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Food safety issues of street foods and dietary practices by school going adolescents

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Abstract

Food are necessary for life, therefore food safety is a fundamental human right. Almost everyone in the world is at risk of unsafe food. Unsafe food causes millions of people to get sick while thousands die every year. Street foods is a source of inexpensive, convenient, appealing food for the adolescents and other consumers and these foods are most liked to eaten by adolescents. Nutritional or healthy diet contributes a most significance role in rapid physical growth and development in adolescents. However, because street foods are frequently connected with nutritional components associated with a poor diet and may provide a higher risk of contamination, they have become a severe food safety concern. Street foods can cause the emergence of foodborne diseases, due to the ease of contamination by microorganisms, and the development of chronic foodborne diseases. Nutrition and Food safety are closely related. Unsecured food generates a vicious cycle of illness and nutritional deficiency influencing adolescents and other consumers. Street food safety is extremely high dependent at the handling of raw food to the cooking of food till its consumption. The aim of this chapter is to determine the Dietary Practices by School going Adolescents and explain the various Food Safety issues related to Street Foods, know how food-borne diseases occur and perceive the significance of food safety management systems; and to increased awareness of food vendors about the role of national and international food standards to ensuring food safety.

Keywords: Street foods, adolescents, dietary practices, food safety, food standard

1. Introduction

Street foods are ready-to-eat foods and beverages made through food vendors or handlers and hawkers sold on streets and other public areas such as schools, railway stations, and bus stations ^[1]. Street foods serve an essential socioeconomic role in satisfying the food and nutritional needs of urban residents at affordable costs for lower and middle income groups, and they are valued for their unique flavours and convenience. While street vended foods are appreciated for their unique flavours and convenience, they also play a significant role in the population's nutritional status. Poor, uneducated street food vendors frequently lack knowledge of proper food handling, the environment, sanitation, and hygiene, food display, food service, and hand washing, raw material sources, and the use of potable water. As a result, street foods are seen as a huge public health threat. Microbial foodborne diseases are a serious health concern related with street foods ^[2]. Schools are sacrosanct because they create an atmosphere in which students can learn new skills and develop intellect that will help them achieve their life goals. It is also stated that "in order for children to learn properly, they must be in excellent health." School admission, as well as continuous engagement and achievement in school, are all influenced by one's health. Work capacity and cognitive skills will be impacted by poor health and diet. This group's requirements should be given special consideration ^[3]. Children's food preferences are influenced by a variety of factors, including ease of access, superior flavour, acceptable pricing, peer pressure, advertisements, and purchasing power. The physiological challenges connected with HFSS meals and obesity are well-known, but we often overlook the psychological consequences of poor eating habits ^[4].

India have wealthy inheritance of foods and recipes. famous north Indian street foods in which include aloo tikki, bhel puri, chaat, pakora, chole bhature, pav bhaji, dhokla, samosa and pani puri. Calorie and fat content are rich in Indian street food depending on the cooking method. Majority of Indian street foods or fast foods is prepared through deep frying into fats specifically saturated fats and Trans fat. Street foods or Junk foods oftentimes contain colors that is inedible, carcinogenic and noxious for the body. Food coloring can result into the lapses of concentration and hyperactivity into the children.

Consumption of diet higher into the saturated fat, sugar, calorie, and salt content in children diet may lead to impaired glucose tolerance, early development of hypertension, obesity, and dyslipidemia. The major concerns with street food consumption into the developed countries as well include poor hygiene practices during food preparation, handling and storage leading to microbial food contamination^[5]. Foodborne as well as waterborne diarrheal diseases killed approximately 2 million people every year, mostly children in developing countries, though serious foodborne disease outbreaks have occurred on every continent in the last decade, partly due to insufficient food safety legislation, poor regulatory systems, and a poor education for food handlers and consumers^[6]. *Salmonella* spp., *Bacillus cereus*, *Clostridium perfringens*, *Staphylococcus aureus* are frequent foodborne bacterial infections found in street vended meals. Foodborne diseases such as diarrhoea, cholera, typhoid fever, and food poisoning have been observed in people who eat street food^[7].

Food safety has become the most sought-after intervention in the realm of nutrition around the world. Though the quality and quantity of food consumed in developing countries has improved significantly, and the nutritional status of children under age of the five years and adolescent's age has improved significantly, there are still challenges to nutrition improvement, and food safety measures are an extremely important area of concern. On a global scale, food safety issues are becoming increasingly prominent. Food has never been safer than it is now. The importance of consumer's awareness and interest in food safety in ensuring the health and safety of domestic populations cannot be overstated. Food safety regulations are also crucial in protecting the quality of goods entering international commerce. Small and micro scale food enterprises can simply implement HACCP. Food safety education for food handlers, on the other hand, has become the most important intervention in recent years all over the world. The Codex Committee on Food Control and Food Safety plays an essential role in improving food Control and food safety issues^[8]. Reviews are relevant to this book chapter. Samuel Imathiu (2017), reported that The World health Organization (WHO) defines street vended foods as foods and beverages prepared and / or sold by vendors in streets and other public places for immediate consumption or consumption at a later time without further processing or preparation, while the Ready-to-eat foods are defined by the Codex Alimentarius Commission as any food (including beverages) eaten in its raw state or any food prepared, processed, blended, cooked, and otherwise produced into a form that is ordinarily taken without additional processing.^[9] Sunita Mishra (2007) conducted a study on, the three components of risk analysis are food safety, risk management, and food control. In India, HACCP (Hazard Analysis Critical Control Point) certification has been made compulsory for seafood export oriented units^[10]. Sandra Hoffmann (2010), reported that, HACCP is a system for identifying, assessing, and controlling sites in a food manufacturing chain where foodborne risks are most likely to enter. HACCP is advertised as providing the freedom to

