



Street food consumption in terms of the food safety and health

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Abstract

Foods and beverages which are prepared and sold by the sellers on places like streets, festival areas and consumed by the consumers on the run are known as street food. These foods are alternatives to homemade food and are more affordable when compared with the food supplied at the restaurants. The areas where the street food are mostly criticised and seen as a threat for health are that the places where they are produced and sold are open to dirt and contamination and that hygiene, attitude, and applications adopted by the sellers during the preparation and storage of the food are insufficient. As a descriptive research, this study aims to provide information on street food consumption with general specifications of street food, the reasons why they are preferred, and general conditions like hygiene, quality, and safety.

Keywords: Street food, food safety, vendors, health

1. Introduction

The changes taking place in people's life styles have caused the habit of eating outside to evolve. Because the consumers do not have time for cooking at home, the changes in consumption habits of the society, cultural interactions, fast living, and the contribution of women to work life are influencing and changing the nutrition style in crowded cities (Cuneo, 1998; Madran, 1999). In today's world, people prefer to buy food sold on the streets to meet their nutrition needs outside home. Street foods are being prepared and sold at places like streets, schools, train stations, bus terminals, entertainment and festival areas where people are crowded. These foods are drinks can be consumed in the run without requiring any processing or preparation afterwards (Von Holy and Makhoane, 2006; Muzaffar et al., 2009; Steyn et al., 2011).

Food sold on the streets is an integral part of a country's cuisine. These food and drinks are important for the local eating habits to be known all around the world. Besides, they play an important role with local cuisine in preserving cultural and social heritage. Street food also appeals to tourists looking for cuisine culture and different tastes and this supports a country's tourism. As they provide income to the sellers, they are also important in generating employment. These foods are highly demanded both by the sellers and consumers because of their tastes, easy availability, low cost, cultural and social heritage connection, and being nutritional (Barro et al., 2002; Buscemi et al., 2011; Kok and Balkaran, 2014).

Street food especially show the eating habits of people living in big cities. Approximately 2.5 billion people around the world consume street food every day. Especially in Far East cuisine culture, production and selling of street food has become a part of social life. As the people in

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developing countries spend an important amount of their budget for eating outside, street food has become an alternative eating trend. In Latin America people spend nearly 30% of their budget for street food (Mensah et al., 2002; Muinde and Kuria, 2005; FAO, 2011; Ackah et al., 2011; Badrie et al., 2013).

Preparing and selling food on the streets provide a constant income for millions of uneducated people. However, during the selling of food on the streets, some risks arise. Some of these risks are causing accidents on busy traffic, being fined because of occupying the pavements, doing sales illegally, or employing children as workers (FAO, 2011). Social and structural specialities arising in some cities of West Africa due to changes in life conditions, have increased demand for street food (Canet and N'Diaye, 1996). Since the money spent on street food is not too much, helps especially poor families to meet their daily nutritional requirements (Chakravarty and Canet, 1996; Van't Riet et al., 2003; Ohiokpehai, 2003). Regarding the employment, street food provides a good job opportunity and income for sellers with small capitals and especially for women. It is seen that in Bangkok, 82% of street food processing is carried out by women and that employment opportunities are good. While this situation creates a constant income for women, it also creates a constant nutrition source for working women (WHO, 1996; Chung et al., 2010).

In another study it is seen that although the food sold in the open may not be produced and sold under appropriate conditions, people can not give up consuming them. Especially it is seen that students think that food sold in the open are unhealthy and nutrition wise low, but that they prefer them because they are cheap and quickly served. It is also determined that there is a positive correlation between the frequency of eating outside and consuming food sold in the open (Sert and Kapusuz, 2010).

Street food is consumed in many countries as food, drinks, and snacks which reflect traditional cuisine culture in countries together with their content, preparation, sales methods, and consumption ways (FAO, 2010; Campbell, 2011). Bagels, pastry, grilled sheep's intestines, meatballs in bread, kebab, lamb doner, steak tartar a la turca, pancake, chichpea-rice, mussel, corns, boza, chestnuts, sahle, licorice, paste, cotton candy, wafer, sugar-coated apple, ice cream, etc can be given as examples of street food widely consumed all around Turkey. According to a research made in Turkey, it is seen that consumers in Ankara often eat pastry, bagel, fries, cheese toast, hamburgers, and lamb doner every day (Özçelik and Sürücüoğlu, 1998). Street foods from around the world are given in Table 1 (Fellows and Hilmi, 2011).

