



Street Vended Foods: Potential for Improving Food and Nutrition Security or a Risk Factor for Foodborne Diseases in Developing Countries?

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Abstract

Street food selling is largely an informal nature of enterprise which is a common practice all over the world. In the third world countries, this normally unregulated practice is mainly used in solving socio-economic shortcomings through the provision of ready-to-eat meals at affordable prices as well as a means of providing employment. Street vended foods are readily available in many forms that the consumers can choose from, depending on their tastes and preferences, and also their affordability. Due to this, these foods, in one way or another, and directly and indirectly, can significantly influence human nutrition, food security and safety. Current literature indicates that increased consumption of street vended foods can immensely contribute to provision of nutrients and availability of food to millions of people worldwide. Of greatest importance in the current developments in street foods is the fact that they have been identified as probable means for micronutrient fortification in an effort to prevent nutritional deficiency diseases. These foods though, have potential risks to the consumers in terms of food safety issues linked to them. In the developing countries for instance, they are usually prepared under unhygienic conditions with little or no regard to food hygiene, a situation that often exposes the consumers to microbiological and chemical hazards that can have detrimental health effects in their lives. There is therefore an urgent need to promote food safety practices in the production and consumption of street vended foods, particularly in the developing countries where levels of hygiene standards are questionable, in order to ensure that the health of the consumers is safeguarded, and at the same time ensuring provision of nutritious, healthy and affordable foods that are easily accessible to all.



Article History

Received: 01 June 2017
Accepted: 23 June 2017

Keywords

foodborne diseases,
food hygiene,
food safety,
food security,
nutrition,
street foods.


Introduction

The street food trade is an ancient practice¹ common in several countries, both developed and developing².

These foods, which are normally ready-to-eat, are very popular among urban dwellers in developing countries because they are usually perceived to

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To link to this article: <http://dx.doi.org/10.12944/CRNFSJ.5.2.02>

be inexpensive, convenient and attractive³. They have enjoyed popularity in recent years due to industrialization which is forcing many town and city dwellers to eat their major daily meals out of home⁴. Street food consists of out-of-home food consumption and has old, historical roots with complex social-economic and cultural implications⁵. 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^{3,5}, while the Codex Alimentarius Commission defines ready-to-eat foods as foods that include any food (including beverages) consumed in its raw state or any food handled, processed, mixed, cooked or otherwise prepared into a form in which it is normally consumed without further processing^{2,3}. Street foods are usually sold on the street from pushcarts, baskets, balance poles, stalls, kiosks or shops^{6,7}. There are three categories of street vended foods⁸: food prepared in small factories and sold by mobile vendors; food prepared at mobile vendors home and offered for sale to the public; and food prepared and sold on the street.

Besides the previously mentioned perceived benefits of street foods, consumers are also attracted to them because of their gustatory attributes such as unique flavours^{4,8}. They have also been shown to play the cultural and heritage roles in many of our societies¹¹, for instance, a study carried out in Singapore showed that street foods are viewed as tourists' attractions⁹, often hailed as being authentic and unique dimensions of culture, lifestyle and even heritage. In this study, 65% of tourists agreed that street food centres had an appealing uniqueness and cultural significance, while 58% of tourists indicated that street food areas were their means of learning about the country's heritage. Street foods increased consumption has also been attributed to their significant contribution to nutrition and food security for millions of practitioners along the food chain¹³, as well as being identified as potential vehicles for micronutrient fortification¹⁴. These foods have for a long time now been praised in many developing economies for offering various business opportunities to small-scale entrepreneurs. For example, the National Policy for Urban Street Vendors/Hawkers in India reported that vendors of

street foods in the country make up almost 2% of the population in cities and towns¹⁵. Though popular, street food vending activities in most developing countries are mostly outside the regulation and protection of the governments¹⁰ and official volume of trade involved is largely lacking¹⁶.

Even with their perceived nutritional benefits to the society, street-sold foods are considered among the contributors of food borne diseases e.g. they can transmit pathogenic microorganisms that can cause illnesses^{17,18}. They can also contribute to foodborne illnesses as a result of presence of chemical hazards such as pesticide residues, heavy metals and process contaminants they may contain. Thus, their quality is of great food safety concern as the consumers are continuously exposed to the risk of getting ill¹⁹.