adopt more cost-effective technologies and adapt to changing situations because enterprises are free to choose how best to regulate those critical points. HACCP was quickly adopted by national governments and international organizations (Unnevehr and Jensen 1999). HACCP rules were included in the Codex Alimentarius Commission's (Codex) Recommended International Code of Practice in 1993. Throughout the 1990s, food safety agencies in the United States began to use HACCP as their primary regulatory method to controlling microbiological risks (U.S.D.A. 1996; U.S. FDA 1995, U.S. FDA 2001)^[11]. Roosmarijn Verstraeten (2014) stated that, In LMICs, children of all socioeconomic levels have experienced a dramatic increase in unhealthy body weight. Obesity prevalence estimates in several LMICs have reached levels comparable to those in high-income countries (HICs), owing to significant economic and sociological developments^[12]. Abantika Bhattacharya (2015), stated that, the school-aged group is included in the adolescent group. Malnutrition, communicable infections, nutritional abnormalities, and skin, eye, ENT, or dental problems are all common morbidities among schoolchildren. School health services have long been seen as an appropriate platform for detecting health problems in children at an early stage. Regular school health check-ups can reduce difficulties by detecting illnesses in children early. Malnutrition and poor health are among the leading factors of low school attendance, high absenteeism, early dropout, and poor classroom performance, according to research^[13]. Arista Lahiri (2019), reported that, with rising urbanisation, the problem of obesity, particularly in rural regions and among adolescents, has become a major healthcare challenge. The Behavioral aspect of adolescent health has gained relevance since the adoption of the "life-cycle approach." As the most modifiable elements, dietary and physical activity, measuring their influence on the development of obesity and overweight has become increasingly more important^[14]. P.T. Lamin-Boima (2017), a study to The majority of food handlers who had attended a training course had knowledge and a positive attitude toward food disease control and prevention measures, according to a study conducted in Italy to assess knowledge, attitudes, and behavior concerning food borne diseases and food safety issues among formal food handlers^[15]. Soumitra Kumar (2017), reported that, An poor nutrition (added sugar and processed grains), vitamin D insufficiency, cigarette use, and physical inactivity all played a role in the increased risk of CVDs among Indians, particularly in urban areas. In addition, the rising prevalence of type-2 diabetes mellitus has made Asian Indians more vulnerable to IHD^[16]. Yabsira Melaku (2017), conducted a study on, Ethiopian women start having children at a young age. Adolescent girls and young women account for 45 percent of all births in the country. In sections of Sub-Saharan Africa, particularly Ethiopia, the majority of pregnant women are malnourished. It has been discovered that most women enter pregnancy with iron deficiency anaemia and other micronutrient deficiencies, which can have negative consequences for her

health and that of the foetus, such as low birth weight, neural tube defects, and other complications (Bernal, Frongillo, Herrera, & Rivera, 2014; Delisle, 2005; UNICEF, 2013)^[17]. Singh M. & Mishra S. (2014), conducted a study on, When compared to a typical day without fast food, children consume significantly more total energy and have poorer dietary quality on a typical fast food day. Fast food has far more negative impacts, and most people are ignorant of them. It has the potential to cause a variety of harmful ailments. Fast food consumption is also linked to health issues such as obesity, indigestion, and high cholesterol. Fast food restaurants target children and teenagers with effective marketing methods, delicious meals, and appealing advertising^[18]. Singh M. & Mishra S. (2014), conducted a study on, Children's poor eating habits and lack of physical activity lay the scene for adult health issues. Furthermore, according to a report performed by the Centers for Disease Control and Prevention, 48 percent of girls and 26 percent of boys do not engage in frequent physical exercise^[19]. Sharaf S. Omar (2020), stated that, In light of the COVID-19 pandemic, food handlers' knowledge and attitudes toward cleanliness food procedures in many local food factories need to be assessed. To eliminate the hazard of contamination of food, food packaging, and other surfaces during processing, their knowledge of food hygiene concepts has to be refreshed^[20]. Sneha Kumari (2017), conducted a study on, The WHO argued for five critical principles of food safety: clean, separate raw and cooked food, prepare food thoroughly, maintain food at safe temperatures, use safe water, and use safe raw materials. These features serve as a practical guidance for all people involved in food handling, whether they are vendors, food dealers, or other food handlers at home. Zero hunger is one of the sustainable goals, thus food security is crucial. However, simply assuring food supply will not suffice. To fulfil its purpose, the food must be safe and sanitary. Globally, food-borne infections claim the lives of an estimated 2 million people each year, primarily in developing nations^[21].

Chapter content

Adolescents

Adolescents make up one-fifth of the world's population, with 84 percent of them living in developing countries. Adolescents are defined as adolescents aged 10 to 19 years old, according to the World Health Organization. Adolescence is the era of life between childhood and adulthood, during which teenagers experience growth spurts with fast increases in height and weight, as well as psychological and sexual maturity, as well as cognitive development (WHO) (NIN, 1998). Adolescence is a special time in life since it is a time of intense physical, psychological, and cognitive growth, which means that caloric and protein requirements rise. During puberty, adolescents' nutritional requirements, such as macronutrients like proteins and micronutrients like vitamins and minerals, are high to meet the demand for

increased nutritional needs, as they gain up to 50% of their adult weight and skeletal mass, as well as more than 20% of their adult height (Spear, 2002)^[22].

Adolescence is a period of rapid personal growth and development. The need for nutrients is at an all-time high. Diet in this day and age has ramifications for future health. Heart disease, cancer, osteoporosis, and diabetes are all linked to a high fat, cholesterol, and salt intake. Insufficient nutrition intake and inactivity can contribute to lifelong obesity. Because adolescent eating behaviors are determined by what, where, and with whom they eat, adults around them must keep a close eye on what, where, and with whom they eat. Soft beverages, sandwiches, potato chips, popcorn, and ready-to-eat (RTE) foods are popular among urban teens. These foods have high carbohydrate content but a poor nutritional density. Fruits and vegetables are essential for appropriate micronutrient intake. The tendency of dining out is one of the most noticeable developments in urban eating habits. The rising popularity of eating out can be attributed to a number of things. Smaller families, working women, dual-income households, more income, more fast-food restaurants, and more advertising are just a few of them. Increased food availability outside from home may have a negative impact on nutrient intake. When children dine outside, they tend to consume meals that are higher in fat and lower in fiber and calcium. Children are influenced to choose less healthy diets by advertisements that display drinks alongside fast food instead of milk or juice. Eating low-nutrient-density foods in moderation does not pose a severe threat to an adolescent's nutritional status if his or her basic food habits are healthy^[23]. Obesity and overweight are the leading causes of contagious diseases, which account for over two-thirds (63%) of adult fatalities worldwide. Similarly, underweight (thinness) affects 8.4 percent of girls and 12.4 percent of boys in children and adolescents. Micronutrient deficiency also contributes significantly to global health hazards. Iron deficiency is the most common micronutrient deficiency among adolescents worldwide^[24]. There have been 1.8 billion adolescents worldwide, with 90% living in low- and middle-income nations (LMICs). Because of the effectiveness of child survival initiatives in recent decades, the population of adolescents has risen dramatically, particularly in LMICs, giving this the biggest generation of younger people throughout history. Adolescence is a phase of fast physiological, sexual, neurological, and behavioral changes that prepares people for adult duties and responsibilities, such as transitioning to work and financial independence, and forming life partnerships. Because this is a phase of rapid growth, proper nutrition is essential for achieving full growth potential; failure to acquire optimal nutrition may result in delayed and stunted linear growth, as well as delayed organ remodeling^[25]. Fig. 1. Shows few of the interplays of nutrition and development during the life duration. Adolescent development are complex, with neurocognitive maturity, puberty and social role Epidemic interaction into the complex ways, each with vital results for nutrition^[26].

