

## Research Article

# Survey on the Microbial Quality of Traditional Foods Sold by Street Vendors in Qatar

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## Abstract

During the past few years the traditional market of Qatar has become an attraction to many customers who eat from the numerous women street vendors selling Qatari traditional dishes. To gain an understanding on the safety of these street vended foods, we designed the study to test microbiological quality of 14 different Qatari foods sold in Souk Wagif, the main traditional market in Qatar. This study was conducted to mainly identify presence or absence of microbial pathogens. A total of 56 samples were purchased from 10 different street vendors and the samples were collected randomly on different days. The samples were tested for microbial contaminants at Central Food Laboratories, Doha, Qatar. The qualitative study was conducted using Real Time-PCR to screen for; *Salmonella* spp., *Listeria monocytogenes*, *Escherichia coli* and *E. coli* O157:H7. Out of the 56 samples, only two samples "Biryani" and "Khabess" contained *E. coli*. However both samples tested negative for *E. coli* O157:H7. The microbial contamination of the Qatari traditional street vended foods was 3%. This result may be attributed to the food safety training requirement set by the regulatory authorities before issuing any license to food handlers in Qatar as well as the food inspection conducted by the Food Health Inspectors on a regular basis.

**Keywords:** Microbiological quality; Street vended food; Traditional dishes; Qatar

## Introduction

Street foods are ready-to-eat foods and beverages prepared and/or sold by vendors, especially in streets and other similar public places [1,2]. Street foods are known to be popular due to their accessibility, low cost, variety and nutritional value, however sometimes they are considered unsafe due to unacceptable handling practices of food servers. Street foods are mostly prepared and distributed in mobile and temporary shops that lack the major facilities and infrastructure required to ensure safe preparation of the foods [3]. The proliferation of street-food vendors is increasing because this business is very profitable and requires very low capitalization [4]. Nonetheless, many reports have shown that street vendors lack knowledge of food hygiene, thus they are unaware of basic food-safety issues [3].

Numerous reports have revealed the risks associated with consuming contaminated street-vended foods that have high levels of coliform bacteria and pathogenic bacteria, such as *Escherichia coli*, *Salmonella* spp., *Staphylococcus aureus*, *Bacillus cereus*, *Clostridium perfringens*, and *Vibrio cholera* [4-6]. In addition, the exposure to the above organisms could contribute to the increased prevalence of multi-drug resistance in these organisms posing a real danger to the public health of the general population [7,8].

Mosupye and Holy [9] indicated that street foods might increase health problems and these foods often were unsafe for human consumption. They studied 132 samples of street foods from two street vendors in South Africa and found a significant number *E. coli* spp. in these types of the foods. Cardinale et al. [10] pointed out that street foods were dangerous and could raise health risks. The

investigators examined samples of foods from 148 street-restaurants in Dakar and found presence of harmful bacteria. The source was traced back to poor personal hygiene of the workers. They did not wash their hands, their clothes were filthy and they did not wash the vegetables before serving food to the customers. A study conducted by Hanashiro et al. [5] confirmed the findings of earlier research. His study was aimed to assess the microbiological quality of street foods selected from a restricted area in Sao Paulo, Brazil. About 35% of the samples tested were considered unsafe for human consumption. Another cross sectional study assessed the microbiological quality of local food items vended by the school-based street food vendors in Dhaka City [11]. Out of the 110 food samples collected for laboratory analysis, half of them (44.5%) were unsafe for human consumption. The study reflected the poor microbiological quality of the school-based street vended foods; thus indicating a health threat to the school children of Dhaka City. A similar study was conducted in 2013 in Taichung, Taiwan, and Laguna, Philippines [12]. In the same study, different bacterial contamination patterns were observed in hot-grilled and cold-cooked street foods. The researchers noted that many of the samples were unsafe due to presence of high levels of pathogenic bacteria.

Most studies on street foods concluded that it could be harmful to health due to presence of harmful pathogenic microorganisms in foods. The common reason for the unacceptable microbiological quality was unhygienic food cooking and handling practices.