Street Foods Production and Utilization

In terms of production, street foods may be centrally processed foods made by the formal sector food industry or they may be processed within the street food trade, either by the vendor themselves or other small-scale processors¹¹. Those who manufacture and/or sell street foods are mainly small-scale operatives that form part of growing informal sector in the developing countries. Since most of the rapidly increasing urban population in third world countries has not been absorbed into the formal labor market, this group of people has taken up a range of self-employed, income-generating activities, both legitimate and illegitimate such as street food hawking, which form the informal sector, sometimes called the tertiary sector or bazaar economy¹⁶.

Like other informal sector enterprises, street food businesses are characterized by their small-scale nature of the operation, use of conventional food processing methods, and low startup costs that allow ease of entry into the market¹¹. Those who participate in this sector are mainly the urban poor and this has been seen as a response to lack of formal employment. Due to its nature, the informal street food sector is not accounted for by official data-collecting agencies in most developing countries; thus official statistics on the street food trade in most of these countries are often non-existent⁷. For this reason, contributions of street food vending to the economy of developing countries is not well appreciated as there is little or no reliable official

statistics on the volume of trade, employment and income generation of the enterprises¹⁶. Street food trade though, is thought to be a multi-million dollar undertaking involving large volumes of business that provides massive source of employment and income to millions of people in developing countries. For instance, approximately 100,000 street food vendors in Malaysia with collective annual volume of sales amounting to over US\$ 2 billion has been reported²⁰. In Zambia in 2003, street food sales had an annual turnover of US\$ 100 million and employed around 16,000 people, mostly women with minimal education, to whom this sector offered a means of earning a living²¹. Street food trade expansion is linked to urbanization and the need of urban populations for food. As a result of this, the role of street foods in food safety as well as provision of nutrient needs for urban population has received increased attention in many countries in recent times^{2,7}.

Just like the official actual data on the street food trade is limited, the consumption of the same is also largely lacking, but a number of studies have been conducted in various countries which show that their trade is large and a complex segment. Extant data on the patterns of consumption of street foods is scanty. The customer surveys undertaken by EPOC²² and other investigators revealed that the main consumers of street foods in most countries were other members of the informal sector, such as fellow vendors and casual wage laborers. Other important categories of consumers were children, students and office workers²³. Children emerged as an important category of consumers in some countries; in Senegal, 28% of all street food consumers were children and adolescents²⁴. A study in Mali also found that children were important consumers of street foods and that they exerted considerable independence in buying it²⁵. A study of Haitian school children's consumption of street foods found that most ate them every day and that street foods provided the children with an estimated 400 Kcals per day²⁶. Recent studies indicate that among lower-income groups in many developing countries, 50-70% of household earnings are spent on street foods²⁰.

Since street foods vending plays a vital socio-economic role, there has been an increasing demand for the same in low income countries²⁷. Urban food supply in developing countries has

been reported to be mainly driven by this highly unregulated informal sector²⁸ which makes up 74% of the total food supply²⁹. In Africa, street food vending has been reported to have enabled 80% of urban populations to feed themselves easily and at low prices, representing about 40% of food expenditure in urban settings in the 1990s³⁰. This sector has been reported to employ, on average 37.8% of the labor force, contributing to approximately 38% of total gross domestic product in Africa³¹. As a form of business enterprise, street food vending has mainly been predominated by women. For example, 53 and 75% of street food vendors in Senegal and Burkina Faso respectively were found to be women^{32,33}. Nearly half the total household food budget is spent on street foods in the cities in Thailand and Nigeria, and over 25% in the Philippines and Indonesia⁶. The author also reported that a large number of people in some developing countries relied on this kind of business to derive their livelihood. For instance, the study indicated that 26 and 15% of the labor force in an Indonesian and Philippines cities respectively worked directly in street food vending. According to a survey conducted by FAO in 2001, about 2.5 million people, which is approximately 0.03% of world population consumed food on the streets³⁴.