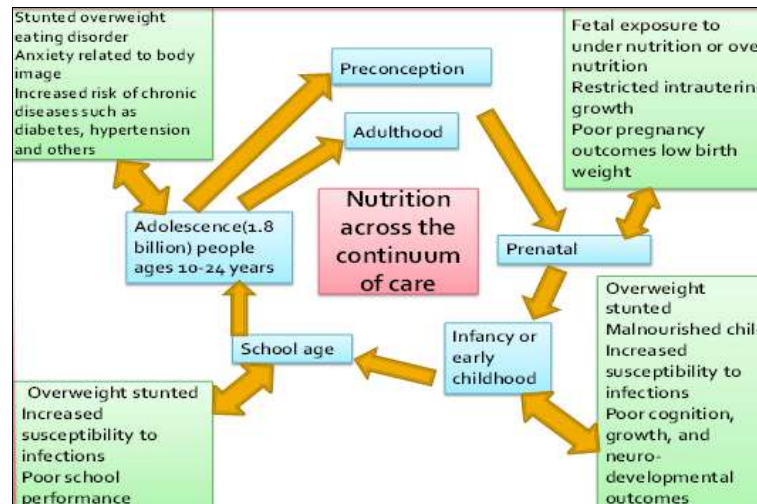


Fig 1: Nutrition and Related Risk Factors across the Continuum of Care

Dietary practices

Nutrient requirements of adolescent girls, in especially, are frequently overlooked (Basu *et al.*, 1986). Increased physical activity, in combination with bad eating habits, menstrual, and adolescent pregnancy, lead to the population's poor nutritional status. The frequency of anaemia among adolescent girls is 69 percent, according to the National Nutrition Monitoring Bureau (NNMB) Report (2003). Micronutrient deficiency problems in adolescence cause growth retardation, reduced resistance to disease, and impaired reproductive functions, all of which contribute to pregnancy-related fatalities or the delivery of low birth weight (LBW) newborns, perpetuating the malnutrition cycle. (Bhaskaram, 2001) [22]. Adolescence is also a time when people are more susceptible to fat. Obesity in the affluent population is caused by a lack of physical activity and outdoor activities, as well as the consumption of fat-rich "junk" foods. Snacking, mainly on energy-dense foods; meal skipping, particularly breakfast; frequent intake of fast food; and poor consumption of fruits and vegetables are just a few of the dietary habits that appear to be relatively common among adolescents [27]. Anemia is common among adolescent girls due to a lack of iron-rich meals, as well as worm infestation and recurrent illnesses. The growth spurt in early adolescence does not occur due to acute starvation and repeated illness, and adolescents from lower socioeconomic position have a slower and longer pubertal development period. As a result, any injury to the body physiology during adolescence, such as early pregnancy, which places additional nutritional demands on the body, is damaging because development is still to be achieved. Anaemia may be managed via suitable diet and iron supplementation. To inhibit anaemia, rise the consumption of Green Leafy Vegetables (GLV) and fruits. Promote

adolescents, especially them with risk factors in order to iron-deficiency anaemia, for follow the dietary strategies like [28].

Adolescent nutrition influencing factors

- Lack of knowledge about the importance of nutrition during adolescence in the family and community
- Lack of food due to socioeconomic circumstances
- Inequitable distribution of food in the family, with girls being denied nutritious food
- Poor dietary intake of iron-rich foods and vegetables
- Poor bioavailability of iron in the diet
- Hookworm infestation
- Diseases such as Malaria
- Cooking mistakes (over boiling vegetables and straining water, removing husk from wheat, eating polished rice and straining rice water, etc.)
- The continuation of a vicious cycle of starvation and illness, which can start even before birth and have more significant implications for girls.

During adolescence, eating healthy and nutritious foods

A balanced diet includes all nutrients (carbohydrates, proteins, fats, vitamins, and minerals) in the amounts and proportions needed to maintain health and well-being, as well as a little provision for extra nutrients to resist short periods of leanness. Carbohydrates, proteins, fats, vitamins, and minerals are a combination of four main food groups (Table 1) that can be used to attain this goal. These can be found in a variety of foods such as dals, chapati or rice, green vegetables, readily available fruits, and milk, therefore it's crucial to take them in the proper combination every day [28].

Table 1: Recommended Dietary Allowance of Nutrients for adolescents in 24 hours

	Male			Female		
	10-12 Yr.	13-15 Yr.	16-19 Yr.	10-12 Yr.	13-15 Yr.	16-19 Yr.
Energy (Kcal)	2200	2500	2700	2000	2100	2100
Protein (gms)	54	70	78	57	65	63
Calcium (mg)	600	600	500	600	600	500
Iron (mg)	34	41	50	19	28	30

Metabolism are directly concerned to total energy requirements and indirectly for growth and in which including of basal metabolic rate (BMR), energy cost of

growth (ECG), and activity energy expenditure (AEE). Figure 2. Describes the rapport between BMR, ECG, and AEE. Basal metabolism are the energy need for cellular and

tissue safety. This increases fast to two years of period and levels off complete adolescence 32. When ECG are a little component comparison with BMR and AEE. 33 Excesses total energy intake can cause to obesity and overweight, notwithstanding, supposing a lack of total energy intake

falls lower BMR, then ECG and AEE have been compromised and may lead for pubertal delay, growth stunting, interference with bone mass accumulation and menstruation abnormalities into the girls ^[25].

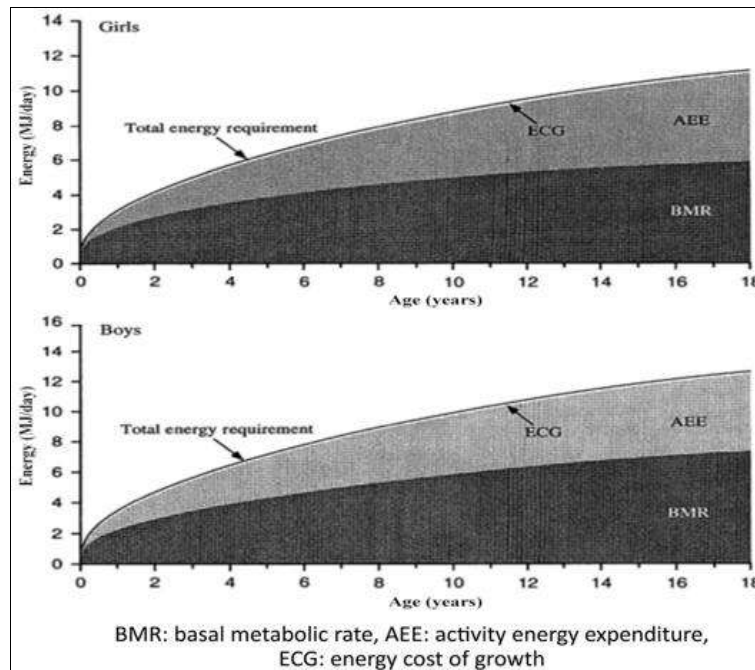


Fig 2: Energy requirements of girls and boys from birth to 18 years of age

The Schofield formulas, which are based on sex, age, and body weight, have been endorsed by the World Health Organization (WHO). 34, 35 for males 10-18 years of age, $BMR \text{ (megajoules (MJ) /day)} = (0.074 \times \text{body weight (kg)}) + 2.754$ and $BMR \text{ (kcal/day)} = (17.69 \times \text{body weight (kg)}) + 658$. For females 10- 18 years of age, $BMR \text{ (MJ/day)} = (0.056 \times \text{body weight (kg)}) + 2.898$ and $BMR \text{ (kcal/day)} = (13.38 \times \text{body weight (kg)}) + 693$. ^[25].

