multiple acts.

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