Street Foods Diversity

The diversity of street foods is extensive, as they vary widely not only from country to country, but also from vendor to vendor³⁵. Street food ingredients are country-specific and mostly undocumented. The type of meals, consumption frequency and regularity, therefore, vary from country to country and are influenced by the national and/or regional food cultures³⁶. The ingredients and means of preparation are also diverse and mainly include meat, poultry, fish, seafood, eggs, cereal products, soya products, fruits and vegetables¹⁴. Most meals are based on combinations of staple foods, and are sold and consumed either as one-dish meals or as snacks³⁷. Street foods are prepared in many ways: they can be fried, roasted, boiled, baked, steamed or eaten raw, depending on different cultures²¹. In a study carried out in Burkina Faso, it was found that the basic ingredients consumed in most street foods were cereals (48.5%) and meat (33.9%), with a much lower contribution from milk (9.6%) and fruits (4.4%)³⁸. Street foods can be grouped in various ways: by meal (meals, constituents of

meals, snacks and drinks), by number and type of ingredients (simple and complex foods that contain more than one main ingredient), and by level and type of processing (minimally processed foods such as fruits which may only have been peeled or sliced; traditionally processed foods made by the vendor or another informal sector operative, and centrally processed commercial foods)¹².

Nutritional Contribution of Street Foods to Human Diet

Besides food safety issues, dietary deficiencies and food insecurity remain some of the most serious challenges facing developing countries to date that calls for urgent intervention in an effort to improve the health and wellbeing of the population. In developing countries all over the world, street foods provide a wide range of nutrients, helping people to meet their nutritional needs. Desirable attributes of street foods such as ease of accessibility, variety in taste, choice and low cost make them an affordable option¹¹. Despite the fact that street foods have been sold for many years and provide a source of livelihood to many households, there is little data regarding their contribution to the nutritional value of the consumers' diet⁷. The role of street vended foods in nutrition interventions and contribution towards ensuring food security, though clearly important and necessary, has not received the attention it deserves. Micronutrient deficiencies remain major public health problems in developing countries in both rural and urban contexts with deficiencies of vitamin A, iron and iodine, for instance, being the most prevalent³⁹. Although various strategies have been explored in order to mitigate this problem, little efforts have been made to utilize the easy to prepare, readily available, cheap and convenient street vended foods to help in solving these problems. Owing to street foods diverse nature, it is difficult and inappropriate to generalize on their nutritional composition from the few analyses that have been carried out on some of them to date. Different street vended foods are expected to have different nutritional contents depending on the types of the raw materials and quantities used, which vary widely. Their ingredients are rarely declared and/or analyzed^{14,40} making it difficult to estimate their nutrient content in the diet. For instance, an analysis of home-cooked traditional and commercially processed snack foods in Malaysia found that the nutrient content of both snack types

were highly variable and depended mainly on the composition and balance of ingredients⁴¹. Some FAO investigations have shown street foods to be good sources of energy and protein available at a lower cost than pre-packaged processed foods⁴². Almost all population groups consume street foods, but with differences in relative importance in the daily diet. Children and adolescents have been shown to represent an important segment of street foods consumers. A study from FAO found that 67% of primary school children in Dar es Salaam in Tanzania purchased street foods daily⁴³ while almost all (96%) elementary school children in Nigeria bought breakfast from street food vendors and 76% bought two street food meals per day⁴⁴. In Tunisia, 75% out of 421 interviewed school children used more than 75% of their pocket money to buy street foods⁴⁵. A number of investigations have demonstrated that street foods immensely contributes to the diet of children and adults in developing countries, both in terms of the variety of food groups consumed and protein, energy and micronutrient intakes^{7,46}. According to Muzaffar⁴⁷, street foods provide a source of affordable nutrients to the majority of the people especially the low-income group in the developing countries. These foods account for a variable, but significant part of the daily diet and nutritional requirements through a wide range of ingredients and products^{44,48}. For example, a study carried out in Indonesia reported that it was possible to obtain almost half the recommended daily allowance of protein, iron, vitamin A and vitamin C from a street food meal by spending US\$ 0.25⁴⁴. A similar study in Bangkok, Thailand, showed that street foods provided around 40, 39 and 44% of total energy, protein and iron intake, respectively⁴⁹. The nutritional importance was even greater in children between 4 and 6 years old, who obtained 80% of their energy, protein, fat and iron intake from street foods⁴⁴. As a result of their regularity and consistency in usage, street foods have been identified and recommended as a means of reducing problems of urban food insecurity and as a possible vehicle for micronutrient fortification to prevent nutritional deficiencies, often referred to as 'hidden hungers', among rural and urban dwellers in the developing countries^{14,50}. Other efforts to improve the values of these foods through additives have been tried in some developing countries such as both in the Philippines and Indonesia⁶. Successful dietary interventions by use