- Food is chosen mostly for its availability, convenience, and timeliness, rather than its nutritional content.
- Peers, mass media, and widespread body image influence eating behavior
- Personal self-esteem and body image govern eating behavior
- Missing meals and snacking are highly common
- Adolescents primarily visit fast food restaurants these are high in calories and low in nutrients, and they suppress appetite for regular meals.
- Assists in reaching rapid development and full growth potential
- Assists in appropriate sexual maturity
- Assists in achieving normal bone strength by ensuring adequate calcium deposition in the bones
- Promotes healthier eating habits and sets the tone for a lifestyle of healthy eating Obesity, osteoporosis (weak bones caused by a calcium deficit), and diabetes can all be avoided later in life ^[28].

Nutritional knowledge leads to the identification of nutritional facts as well as improved eating behaviors and practices. Furthermore, solid nutrition information, such as the facts panel, helps to speed up healthy nutritional practices ^[29]. Meanwhile, adolescences require a more comprehensive food safety education programme.

Adolescences play an important part in purchasing, storing, and even preparing food, and this responsibility will only grow in the future. Adolescents who have experienced puberty, on the other hand, have a greater sense of independence and a predisposition to form peer groups. As a result, individuals are more likely to eat fast food or a snack away from home than preparing a dinner at home. As a result, adolescents are more susceptible to food-borne illnesses. Knowledge has been found to be the most important predictor of healthy nutritional habits in adolescents in previous studies ^[30].

Food safety issues

Food safety have been the topic of research, and few have encouraged this for the level of a national safety issue. Street food are a weak connection in food safety supervision ^[31]. Food safety is a vital issue that affects each of the world's persons. Numerous countries everywhere the world are increasingly interdependent onto the obtained of theirs food supply and on this is safety. Therefore, people whole the world rising value food safety, food production have done safely for all over public health secures and environmental an advantages. Food safety agreements with protecting the food supply chain from the introduction, development or survival of Dangerous microbial and chemical agents. Unsecured food containing hazardous viruses, bacteria, parasites, or chemical substances due to greater than 200 diseases limits from diarrhea to cancers. Estimation 600 million whole world fall unhealthy after eating contaminating food and 420,000 death every year, consequence into the harm of 33 million disability adjust life years. Under and above five years age Children bear 40% of the food borne illness burden, with 125,000 dies each year. Diarrheal diseases is the most common diseases

consequence from the consumption of contaminating food, due to 550 million people for fall harm and 230,000 dies each year [32]. Hundreds of millions of people around the world are at risk of consuming contaminated food. Every year, millions of people become ill and hundreds of thousands die as a result of consuming tainted food. As a result, healthy diet saves lives. Individual and group health benefits from safe food. Food safety boosts economic growth in areas where it is practiced and improved. Sound science and fair law enforcement are required for a safe food supply. With technological advancements, new regulations must be adopted to ensure a continuous supply of safe and wholesome food products for people's health and welfare. Concerns about food safety and potential pollutants will continue to be a major health problem as the level of life rises. Because food is both an energy source and a nutrient, consumers expect high quality and safety from the products they buy. Food safety and nutritional safety is a

basic human right [33].

It is important to pay attention to nutritional safety and hygiene practices during food processing. Food Nutritional Safety is defined "it's a situation that is there when each people, at each time, keep physical, social, and economic access to adequate, secure, and nutritious food that obtains their dietary requirements and food preferences, and is supported by an environment of adequate sanitation, health services, and care, allowing to an active and healthful life". Nutritional Safety with the 3 determinants: Access to adequate food, care and feeding practices, Sanitation, and health [34]. Both major parts normally used in conceptual structure display has been shown in Fig: 3, important differences: (1) the food safety structure emphasizes an economic approach wherein food like a commodity is a central focus. (2) The nutrition safety structure takes a biological approach wherein centers on the nutritional status of the human being [35].

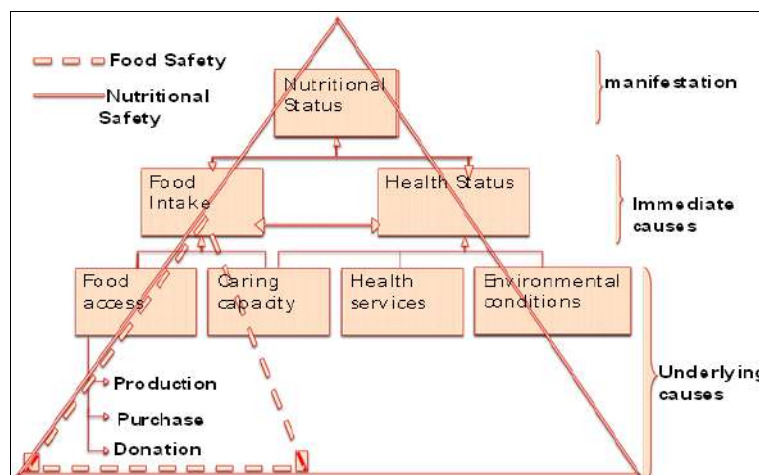


Fig 3: Conceptual structure of the food nutritional safety

The term food safety is used in a traditional form that encompasses the four traditional dimensions (Fig: 4) of food safety: food availability, food accessibility, food utilization, and stability [36]. Four elements (Fig: 5) construct the frame of food and nutrition safety: availability, access, use and utilization, and stability. Stability originally affects each other elements of the basis [37].

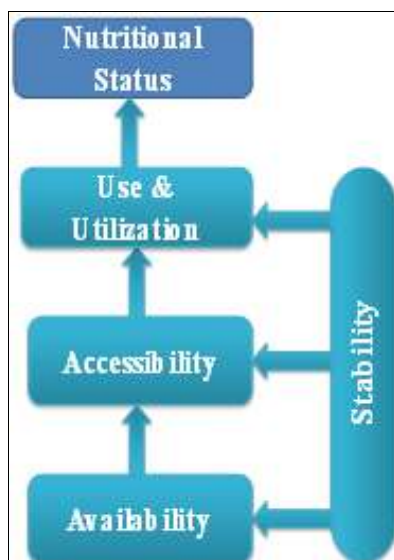


Fig 4: Dimensions of Food Nutritional Safety

Availability	Access	Stability	Utilization
<ul style="list-style-type: none"> • Domestic production • Import capacity • Food stocks • Food aid 	<ul style="list-style-type: none"> • Poverty/purchasing power • Transport and market infrastructure • Food distribution 	<ul style="list-style-type: none"> • Weather variability • Price fluctuations • Political factors • Economic factors 	<ul style="list-style-type: none"> • Food safety & quality • Clean water • Health & sanitation • Care and feeding

Fig 5: Four food safety dimensions with nutritional linkage

Food that is unsafe to eat creates a global health risk. Young children, the elderly, and the sick are especially vulnerable. If food supplies are insecure, people eat less healthful diets and consume more "unsafe foods," which include chemical, microbiological, and other hazards that can cause health problems, resulting in greater healthcare expenditures and a drain on national revenue. Food safety in the twenty-first century should go beyond improving nutritional profiles, transparency of ingredients, and regulations of unhealthy foods to include regular monitoring, surveillance, and enforcement of food products in the interest of public health and the prevention of foodborne illnesses, in light of

recurrent food contamination incidents. The Center for Science in the Public Interest, which has been tracking and documenting foodborne illness outbreaks since 1997, is a good source of up-to-date information [33]. According to a research conducted by the Food and Drug Administration (FDA), foods contaminated by food processing workers caused 81 foodborne illnesses. It's worth noting that food workers have the potential to have a significant impact on

public health. Personal hygiene habits of workers at food manufacturing sites are a crucial component in minimizing foodborne infections or food poisoning. It is common knowledge that maintaining good personal hygiene is the most effective strategy to reduce the chances of infection by most of the germs that cause foodborne illnesses. (Table 2) [38].

