



Urban street foods in Shijiazhuang city, China: Current status, safety practices and risk mitigating strategies



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ABSTRACT

Street foods often reflect traditional local cultures and offer a unique cultural experience to tourists and even to ordinary consumers. With the increasing pace of globalization and tourism, the safety of street foods has become one of the major concerns of public health. There is an urgent need, in China, to establish a national program to raise the food safety awareness and knowledge of street food vendors. The safety and hygiene status of street foods in Shijiazhuang city was investigated. Data on the street food vendors' food safety knowledge and practices, inspectors' regulatory capacity and consumers' purchasing habits were collected. Potential hazards in the preparation and sale of street foods were analyzed and strategies for ensuring the safety of street foods were recommended. The study showed that the street food safety risks are primarily due to the use of unqualified raw materials encouraged by ineffective inspections, poor infrastructure at the street food vending sites and lack of sanitation knowledge among street food vendors. In order to prevent street foods from being contaminated, more stringent and effective routine supervision and food safety practices should be adopted and the environmental conditions and facilities should be improved. Regular training in food processing technology, food safety knowledge and practical food safety evaluation methods should also be strengthened among street food vendors and food safety inspectors.

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1. Introduction

Street foods (SFs) are now sold around the world (WHO, 2010). In China, you can enjoy a wide variety of SFs such as Yangrou Paomo (Pita bread soaked in lamb soup), Goubuli Baozi (a famous brand of steamed stuffed bun), Lanzhou Lamian (a type of handmade noodle) and other local delicacies. Due to their low cost and convenience for both sellers and buyers, most SFs are undeniably popular. It is a common practice for SFs to be prepared and sold on the streets or in other public places such as school areas and bus terminals with poor sanitary conditions. Consequently, SFs have the potential to get contaminated, leading to food-borne illnesses.

Globally, SF safety and quality have received increasing attention in recent years. In order to ensure SF safety, FAO/WHO have developed many guidelines, such as safety requirements (WHO, 1996), five keys to safer food manual (WHO, 2007), HACCP-based sanitation strategies (FAO, 2009), and education and training program (WHO, 2010). Further, FAO has implemented several projects to strengthen the quality control capacity of local authorities (FAO,

2011). China has taken proactive measures for SF safety under the Food Safety Law. Detailed management measures and requirements have been developed and implemented (WHO, 2012). But it should be noted that these are far from enough to ensure SF safety.

It has been proved that improper food handling, poor personal and environmental sanitation, and inadequate infrastructure such as drinking-water supply and garbage disposal are the main risk factors associated with SFs (FAO, 2011; WHO, 2010). Food safety knowledge and sanitation practices of SF vendors in different countries have been widely studied (Abdalla, Suliman, & Bakhiet, 2009; Choudhury, Mahanta, & Goswami, 2011; Gorris, 2005; Grunert, 2005; von Holy & Makhoane, 2006; Kealesitse & Kabama, 2012; Omemu & Aderoju, 2008; Rane, 2011) and it has been shown that the majority of SF vendors are lack of appropriate knowledge about the hygiene and sanitation practices, which makes it more difficult for them to ensure the SF safety and quality.

In China, the overall food safety has been greatly improved and there are some on-going efforts to raise public food safety awareness. However, food safety crimes such as meat adulteration and contaminated bean sprout processing still occur frequently, arousing public panic about food safety issues (Tian, 2013). Considering the diversity, mobility and temporary nature of SFs,

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generally speaking, it is very complex and difficult to control a large number of SF vending operations and ensure SF safety. Hence, necessary measures are needed to improve the SF hygiene condition and safety for facilitating China's sustainable economic and tourism development.

To our knowledge, in China, limited data on the food safety knowledge and sanitation practices of SF vendors are available, the sanitation and safety inspection techniques of food safety inspectors remain almost totally unexplored, and the practical guidance for SFs is largely lacking. This study therefore attempts to gain insight into the current status of urban SFs in Shijiazhuang and provide some data so as to facilitate the development of safety management measures. The awareness and knowledge of food safety of vendors, food inspectors and consumers were assessed, and the potential contaminant sources in different sectors of SF supply chains were analyzed so as to identify some major hazard factors. Then recommendations for increasing the SF safety were made.

2. Materials and methods

2.1. Vendor questionnaire

The survey was conducted to evaluate the food safety knowledge and awareness of SF vendors in Shijiazhuang city, China. 50 SF vendors operating on the major streets, or near open air market, schools and bus terminals were randomly chosen from four districts: Qiaodong, Qiaoxi, Xinhua, Changan and Yuhua in Shijiazhuang city to participate in the survey.