of street foods, such as a legume added to cassava cookies or vitamin enhanced fish balls, have been shown to result to culturally appropriate changes that do not increase the cost of the food item⁶, at the same time improving the nutritional content of the food. To ensure the nutritional quality of the diet of people who consume street foods, it is essential that the nutritional composition of each street food be analyzed and reported. There is also need for quantitative information on the nutrient content of street foods to assess the nutritional quality of different types of these foods and their contribution to the overall energy and nutrient intake of different population groups in order to help identify particular foods or ingredients that in terms of composition and consumption, may offer potential as vehicles for nutritional interventions¹⁴.

An important concern that requires attention when discussing street foods as nutrient sources though, in developing countries, is the emerging trend of westernization of diets⁷, which has led to increased intakes of saturated fat, trans-fats, sugar and salt through them⁵¹ which have been shown to have adverse health effects on consumers. To help mitigate this problem, health policy makers and educators should encourage and promote the sale of healthy, traditional street foods and ensure that regulation efforts are in place to prevent health problems from arising⁷.

Street Vended Foods Safety Challenges

The numerous advantages offered by street vended foods to food nutrition and security, however, needs to be considered alongside several food safety issues as foods prepared and exposed for sale may become contaminated by pathogenic micro-organisms as well as hazardous chemicals¹¹. Whereas several studies on microbiological hazards in street vended foods have been carried out in a number of developing countries^{52,53}, chemical hazards have often been ignored possibly because they rarely cause acute clinical illnesses which can explain the limited toxicological data currently available on the same¹¹. Both microbial and chemical hazards can cause foodborne diseases. In developing countries, foodborne illness causes an estimated 2.2 million deaths each year, of which 1.9 million are children²¹, and this needs to be prevented.

Microbiological Quality of Street Vended Foods

The global concern for the safety of the consumers of street vended foods has led to several research efforts to determine the hygiene of the preparation and vending as well as the microbial hazards associated with consumption of these foods^{16,33}. The potential for the contamination of street foods with pathogenic microorganisms has been well documented and several outbreaks of diseases have been traced to consumption of contaminated vended foods⁵⁴. Foodborne illnesses of microbial origin are a major health problem associated with street foods^{11,54}. Foodborne bacterial pathogens commonly detected in street vended foods in developing countries include *Bacillus cereus*, *Clostridium perfringens*, *Staphylococcus aureus* and *Salmonella* spp.¹¹. These pathogens, among others, may result in foodborne infections and intoxications once contaminated food is ingested by the unsuspecting consumers. Street foods are often prepared by hand which may lead to an increased incidence of contamination with the potential foodborne pathogens^{11,54}. The risk of contamination usually varies with the type of street food and how the food is prepared.

Microbiological foodborne diseases have been widely reported to immensely influence the economies of both developing and developed countries in a negative way, which has necessitated street foods safety to remain a principal priority for most governments²⁹. Most of the outbreaks have been closely linked to a number of factors including use of microbiologically poor quality raw materials in food preparation, improper handling of prepared foods and unsound vendor hygiene practices among others²⁸. This is even made worse by the fact that many street vended foods in developing countries are prepared under unsafe environmental conditions such as close to municipal waste disposal sites that provide favorable breeding sites for insects and rodents which can easily contaminate the foods. In most cases also, basic provisions such as running potable water, washing facilities, toilets and organized waste disposal are often unavailable at the retail sites¹⁸ which can put consumers health at risk of microbial foodborne illnesses³³. In many cases, street food vendors are uneducated and untrained in basic food hygiene and pre-requisite systems, such as the good manufacturing practices and good hygiene practices^{2,55}.