Table 2: Threats to food safety include pathogens, the foods they infect, and preventive measures

S. No.	Pathogen	Food Items	Prevention
1.	Shigella	Ready-to-eat meals (salads, sandwiches, etc.) contaminated by bare hand contact; flies and human waste as sources.	Practice proper hand washing after using the bathroom. Use only approved water and foods
2.	Salmonella	Raw meats, poultry & shell eggs, poultry and egg salads, egg custards and protein-containing foods, sauces, pets and infected food handlers	Avoid cross-contamination. Cool and refrigerate foods immediately. Cook meats / poultry thoroughly. Practice proper hand washing.
3.	S. aureus	Foods that are ready to eat, such as sandwiches, salads, ham and other meats, potato salads, custards, and warmed-up dishes, as well as the infected cuts, throat, nose, and acne of food handlers.	Practice proper hand washing and hygiene. Avoid cross-contamination. Avoid touching food with bare hands as much as possible. Employees with cuts or sores shouldn't handle the food. Cool foods rapidly.
4.	Campylobacter	Unpasteurized dairy, poultry and meats, infected food handler	Cook all foods thoroughly. Use only pasteurized dairy products. Wash hands properly.
5.	Noro virus	Raw fruit, raw shellfish, raw vegetables, and prepared salads.	Cook foods thoroughly. Wash hands. Use certified shellfish.
6.	Hepatitis A	Any food that won't be further heated up, such as water, ice, shellfish, salads, cold meats, sandwiches, fruits, fruit juices, milk, milk products, veggies, and so on.	Purchase shellfish from approved suppliers. Prevent cross-contamination through hands. Make sure those who handle food wash their hands properly and avoid touching food with bare hands.

Food safety

Food safety refers to the guarantee that the food will not affect the consumers. The definition of two other terms, toxicity and hazard, improves one's comprehension of food safety. Toxicity refers to a substance's ability to cause harm or injury under all circumstances [39].

Hazard: physical, chemical and biological agents that are duly probability to reason disease or injury into the lack of this control [40]. It's caused harmful influence onto the health of consumers [39].

Physical hazard: Any physical material not ordinarily found in food that causes illness or harm, such as wood, stones, insect parts, hair, and so on, is considered a physical hazard [39].

Chemical hazard: Chemical risks are chemicals or harmful compounds that may be added to foods, either purposefully or unintentionally. Pesticides, chemical residues, hazardous metals, polychlorinated biphenyls, preservatives, food colours, and other additives all fall within this category of dangers [39].

Intentionally Added Chemicals - Food Additives

1. Direct (allowable limits under GMPs)
2. Preservatives (e.g., nitrite and sulfiting agents)
3. Nutritional additives (e.g., niacin)
4. Color additives.

Unintentionally or Incidentally Added Chemicals

1. Agricultural chemicals (e.g., pesticides, fungicides, herbicides, fertilizers, antibiotics and growth hormones)
2. Prohibited substances (Code of Federal Regulations, Chapter 21, Section 189)
3. Toxic elements and compounds (e.g., lead, zinc, arsenic, mercury, cyanide)
4. Secondary direct and indirect - Plant chemicals (e.g., lubricants, cleaning compounds, sanitizers, paint) [40].

Biological hazard: Living microorganisms, including microbiological organisms, are considered biological risks. Food-borne pathogens are microorganisms that are associated with food and can cause sickness. Microbial pathogen infections and poisoning are two forms of food-borne illnesses [39].

When microorganisms are grow, microorganisms makes by-products.

- Yeast - beverages, bread, fruit
- Lactic acid bacteria - cheese, yogurt, meats
- Staphylococcus aureus - enterotoxin

Majority of spoiled foods not present a health hazard, and do not each food that appears common are safe for consume. Bacterial hazards is refers as these bacteria, if these occurs into the food, can cause disease into the humans, anyone through infection or intoxication. Food-borne diseases or infections is caused through swallowing live microorganisms that increase inside the body, ordinarily into the intestinal tract. These are differing to the food-borne intoxication, which are a conditions reason by swallowing preformed toxins (i.e., toxic substances produced through microorganisms into the food prior to its eaten.

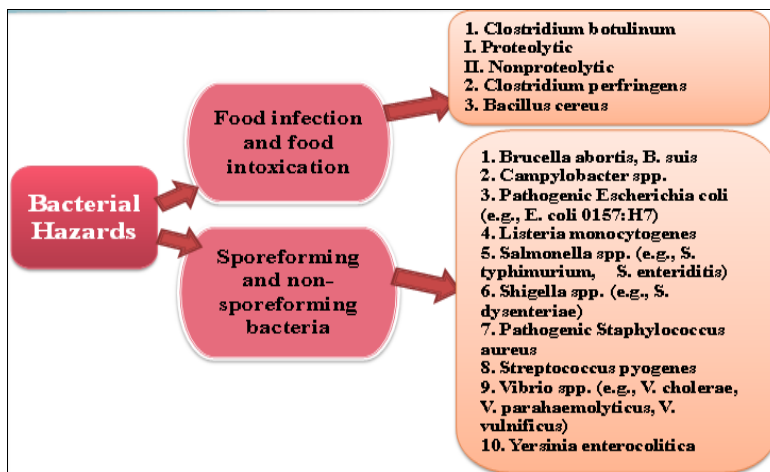


Fig 6: Bacterial hazards

Food decomposition or spoilage that may effect on the food-safety problem, that can prevent or controlled through a HACCP program. In the HACCP, "hazards" refers for contaminants or conditions into the foods that may reason disease or injury. This do not refers for undesirable contaminants or conditions such as that:

- Hair,
- Filth,
- Insects,
- Spoilage,
- Economic fraud and
- Infringement of regulatory food standards do not directly Connected to safety [40].