Table 1. Street foods from around the world

Continent	Country	Food	Description
Asia	India	Chaat	Tangy, spicy mix with varied ingredients (lemon, pomegranate seeds, salt, tamarind), and different chutneys
		Pakodas	Various vegetables fried in chickpea batter
		Panipuri	Unleavened Indian bread fried crisp and filled with tamarind, chilli, potato, onion and chickpeas Various vegetables fried in chickpea batter
	China	Chuanr	Lamb, pork, beef, chicken roasted or deep-fried on skewers
		Tang Hu Lu	Fruit on skewers garnished with sugar syrup
		Rice	Served with scallions, bean sprouts, cabbage and ginger root, soybean curd

			(tofu), pork or chicken
		Peking duck	Roast duck with strips of crisp duck skin wrapped in thin pancakes
	Pakistan	Pahata roll	Beef or chicken in fried oil bread with onions, tomato and raita (cucumber yoghurt)
	Thailand	Pad Thai	Fried rice noodles with eggs, fish sauce, tamarind juice and red chilli pepper, plus bean sprouts, hrimp, chicken, or tofu, garnished with crushed peanuts
Africa	Kenya	Nyama choma with ugali	Grilled beef, veal, sheep, lamb, goat with steamed maize /cassava dough
		Mandazi	Fried doughnuts made using coconut milk groundnut paste or almonds for flavour
	Morocco	Merguez	Lamb or beef sausage with red spices (paprika, Cayenne pepper or chilli eaten with couscous)
	Ghana	Fufu, banku kenkey,	Steamed cassava/plantain pulp with fried yams and bushmeat or chicken
	Ethiopia	Injera and Wot	Tef bread with spicy stew made from beef, lamb, chicken, goat, lentils or chickpeas, with spicy berbere
	Nigeria	Chin Chin	Doughnut made from wheat flour or cowpeas and eggs
		Suya	Barbecued spiced meat, with roasted plantain and maize, fried yam and fish
Uganda	Matoke	Mashed plantain steamed in plantain leaves, with groundnut sauce	
Middle East	Egypt	Falafel	A fried ball or patty made from ground chickpeas and/or fava beans.
	Palestine, Syria	Madlu'e	Sweet cheese curds on a rich biscuit in syrup A fried ball or patty made from ground chickpeas and/or fava beans.
	Israel	Sadikh	Boiled egg, eggplant, tahini and mango pickle rolled in pita bread
South America	Brazil	Pão de queijo	Cheese bread
		Biscoitos de polvilho	Sour manioc flour puffs
		Acarajé	Deep fried black-eyed pea bun filled with salted dried shrimp
	Mexico	Taco	Corn or wheat tortilla folded or rolled around a filling
	Peru	Tamales	Maize dumplings filled with suckling pig, guinea pig, deep-fried pork or chicken
Venezuela	Arepa	Flattened maize meal bun, stuffed with soft cheese	
	Haiti	Calalou	Crabmeat, salted pork, spinach, onion, okra, and peppers with sweetened potato

Caribbean		Mayi moulen with pikliz	Rice and beans, cornmeal mush, kidney beans, coconut, and peppers with spicy pickled carrots and cabbage.
	Jamaica	Jerk	Barbecued chicken or pork in marinade of scotch bonnet peppers, onions, scallions, thyme and allspice, with breadfruit and/or festival, a sweetened fried dough
Europe, Asia	Turkey	Bagel (Simit)	Bagel paste is prepared by mixing flour, water, milk, sugar, sesame, and salt, after paste is fermented it is divided into pieces and after annulation, it is put in cold water with pekmez and sesame and than put in the oven (Anonymous, 2016).
		Lamb Doner (Döner)	It is a type of kebab made by slim slicing of meat that is cooked by rotating on rotary skewer after being marinated (Ergönül and Kundakçı, 2006).
		Grilled sheep's intestines (Kokoreç)	It is obtained by putting small sheep intestines on mesenteric oils and cooking on charcoal grills (Temelli et al., 2002).
		Boza	It is obtained by heating of corn, rice, millet and similar cereals being milled and mixed with water and adding sugar and applying alcoholic and lactic acid fermentation (Güven and Benlikaya, 2005).
		Fermented carrot juice drink (Şalgam suyu)	It is obtained by mixing red carrot, bulgur flour, bread paste, salt, water, and red pepper if preferred, all of them being subject to lactic acid fermentation (TSE, 2003).