The SFs the vendors sold were Steamed stuffed bun, Dumplings, Donkey burger, Sesame seed cake, Egg pie cake, Pita bread soaked in lamb soup, Xinjiang kebabs, Handmade noodle, etc. Of the respondents, 56% were males, 18% were females and 26% were married couples. Most of them (94%) were married and 78% were 35–54 years old. The questionnaire adopted to collect data was related to general food safety knowledge such as personal hygiene, food-borne illness, cross contamination, glove use, cleaning and sanitizing, sanitation practices and food handling practices.

2.2. Consumer questionnaire

In order to investigate consumers' attitude towards SFs, motivation to buy SFs and food safety knowledge, we conducted a survey of 1000 adult consumers in Shijiazhuang city, Hebei, a major food production province in China. The first section of the questionnaire is personal information related to gender, age, income, educational background, marital status and household size. The second section is information on food purchase decisions. The factors influencing food choices were designed based on food choice questionnaire developed by [Steptoe, Pollard, and Wardle \(1995\)](#) including convenience, sensory appeal (appearance, taste, smell, texture and sound), price, nutritional values, mood, familiarity, image of SFs and safety. The last section is on food sanitation knowledge, concerns and attitudes to food safety. In order to find respondents' attitude toward food safety, concerns and safety knowledge, a series of "Yes", "No" or an open ended questions were asked. Besides, a five-point Likert rating scale, ranging from one (1) "strongly disagree" to five (5) "strongly agree" was also used to determine respondents' attitudes toward SF safety. The main questions are as follows: (1) Do you like to eat SF and why? (2) Do you have any comments or suggestions for the food you like? (3) How to avoid cross-contamination properly in food storage and preparations to keep food safe? (4) Can you judge the quality of SFs by sensory evaluation methods? (5) Which of the following factors are you concerned when buying SFs (pesticide

residue, usage of food additives/adulterants, bacterial contamination, GM ingredients, food handling practices)? (6) SFs are safety enough. (7) SF safety inspections should be carried out more efficiently. (8) There is enough information on SF safety available for consumers at the marketplace. (9) Consumers should follow safe food handling practices while preparing and handling foods at home.

2.3. Field survey

Field survey for determining food safety practices of SF vendors was conducted based on an observation checklist. Personal hygiene, food handling practices, sanitation practices, environmental status, raw material purchasing and utensils used were observed. Then the potential hazards in the purchase, preparation, storage, service sectors were assessed. The following items were included in the observation checklist. ① Personal hygiene. Such as wearing an apron or overall, washing hands before handling foods or after using the toilet and handling contaminated materials. ② Handling and sanitation practices in the stages of SF preparation, storage and vending. Such as washing cutting boards, raw materials, skewers, dishes and other utensils; touching foods with bare hands; cutting raw meats, fruits and vegetables on the same cutting board; separating fruits and vegetables from raw meat; adopting low temperature storage and protective measures. ③ Availability of facilities and basic infrastructure for sanitation practices. Such as potable water access, electricity, drainage system, waste containers, environmental conditions of the working area. ④ Raw materials and ingredients. Surveyors were required to observe and record all the actions and phenomena they noticed.

2.4. Interview survey

To collect data on the situation of pesticide application on vegetables by farmers, face to face interviews by trained investigators were conducted in Zhengding district of Shijiazhuang city and 12 villagers from different natural villages were interviewed. The questionnaire is mainly on the variety of pesticides they used, the common practices they adopted in handling and use of pesticides, and factors influencing pesticide selection and buying decisions.

Similarly, interviews with 12 food safety inspectors were also conducted. The data collected include general information such as educational background and food company work background, food safety knowledge, hazard detection techniques, training in food safety inspection, the difficulties they met in the inspection, suggestions and expectations.

2.5. Statistical analysis

The results of the survey were collected in excel sheets and imported into the statistical package for the social sciences (SPSS version 12.0) and then series of statistical analysis were applied to identify the key factors and major impediments of ensuring food safety. Descriptive statistics were used to summarize the variables of interest and determine relationships between them. Statistical significance was identified at the 95% confidence level ($P \leq 0.05$).

2.6. DNA isolation

18 kebab samples, triplicate sampling pattern, were obtained from four barbecue stalls and two kebab shops. 3 samples were collected from every sampling site. To obtain a representative sample, all raw meat threaded on one skewer was blended thoroughly in a mixer mill (Restch MM400, Germany). Then, DNAs in

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