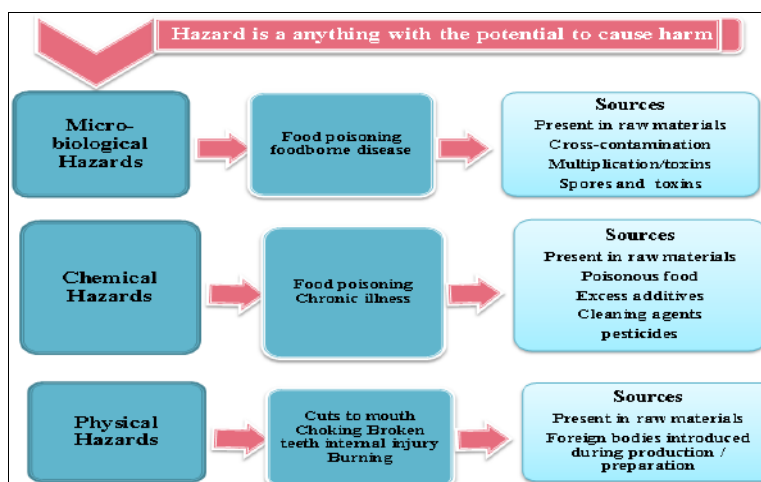


Fig 7: HACCP Hazards

Fig. 8, hints at the four major challenges related to keeping food safe. Street food vendors are poor, illiterate with little knowledge of how to maintain nutritional safety of street foods, maintain food safety, maintain a neat-clean

environment, sanitation, and hygiene practices and lack of knowledge in aspects of hand wash, food display modes, service, procurement, drinking water [41].

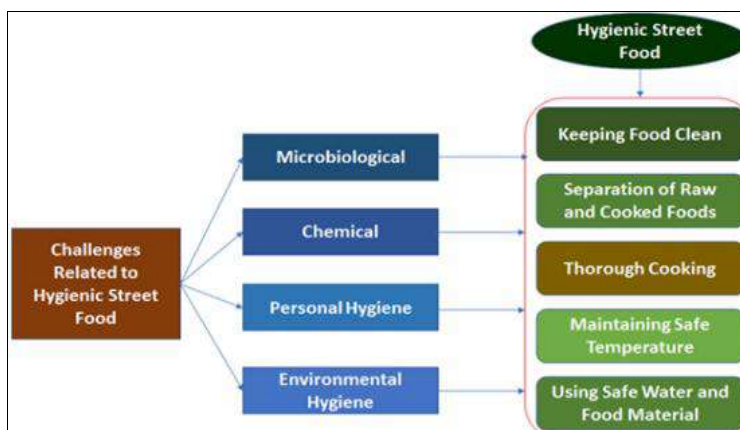


Fig 8: Challenges Related to Food Safety Hygiene of Street Food

Federal Regulatory Programs

The four types of agencies play important roles into carrying out food safety regulatory activities, in which include, like as: 1) Food and Drug Administration (FDA), which are part of the Department of Health and Human Services (DHHS), 2) Food Safety and Inspection Service (FSIS) of the US Department of Agriculture (USDA), 3) Environmental Protection Agency (EPA), and 4) National Marine Fisheries Service (NMFS) of the Department of Commerce. Greater than 50 interagency deals have been done developing to attach of the different agencies direct. Food and Drug Administration has been jurisdiction Excess domestic and import food products that is marketing interstate commerce, excluding of meat and poultry products. Food and Drug Administration (FDA's) Center in order to Food Safety and Applied Nutrition (CFSAN) towards to ensure so these food and food products are have been done nutritious, safe, sanitary, good health and physical well-being. Faithfully and properly labeled. Food Safety and Applied Nutrition (CFSAN) practice jurisdiction over food processing plants and has been responsibility in order to the approval and surveillance to the feed additives, food-animal drugs and all various types of food additives, in which includes, (like as: preservatives, sanitizers, boiler water additives, coloring agents and food packaging), that be able occur part of food. Food and Drug Administration (FDA's) statutes grant CFSAN jurisdiction Excess restaurants yet it has been always ceded its responsibility of the states and localities. The CDC (Centers for Disease Control and Prevention) of the Department of Health and Human Services (DHHS) engages into observation and examine of diseases allied with consumed food into the endorsement by the USDA and FDA regulatory missions. The FTC (Federal Trade

Commission), via regulation of food advertisement, plays indirect contribution into the food safety regulation [42]. Food safety responsibilities of U.S. Food and Drug Administration, Supervises each domestic and imported food sell into interstate commerce, in which included shell eggs, however not meat and poultry, packaged bottled water, and wine beverages lesser than 7% alcohol as well apply food safety regulations governing domestic and imported food, besides of meat and poultry, through the inspection of food production establishing and food go down and collect and analyzed the samples in order to physical, chemical, and microbial contamination; reviewing the security of food and color additives prior to marketing; reviewed animal drugs to the security of animals so obtain those and humans which eating foods produced through the animals; Invigilate the security of animal feed consumed to food-production animals; evolved model codes and rescript, guidelines, and explanations and worked with states for implementing those into regulate milk and and shellfish and retailing food established, like as restaurants and grocery stores (for examples, the model Food Code, a context to retailing outlets and nursing homes and different institutions at how to make food for inhibit foodborne diseases); established GMP (good food manufacturing practices) and different produces standards, like as plant hygiene & sanitation and packaging needs and HACCP (Hazard Analysis and Critical Control Points) programs; works with foreign governments for ascertain the safety of Few imported food products; requested to manufacturers for recall Insecure food products and Invigilate them recalls, taking suitable actuation actions; conduct research at food safety; and educate manufactures, food handlers and consumers onto secure food-handling practices [43].

Table 9: Three Fundamental Components of U.S. Food Safety Food and Drug Administration’s Food Protection Plan

Three Fundamental Components of U.S. Food Safety Food and Drug Administration’s Food Protection Plan		
Prevent foodborne contamination:	At critical points in the food supply chain, take action:	Respond rapidly to minimize harm:
Encourage greater corporate accountability to stop foodborne infections.	Focus inspections and sampling based on risk.	Improve immediate response.
Identify food vulnerabilities and assess risks.	Enhance risk-based surveillance.	Improve risk communications to the public, industry, and other stakeholders [25].
Deepen knowledge of and application of efficient mitigation strategies.	Enhance the recognition of "signals" in the food system that point to contamination.	

Food Standards

Influential food standards and control systems is expected for integrated quality in all aspect from food production and service, for ensuring the supply of nutrimental, hygienic food as well for facilitate trade inside among nations.

National Standards: They are issued through national standards body.

International Standards: The International Organization to Standardization (ISO) and Codex Alimentarius Commission (CAC) published international standards [39].

Food Standards Regulations in India

- The Prevention of Food Adulteration Act, 1954
- The Fruit Products Order, 1955
- The Meat Food Products Order, 1973
- The Milk and Milk Products Order, 1992
- Bureau of Indian Standards (BIS)
- AGMARK Standard

The food processing industries in India are regulating

through various laws which governed the aspects with sanitation, licensing and different essential permits that is needed for beginning and run a food business. The provision that dealt of food safety in India were the Prevention of Food Adulteration Act, 1954 (PFA Act). The Prevention of Food Adulteration have been into the place in order to over five decade and thereat were a necessity to change because of various causes in which included the changes needs with our food industry [44].