Street foods are preferred by people in many countries because of their variety, cheapness, and availability. So the consumption of these foods is common around the world. There are many studies about relation of street food and diseases, because of lack of knowledge about hygiene, and food safety of street food seller's and the excess of infective bacteria in street food samples. This study has highlighted the importance of the issue.

A comprehensive literature search was conducted on the street foods during the construction of this study. The studies about street foods are evaluated and information is given about food safety and health aspects of street foods.

2. Evaluation of street food as regards to hygiene, quality, and safety

In today, millions of people catch diseases originating from food sources and thousands of deaths occur in world (Pilling et al., 2008). The wide consumption of street food around the world increase the importance of safety and health issues (Canet and N'Diaye, 1996). Street foods are not reliable, they also carry diseases originating from food sources in many countries (Omemu and Aderoju, 2008; Biswas et al., 2010; Nunes et al., 2010; Mamun et al., 2013).

One of the reasons for spreading of diseases originating from food sources is that street food sellers do not have sufficient information about food safety. Besides, in various researches made in some countries, insufficiencies were found out relating with application of hygiene and sanitation, preparation of food, food safety rules and knowledge of street food sellers. Poor hygiene, difficulty in obtaining drinking water, not removing wastes and similar environmental problems and the fact that street food are exempt from legal legislations, all these factors increase risks in ensuring food safety (Rheinlander et al., 2008; Omemu and Aderoju, 2008; Abdalla et al., 2009; WHO, 2010; FAO, 2011; Choudhury et al., 2011; Rane, 2011; Kealesitse and Kabama, 2012). Food originated pathogens are seen as a health threat during preparation and protection stages depending on the type of food. Abibo and Lowatt (2015) conducted, they have stated that food processing places, restaurants, food sellers, schools, and houses are influential in development of diseases originating from food.

Street food safety is influenced starting from the quality of raw materials to food processing and storing and similar steps in the process. Besides the fact that raw materials used in these products are of poor quality, these foods are stored under wrong and unsafe conditions for a long time. Selling points of street food have a limited infrastructure as regards to clean drinking water, toilets, freezing-ice creams, disinfection, hand washing, and removal of wastes. In most cases, since water does not come from taps constantly, water storage is required and this kind of water is not appropriate for hand or dish washing, cooking, or drinking, and contamination factors occur. Besides, street food is subject to the contact of insects, rodents, domestic and other animals and unfavorable environmental conditions like air pollution (Hanashiro et al., 2005; Lucca and Torres, 2006).

Muyanja et al. (2011) found out that among 225 street sellers in Uganda, 87.6% were made up of women with low education, that they were using non-recyclable plates and glasses during food sale, and that soap and cold water were widely used in cleaning of kitchen materials. In the research conducted in India, Choudhury et al. (2011) found out that majority of street food sellers (54%) were food processors servicing at small restaurants and that their daily incomes were low. Besides, it was seen that 30-37% of them were informed about hygienic applications during food processing and that only 8-11% of them were informed about food contamination. In another study made in China, it was seen that the increasing threat of food safety has increased worries of consumers regarding food quality and reliability and that consumers were focused on correct information, attitude, and behaviour relating to food safety. It was also found out that although consumers were aware of food safety, they had limited information, that they did not read the labels well, and the labels were limited in describing safe food. It was also seen that consumers were ready to pay higher amounts for safe food products (Liu et al., 2013).

It was stated in a research that street food have socioeconomic and cultural influences as they reflect historical roots (Buscemi et al., 2011). It is also mentioned that although modern fast food consumption is being spread, still the consumption of street food continues all around the world traditionally, but that the relation between their consumption with health, obesity, and related diseases is not well known. Eliminating a huge amount of pathogenic bacteria from the samples taken from food sold on the streets, has enabled many researches to be linked with epidemiological study between street food and diseases (Bryan et al., 1997; Muinde and Kuria, 2005; FAO, 2010).