Chemical Quality of Street Vended Foods

Limited research exists on chemical hazards in street foods, which deserves a comparable share of attention as does microbiological contamination³⁷. According to Proietti³⁷, street foods are at a risk of getting contaminated by air pollutants (they are mainly sold in the open, often alongside streets), contaminated raw material from unsafe sources e.g. fish harvested from contaminated waters, meat and milk from animals undergoing antibiotic treatment, fruits and vegetables containing pesticide residues and plant-based food (mainly cereals) contaminated with mycotoxins, packaging in undesirable materials (food contact materials) and improper cooking and/or processing methods which may increase the content of process contaminants such as polycyclic aromatic hydrocarbons or acrylamide, among others in certain foods.

Presence of food contaminants of non-microbial nature in street foods is of paramount importance because of the frequency at which these products may be consumed, particularly by children. Several food contaminants, both intentionally and non-intentionally added to street foods have been reported in the scientific literature. These include;

Antinutritional Factors

These are chemical substances naturally present in many cereal and legume products which affect food utilization, thus reducing the nutritional benefits of these foods. The main health effects include gastrointestinal and neurological disturbances such as those caused by glycoalkaloids present in potatoes and other members of the Solanaceae family⁵⁶; reduced growth rate due to impaired digestion and absorption of proteins caused by presence of tannins and saponins found in most vegetables and legumes; and deficiency of essential minerals like calcium, iron, magnesium and zinc as a result of poor bioavailability due to chelating by phytic acid and tannins present in many cereals and legumes, particularly in sorghum^{2,37,56}. The underutilization of nutrients as a result of these antinutritive factors is of great concern to children in developing countries where cereals and legumes make up about 50% of traditional diets.

Mycotoxins

Raw materials from which many street foods are made may be naturally contaminated with one

or more types of mycotoxins, some of which are resistant to most of the processing methods including thermal treatment e.g. aflatoxins⁵⁷. Mycotoxins have been detected in numerous agricultural commodities sold in the streets, mainly cereals, dry fruits, spices, coffee and cocoa. Aflatoxins have been reported to occur in 68% of street-vended snacks in Nigeria; in particular, corn-based, groundnut-based and wheat-based snacks were found to be contaminated with total aflatoxin concentrations at levels exceeding the maximum limits in foods (15µg/kg) established by the Codex Alimentarius⁵⁸. Levels of aflatoxin B1 exceeding the maximum allowable limit set by the Joint FAO/WHO Expert Committee on Food Additives (JECFA) (5µg/kg) were found in 70 and 35% of peanut samples collected from Kinshasa in the Democratic Republic of Congo and Pretoria in South Africa, respectively⁵⁹. Presence of aflatoxins, ochratoxins and patulin producing fungi (mainly *Aspergillus* and *Penicillium* spp.) was also found in various street food items in Cape Coast in Ghana, including meat pie, *banku* (a cooked fermented corn dough), beans with *gari* (roasted fermented cassava flour), *dakua* (ground, spiced mixture of roasted groundnuts and millet) and *fufu* (pounded mixture of cooked cassava and plantain)⁶⁰.

Pesticides Residues

Pesticide residues are of great concern in street vended foods from the developing countries where the quality of raw materials is often ignored. Street food operatives will usually buy raw materials with total disregard for the likelihood of presence of pesticides residues. Worth noting also is the fact that pesticides in developing countries are often used indiscriminately, and raw materials from which many street foods are made are never tested for presence or absence of these dangerous compounds. This is usually due to the lack of proper regulation and/or controls in many countries^{37,61}. In general, the use of different insecticides, rodenticides, cleaning agents, disinfectants, and biocides may be a common practice in street food to protect foods from pest or insects and may find their way into street vended foods. A common practice among food vendors is to spray products such as fish, fruits and vegetables with chemical disinfectants including formalin, a commercial solution of formaldehyde and water. An investigation on formalin contamination of children's street foods at schools in Surakarta, Indonesia found

that 49% of the meals tested were contaminated with the chemical⁶².