Modern Integrated Food Law (FSSA, 2006)

For consolidation the laws related for food and to establishment of the Food Safety and Standards Authority of India in order to maintaining science based standards in order to articles of food and for regulate theirs manufacture, storage, distribution, sale and import, for ensuring the availability of secure and wholesome food for human consumption and in order to cases related thereto or casual therewith, the Govt. of India have enact recent food laws is

also known as “The Food Safety and Standards Act, 2006”. It Act were permitted on 23rd August, 2006. This Act is spread in the whole of India. Notwithstanding, this Act arrived in the effect only recently in 2011. It Act consolidation varied acts & orders that have so far handled food Connected issues into different Ministries and Departments ^[45].

Need for the new act

FSSA begin affixation of India's food regulations according to international standards. this establishment a recent national regulatory body, the Food Safety and Standards Authority of India (FSSAI), maintaining science based standards in order to articles of food and for regulate theirs manufacture, storage, distribution, sale and import, for ensuring the availability of secure and wholesome food for human consumption. Each food imports will be so become topic for the provisions with the FSSA and rules and regulations which like notified through the Government at 5th of August 2011 will be appropriate.

Licensing Registration and Health And Sanitary Permits

It's as well vital to mind that FSSA, existence the alone legislation suitable to the food sector everywhere the country, will as well enforce as far as the national health and sanitary allowed is relation. Each food business operators into the country is required to become registered in according to the License and Registration Regulations, Under Regulation 2.1 of the License and Registration Regulations, therefore no person shall initiation anybody food trading unless recognize license are subservient by the food business operator, and the terms with regard for safety, sanitary and hygienic needs has to be obeyed with at each times through those ^[44].

Quality Standards

Those specifications which are lay down through the Govt. body composed by the Govt. to the aim of produce good quality products, these are also known as quality standards. When legal standards is compulsory, the quality standards is not compulsory. These are at voluntary based.

Two types of quality standards have in our country

- Agmark standards
- BIS/ ISI standards

Both quality standards are used to produced export quality products. BIS/ISI standards are related with various types of processed food products, Different of non-food products ^[45].

Bureau of Indian standards

Different committees Inclusive representatives of the government, consumers and industry, formulate the Indian Standards Institution (ISI). Safety performance and reliability is ensured as the product are ISI marked. ISI are presently known as Bureau of Indian standards. Bureau of Indian standards works a certification mark scheme under the BIS Act, 1986.

Functions of the Bureau

1. Certification: Product, quality, management system, Eco mark, environmental management system, hazard analysis and critical control points.
2. Laboratory: testing, calibration and management
3. Awareness and training program
4. Standard formulation and Consumer affairs ^[46].

Likewise, Agmark standards related with various types of foods, basically with the raw agricultural produce. For example: oils, oil seeds, cereals, spices, eggs, legumes, butter and ghee etc.

PFA Act and Rules

The PFA (Prevention of Food Adulteration) Act was allowed in 1954 and PFA Rules was framed in 1955 for protection of the consumers against the supply of adulterated food or low quality. In recently years the Govt. of India has enact another Act also known as “The Food Safety and Standards Act, 2006” (FSS Act 2006). The regulations under it act has come in effect from Aug, 2011.

The major purposes of PFA Act:

1. To prevent the sale of substandard food containing harmful substances.
2. To protect the public from harmful and poisonous foods, and
3. To protect the society against unscrupulous and anti-social dealers by eliminating fraudulent practices.

Agriculture Produce (Grading and Marking) Act (AGMARK)

Agmark means for “Agricultural Marking”. For having a systematic marketing of Agricultural Produce onto the base of safely define quality, Indian Legislature in 1937 passed an act known as “Agriculture Produce (Grading and Marking) Act, 1937.

The standards is given in order to agricultural and associated commodities such as includes cereals, oil seeds, oils, creamery butter, ghee, legumes, eggs etc., under the Agricultural Produce Act, 1937-grade. Agricultural commodities is classified in different grades like that, special, good, fair, ordinary etc dependent on the degree of quality into the all case.

The main objectives of the Agmark Act:

1. To enable the producer of good quality products for have better returns.
2. To ensure the consumers a product of pre-tested quality & purity.
3. To elimination the malpractice of adulteration into the movement of the product from manufacturer to consumer.
4. To have a sale of the product into the market with a identical composition and well define quality.

Under the Agmark among the dairy products, only ghee and creamery butter (Salted butter) are graded ^[45].

Fruit product order

- In 1946 fruit products order promulgate by the Government of India. Under the essential commodities act the order was revised in 1955. These order are operated through the Food and nutrition board of the ministry of Food Processing industries.
- The FPO (Fruit Product Order) determined does statutory minimum standards for the quality of different fruits and vegetable products and processing facility on storage, sale and manufacture. The FPO and PFA is enforced through the Department of Health.
- The Agricultural marketing adviser are authorize through regulation for issue a license in respect of manufacturing fruits and vegetable products, since because the inspection of the factory to quality of formulation, sanitation and hygiene [46].

Milk and milk products order, 1992

- MMPO (Milk and milk products order) 1992 are used under the essential commodities Act and are regulated through the ministry of Agriculture by the department of Animal husbandry and Dairying and fisheries.
- The collection, production, transportation, distribution and supplied milk and milk products is controlled through the Milk and Milk Products Order, 1992.
- This order laid down sanitary requirements in order to dairy, machinery and premises and in which includes certification, quality control, packing, labeling and marking standards in order to milk and milk products. The standards specific into the order as well apply for imported products.
- Each person the business of processing, handling milk and milk products should endow suitable labeling based at the certification through a certified officer [46].

Meat food products order

Regulation in order to the production of meat products is covered through the Meat Food Products Order, 1973.

Ministry of Food processing industries operating MFPO (Meat Food Products order), 1973 in which ensuring does the quality and hygienic production of meat food products inclusive fish products.

Meat food products are regulated by licensing under Meat Food Products order (MFPO), 1973 [46].

International Regulations

- Food and Drugs Administration (FDA)
- International Standards Organization (ISO)
- Codex Alimentarius
- Hazard Analysis and Critical Control Point (HACCP)
- Good Manufacturing Practices (GMP)

Food and Drugs Administration (FDA)

Food and Drug Administration are an agency of the United States Department of Health and Human Services. The FDA are responsible in order to protect and promote public health by the regulation and supervision of food safety, dietary supplements, tobacco products, over-the-counter pharmaceutical drugs and prescription, vaccines, biopharmaceuticals, medical devices, blood transfusions, ERED (electromagnetic radiation emitting devices), cosmetics and veterinary products.

The Food and Drug Administration as well enforces another laws, which comprise hygiene and sanitation necessity on interstate tour and control of illness onto products ranging from few household pets for sperm donation in order to assisted reproduction.

The FDA is built up in 1906 and have its head quarter at White Oak, Maryland. The agency as well have 223 field offices and 13 laboratories located everywhere the 50 states. the FDA started inaugurate offices in foreign countries, Inclusive China, India, Costa Rica, Chile, Belgium, and the United Kingdom, In 2008.