Rise of food originated diseases is related with wrong storage (50%), reheating-storing under inappropriate conditions (45%), and cross contamination (39%) (Bean and Griffin, 1990). It is known that the places where street food are prepared, sold, and consumed provide appropriate conditions for contamination (Muinde and Kuria, 2005). Street foods were responsible for 691 food poisoning outbreaks and 49 deaths from 1983 to 1992 in China (Rane, 2011). It was found that in Hong Kong, 300 people consuming street food were ill and that 14 death instances seen in malaysia originated from food sources (FAO, 1990). An important disease like cholera was seen among people consuming street food which was contaminated with pathogen microorganisms (Abdussalam and Kaferstein, 1993). Many of the food sold on the streets can not be protected

from flies and other living creatures which can be a cause of pathogens. In pathogen bacteria development and formation of toxins time and temperature are two other important factors. Not paying attention to the storage temperatures of these food before sales, their being contaminated with pathogen microorganisms during steps of preparation, cooking, and similar steps create risk for public health. In various studies conducted regarding hygiene quality of street food, it was reported that these foods especially contained pathogen bacterias like *Salmonella typhi*, *Bacillus cereus*, *Staphylococcus aureus*, *Clostridium perfringens*, *E. coli* and *Pseudomonas* types (Ghosh et al., 2007; Haryani et al., 2008; Mahale et al., 2008; Abdallah and Mustafa, 2010; Gordon-Davis, 2011).

The street foods of India, Ragda-Petis, Bhel and Panipuri, existence of *E.coli* and *S.typhi* was found and that more than 70% of them contained bacterias (Garode and Waghode, 2012). Biswas et al. (2010) found that from out of 50 food samples, 37 of them (74%) had *E.coli* contamination and that foods containing vegetables had *E.coli* at a high percentage (91%), and that these organisms also existed in samples of fish, meat, and cereals and that food sellers could be carrying diseases originating from food sources. In China, Liu et al. (2015) found that disease outbreaks originating from *Vibrio parahaemolyticus* had a high occurrence rate.

By analysing 20 different hotdog selling places in Sao Paulo, Lucca and Torres (2006) found out that in 30% of them hygienic conditions were poor and that the preparation stage of fries, chicken meat, and beef were highly riskful. It was stated that inappropriate hygienic conditions during food preparation and the lack of basic information regarding food processing were causes of public health problems. Walker et al. (2003) found out that 57% of 444 food processors knew that food could be contaminated with bacterias causing food intoxication, with smell, appeal, and taste, and that 16% of them knew that the right temperature for refrigerators is -18°C or below. Because street food sellers are generally not educated about hygiene and sanitation and they perform in places with lack of hygiene increase worries about food safety (Mensah et al., 2002; Muinde and Kuria, 2005; Lues et al., 2006). The reason giving rise to food intoxication is not only lack of knowledge of street seller about hygiene rules but also not applying the information learned (Bryan, 1988; Ehiri and Morris, 1996). Many studies have shown that there is a correlation between food hygiene education and lack of attitude relating with food hygiene (Luby et al., 1993; Howes et al., 1996). Omemu and Aderoju (2008) found out in the study they conducted in Nigeria that 12% of street food sellers learned their knowhow about food preparation at the university and that only 31% of them had yearly medical health certificate. Chukuezi (2010) found out that street food played an important role in meeting nutrition requirements of people living in the cities, but that there are various health risks related with these food and that 23.8% of women sellers were preparing food under nonhygienic conditions. Besides, he stated that street sellers had to take health and food safety education. Ackah et al. (2011) found out that in Accra-Ghana, street food sellers earned 84% of their main income from their sales and that 80% of the sellers were aged between 25-50. Besides, they mentioned that most of the sellers did not have a health certificate and that the knowledge of sellers relating to food processing applications was not enough. Rahman et al. (2012) reported that in Malesia, street sellers did not have enough knowledge and that there were malfunctions during applications, and that street sellers needed to be informed about food safety, hygiene and diseases originating from food sources. Sani and Siow (2014) found out that most of 112 personnel working at food services division of Malaysia Kebangsaan University did not know critical storage temperatures for the foods prepared and that their knowledge about pathogens causing diseases was also poor. They mentioned in their studies that in order to have food safety, constant and effective education should be given to personnel working at food servicing division. Liu et al. (2015) stated that most of 171 food processors working at 22 food facilities operating at coast did not know maximum storage time for food at room temperature and that they also did not know disease agent widely seen in sea food. Besides, they observed that food processors were mixing all of the products (raw and cooked) in the same containers. Choudhury et al. (2011) found that after 80 street food sellers in India were given education, average knowledge

level increased from 24.4% to 66.2% and that adapting to hygiene applications increased from 37.5% to 50.8%.