Heavy Metals

Heavy metals such as mercury, arsenic and lead, may contaminate street vended foods from various sources such as water, soils and non-food grade food handling and processing equipment through leaching. In the developing countries in many cases, equipment such as cooking pots are fabricated by the informal manufacturers who have little or no regard for chemical food safety. A study carried out by FAO/WHO has shown that pots used in preparation of street foods in many developing countries are often manufactured using materials not suitable for use with foods, such as damaged cars bodies and industrial machinery²¹. An investigation carried out in Ghana showed that some street food samples contained high levels of arsenic, cadmium, copper, lead and mercury possibly from leaching from utensils manufactured from informal retailers using non-food grade materials⁶³.

Process Contaminants

Noteworthy contaminants in this category are polycyclic aromatic hydrocarbons (PAHs) and acrylamide³⁷. Street foods can significantly contribute to the intake of PAHs and acrylamide. An investigation carried out in Bangkok in 2005 reported that grilled-meat vendors were exposed to total PAHs at higher levels than other street vendors in the same area, possibly due to additional formation of these compounds during the grilling of meat. Re-using of frying oil, which is a common practice in many developing countries has been shown to promote formation of both PAHs and acrylamide to large extent³⁷. Indiscriminate open-air burning of trash may also expose foods to PAHs and dioxins.

Strategies to Enhance the Safety of Street Vended Foods

The benefit and contribution of street food trade to the economies of developing countries calls for ways to mitigate the hazards in its consumption and safeguard the health of the consuming population. To assure street food safety and quality, and protect consumers against unsafe foods, the management of the main risk factors associated with street foods should be strengthened and effective preventive measures at an appropriate stage need

to be taken^{64,65}. Essentially, food safety issues are everyone's responsibility which means to ensure hazard free food, all necessary measures must be taken along the entire food chain, from farm-to-fork. An important step towards reducing the risks of foodborne illnesses particularly those originating from pathogenic microorganisms from street foods would be controlling the steps in food preparation and sale that may contribute to the contamination, growth and survival of the microbes responsible for foodborne diseases. This should particularly focus on educating the food handlers, improving the environmental conditions under which the trade is carried out and providing essential services to the vendors to ensure safety of their commodities³³. Research has shown that educating and training of the consumers and street food vendors on food safety can help in reducing or eliminating majority of food-related illnesses and deaths.

All stakeholders in street food trade including the street vendors, consumers and governments must be involved in ensuring the safety of the sold and consumed food¹⁰. Strengthening of food safety policies and stringent enforcement of food safety laws would significantly prevent, eliminate, or reduce the street foods hazards to acceptable safer levels. This is important because in majority of developing countries, street foods safety policies do not either exist or are poorly enforced^{65,66}. Engagement of experts in food and health related disciplines to draw up guidelines for the management of street food practices and implementation of hazard analysis and critical control points (HACCP) concept from farm-to-table are recommended^{33,65,66}. In developing countries, it is vital to officially recognize the street foods and street food vendors, as in so doing, it can help in ridding tendencies of operating this highly risky food business in hiding thus exposing the public to health issues. This calls for the development of well-structured guidelines and/or regulations specifically for this food service sector. Proper and timely coordination of various departments within the governments involved in food safety issues is also of paramount importance in order to ensure smooth implementation of food safety regulations aimed at provision of safe and nutritious foods.

Conclusion

Street food business is a key indirect driver of economies of developing countries that ought not to

be ignored as majority of the unemployed population turns to it as their main means of earning a living in order to improve their lives. This food service sector has played and is still playing a critical role in ensuring availability of affordable and convenience foods greatly ensuring food security and alleviating hunger. The current challenges that the governments in developing countries need to tackle to ensure that the full potential of street foods is realized includes; officially recognizing street foods, developing and

implementing guidelines on their production and sale; ensuring safety of these foods by enlightening both the consumers and vendors through training on best food handling hygiene and processing practices to prevent foodborne diseases caused by both microbiological and chemical hazards; and encouraging production of healthier options of street foods in order to curb surging lifestyle diseases often associated with several types of these foods often considered junk.

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