Regulatory programs of FDA

- Food and dietary supplements
- Drugs
- Blood and tissue products, vaccines and biotechnology
- Medical and radiation-emitting devices
- Cosmetics
- Veterinary products

- Tobacco products

FDA and India

FDA's (Food and Drug Administration) activities in India is for ensure that food and medical products exported since India for the U.S. is secure, is good quality, and is effective; these endeavors comprise obtaining better and much robust information for help FDA officials in the different FDA headquarter Offices and centers and on the limits make superior decisions in regard of products from India that is being developed in order to the U.S. market. It comprises products being review to the marketing authorization into the U.S., and that is previously at the U.S. market.

FDA activities in India include

- Engaging with Indian counterpart regulatory authorities for ensure the timely commutation of information about clinical trials that is operated that support marketing used in the U.S.
- Partnering with Indian counterpart agencies onto different bilateral and territorial efficiency construction initiatives
- Working with regulated product industries in India so that choice for export theirs products for the U.S. to ensure their understanding of our standards and expectancy about FDA regulated products
- Coordination and collaborate daily at product safety and quality issues with another U.S. government agencies that has supplementary missions for assess conditions and incidents into them areas that might have an effect at the safety and quality of FDA-regulated products being exported for the U.S.

International Standards Organization (ISO)

International Organization for Standardization (ISO) are a network of national standards institutes of 158 country, one person per country, with a Central Secretariat into Geneva, Switzerland, so co-ordinate the system. ISO are a non-governmental organization so that forms a bridge between the public and private sectors. It is the world's biggest developer and illuminator of International Standards. International Organization for Standardization (ISO) enables a general agreement to be accessed onto solutions that completed both the needs of trade and the detailed requirements of society [47].

Codex alimentarius commission (CAC)

The WHO and the FAO compositely established the Codex Alimentarius Commission (CAC) in 1962 for implement the jointly WHO/FAO food Standards Programme. The purpose of the commission are to safe the health of consumers through ensuring abidance of impartial practices into food business. this is Encourage co-ordination of function onto formulization of food standards undertaken through non-governmental organizations and international governmental. The CAC (Codex Alimentarius Commission) should be responsible in order to making proposals for, and should be consulted through, the Directors-General of the World Health Organization (WHO) and the Food and Agriculture Organization (FAO) and onto each matters pertaining for the implementing of the jointly WHO/FAO Food Standards Programme. There are common standards or suggestions for:

- Food labeling

- Food additives
- Contaminants
- Methods of analysis and sampling
- Food hygiene
- Foods for particular dietary purposes and nutrition
- Food import and export inspection and certification systems
- Residues of veterinary drugs in foods
- Pesticide residues in foods.

International dairy federation (IDF)

IDF is the main sources of scientific and technical expertise for all stakeholders involved in the dairy supply chain. Membership covers 56 countries and is growing. The IDF mission are to represent the dairy sector worldwide through providing the excellent global source of scientific expertise and knowledge into justification of the development and field upgrading of quality milk and dairy products for make consumers with the nutrition, health and goodness ^[47].

Hazard analysis and critical control point (HACCP)

ISO 22000 and HACCP ISO 22000 usage Hazard Analysis and Critical Control Point (HACCP), evolved through the Codex Alimentarius mission. Hazard Analysis and Critical Control Point are a modus operandi and a management system. to identify, prevent, and control of food safety hazards through HACCP management system. this system apply the following methodology:

1. To Conduct a food safety hazard analysis
2. To Identify Critical Control Points (CCPs)
3. To Establish critical limits in order to the every critical control point
4. To Develop procedures for monitor critical control points
5. To Design corrective actions to handle critical limit violations
6. To Create a food safety record keeping system
7. To Validate and verify system

It's uses to develop a Hazard Analysis and Critical Control Point plan ^[48].

Good manufacturing practices (GMP)

Each food service provider (these involved on each phases of preparation and pre-preparation/processing, packaging and service) should be follow for good manufacturing practices and secure food safety. Some major points for borne into the mind:

1. Cleaning of personnel, premises, equipment, food storage and preparation and serving areas
2. Quality of raw foods or materials and water
3. Storage of food on suitable temperature
4. Good service practices
5. Food hygiene ^[39].

Application of nanoparticle as food preservative

Before in food industry, many chemical or physical methods was applied at big scale. They agents is inexpensive and easily obtained, but these are deleterious for human body. Natural biologic compounds is ever in demand like they are non-poisonous in nature, easily dissolved, eco-friendly, and inexpensive than chemical or physical preservatives. at recent time, the application of nanoparticle like food preservative have revolutionized the food industry. Because

of their nano size (Fig-7), these have very influential antimicrobial activity and this may be applied into the food packaging materials or into the food for killing the pathogenic microbes ^[49].

Nanotechnologies have a large area of food-related applications. Into these applications, a conspicuous type of nanomaterial are incorporated in a specific food product for that food product to developed few desired properties. The region of nanotechnology have as well been an integrated part of research and development in order to the big-level manufacturing of agricultural products and processed foods and drinks, as well in order to food packaged thereon the world. Few reports state that these nano materials may do successfully become better food safety through increasing the efficacy of food packaging, shelf-life and nutritive value like additives without changing the taste and physical symptoms of food products ^[50]. In the small and large food sectors, nanotechnology may be utilized to the improvement of food safety, quality, shelf life, cost, and nutritional benefits ^[51]. The increasing of consumers concerns in regard of food quality and health benefits is conducting the researchers for find the path that may increase food quality until disturbing least the nutritional value of the food product. The requirement of nanoparticle based materials have rising into the food industry like numerous of those contain necessary elements and as well found to occur non-toxic. Nanotechnology offering overall food solutions of food manufacturing, processing to packaging, has been shown in Fig 8. ^[52]. The role of food vendors ineffectively reducing the risk of food borne disease is critically important as they are in direct contact with the consumers and also they are the least challenging in terms of implementing food safety control measures ^[53].

Touching on solutions, and some conclusions

Safe food provides basic human necessity. School children are commonly unable to buy food from exterior source during six hours at the time of school because they are confined. It is necessary for schools to understand their shared responsibility of providing nutritional and safe food for their school children. Eating habits to a combination by street foods provides both the consumer and the vendor by sufficient occasion of meet their daily nutritional requirements at an affordable price. Therefore, there is requirement of proper technology to preserve the nutritional value of the street foods. Although food safety is a very measure issue but now it is nanotechnology also placed and very important role in food safety. Because the packaging done by nano material, nano does some potential harmful to the consumer (it is not that good) after being used, then they have nothing of food safety. It is also very good and there is a lot of potential risk for the consumer, because whenever they use the nanoparticle, after the expiry date, they have nothing of food safety. Consumers should remain vigilant and literate on food safety issues and to increased awareness of food vendors about the role of nanotechnology and national, international food standards to ensuring food safety. Because national and international food standards play a vital role to ensuring food safety and protect public health.

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