Food processors play an important role in avoiding food intoxication during food production and distribution. These people can cause cross contamination of raw and processed food during insufficient cooking and food storage (Ehiri and Morris, 1996; Abdalla et al., 2009). Sufficient personnel hygiene of food sellers and appropriate food applications can minimize the transfer of pathogens causing foodborne diseases (Evans et al., 1998; Medeiros et al., 2004). Besides hands which is important relating with disease infections, stool, face, and skin are also important transfer sources for microorganisms. Among these microorganisms, *E.coli*, *Salmonella*, *Shigella*, *Campylobacter*, and *S.aureus* are important for consumers regarding formation of foodborne risks (Abdalla et al., 2009; Tambekar et al., 2011). In order to reduce especially the risk of cross contamination, education should be given to food processors about washing hands correctly, effective cleaning, and sanitation procedures should be applied (Sneed et al., 2004).

Samapundo et al. (2015) reported in their study made in Haiti that 60% of foodborne diseases were caused by flies and other animals and that 65% arose from lack of drinking water. They also reported that food were served with bare hands, and that sellers did not wash their hands after touching money, and that 70% of sellers did not freeze the cooked food. Silva et al. (2014) mentioned that in Brasil 22.6% of street food sellers did not disinfect their hands while working and that 80.2% touched food and money at the same time. In their study, they emphasized that many of the street food sellers worked under poor hygiene conditions and they stated the socio economical importance of street food sector.

Food and drinks prepared on the streets are usually sold within aluminium packaging, nylon bags, and newspapers (Adiloğlu, 2009). Muinde and Kuria (2005) observed that in Kenya, raw materials and equipment used were not washed regularly and that cooked food were stored at environmental temperature within plastic cases, pitchers, and buckers with no covers. Besides, they also emphasized that 85% of food serving places were next to carbage and waste cans, that the food containers were not clean, that the sellers did not pay attention to their personnel hygiene, and that they did not wear apron, cap, or gloves.

Urbanization and increase in population spreading in many countries in recent years are influential in the development of street food as an illegal sector (Omemu and Aderoju, 2008; Chukuezi, 2010). Food contamination can occur during the steps related with production, processing, and preparation for consumption. It is determined that in many countries national authorities have prepared legislations to reduce contamination during food production and processing stages. Besides, specific legal regulations were not determined for people selling these products (Muinde and Kuria, 2005; Omemu and Aderoju, 2008).

In another study, it was seen that 95% of street food processors did not have sufficient information and that 88% applied wrong food safety methods (Nguyen et al., 2010). Besides, it was determined in several studies that food sellers did not have adequate information regarding pathogens (Askarian et al., 2004; Gomes-Neves et al., 2011). Liu et al., (2014) determined that usage of poor quality raw materials, inefficient audits, insufficient infrastructure at places where street food is sold, and insufficient sanitation knowledge among street food sellers all form risks for food safety. It was emphasized that to increase food safety knowhow and consciousness of street food sellers in China, a national program needed to be formed. Food and Agriculture Organisation (FAO) prepared a detailed report regarding quality and safety of street food in order to help local authorities of the countries. The fact that many of the street sellers work under poor and unhealthy conditions, and that they have insufficient knowhow about food hygiene and sanitation has led FAO to take actions and it was ensured that these people are eager to education. Within the scope of these works FAO and World Health Organization (WHO) have brought in regulations like safety rules (WHO, 1996), five conditions for safe food (WHO, 2007), Hazard Analysis and Critical Control Point (HACCP) based sanitation strategies, (FAO, 2009) and education (WHO, 2010).

Besides, FAO has activated many projects to enforce food quality control capacity of local authorities (FAO, 2011).

3. Conclusions and suggestions

Street foods are foods and beverages that are sold in the street and other open public spaces like schools, bus stations, train terminals, and entertainment places. They are ready to consume, without the need for any processing or preparation. Studies have shown that about 2.5 billion people consume street food around the world. Although consumption keeps on spreading, required and sufficient legal regulations and rules regarding safety measures have not been set and this situation creates health risk relating with street foods. Studies have shown that in most countries' policies there is no legal arrangement for food safety and application or the sale of street food.

Besides, microbial contamination, usage of illegal chemical additives, and environmental pollution are the main threats for street food. In many studies conducted, it was stated that food safety knowledge and applications of street food sellers were at poor levels. Most street sellers did not have adequate information about hygiene rules for food preparation, processing, servicing, and storage stages. For this reason, educational programs must be prepared for street sellers, food preparation and storage conditions must be improved, sufficient hygiene and sanitation should be provided, and waste removal facilities should be enhanced. Successful food hygiene education and knowledge about food hygiene practices due to this education are important in the prevention of foodborne diseases around the world. Furthermore, regarding street food, detailed food hygiene regulations and food safety system should be in force and should be applied.

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