The phenomenon of street food vendors in Qatar is not popular when compared to other countries however there is a growing market for street vended foods due to the influx of work immigrants and

**Table 1:** List of tested street foods included in the study with a description of the major components in each.

Traditional food	Major components
Macaroni with Chicken	Pasta, chicken, oil, salt and spices
Madrooba	Meat, cereal, vegetables oil, salt and spices
Lugaimat	Flour, oil and sugar
Balaleet	Flour, sugar, ghee and eggs
Hesso	Cereal and sugar
Khanfarroosh	Flour, oil and sugar
Sago	Sago and sugar
Biryani	Rice, chicken, vegetables oil, salt and spices
Harees	Cereal, meat oil, salt and spices
Margoog	Rugag Bread, meat, vegetables oil, salt and spices
Kebab Nekhi	Chickpea and vegetables
Asidah	Flour and sugar
Harees	Cereal, meat, ghee oil, salt and spices
Khabees	Flour and sugar

tourists coming into Qatar. The street food vendors at the Souk Wagif are mainly sold by women who prepare the foods at home and then transport them to the market in insulated containers. The objective of this study was to obtain data on the microbiological quality of traditional foods sold in one of the most important markets in Qatar, Souk Wagif. The microorganisms to be analyzed were; *Salmonella* spp., *Listeria monocytogenes*, *Escherichia coli* and *E. coli* O157:H7.

## Material and Methods

### Study site and sampling

The qualitative study was conducted by the Department of Health Sciences, College of Arts and Sciences, Qatar University, Qatar in collaboration with Central Food Laboratories, Department of Food Safety and Environmental Health, Supreme Council of Health, Qatar. The food samples were collected from Souk Wagif. The duration of the study was 2 months. For this study, women, food vendors were randomly selected and the street foods were restricted to those prepared at home and transported to the market. The traditional composite dishes included in the study were 14 collected from 7 street vendors. The total of number of samples analyzed were 56 samples. Table 1 shows the list of the Qatari traditional foods included in this study. All these foods are cooked composite dishes.

### Food analysis laboratory procedures

The food samples were collected in the containers that were used to provide foods to the consumers. They were then placed in thermo insulated cool boxes with ice packs until delivery to the Central Food Laboratories within a maximum of six hours of collection. Food samples were processed in the laboratory immediately upon receipt. However, if a laboratory analysis was postponed due to the delayed arrival of samples, those samples were refrigerated at 0°C until examination. Microbial contamination in food samples was assessed using StepOnePlus™ Real-Time PCR System. The procedure aimed to examine presence/absence of four different pathogens; *Salmonella* spp., *Listeria monocytogenes*, *Escherichia coli*. PFGE –Pulsed Field Gel Electrophoresis were used to identify DNA fingerprint of *E. coli* O157:H7.

## Results and Discussion

### E. Coli

All tested food samples were negative for microbial contamination except Biryani and Khabees. Both these foods tested positive once for *E. coli* as shown in Table 2. However, when analyzed using PFGE both tested negative for pathogenic bacteria *E. coli* O157:H7. Laboratory analysis shows that 3.4% of the total number of samples were positive for *E. coli*. The results were in agreement with the findings of Cho et al. [4] for hot street dishes sold in Korea, where *E. coli* contamination was 3%. However, in his study the *E. coli* strain was of the pathogenic O157:H7. In another study conducted by Diaz-Lopez et al. [13], the researchers reported that *E. coli* O157:H7 was found in 11.6 % of grilled chicken sold by street vendors in Mexico. Canizalez-Roman et al. [14] findings of *E. coli* O157:H7 were in 7.9% of the food samples tested in their study in Mexico. In South Africa the prevalence was 13% of the food samples which tested positive for non-pathogenic *E. coli* [9] while Manguiat and Fang [12] reported the presence of non-pathogenic *E. coli* contamination in stews prepared in the Philippines was 72%. In a study carried out in Brazil by Harashino et al. 22.5% of the street foods in the study were contaminated with *E. coli*.

### Listeria Monocytogenes

*L. monocytogenes* was not detected in any of the food samples collected from Souk Wagif as shown in Table 3. These findings agree with those reported by Diaz-Lopez et al. [13] in Mexico and Lidya and Fang in Taiwan and the Phillipines. On the other hand, Ologhobo et al. [15] reported that the *Listeria* was isolated from Nigerian street roasted chicken. Jamali, H. et al. detected *L. monocytogenes* in 11.4% of in Ready-To-Eat (RTE) foods samples sold by street vendors in Malaysia. Among the studied RTE foods, salads and vegetables had the highest prevalence of *L. monocytogenes*, followed by chicken and chicken products. Salihu et al. reported the presence of *L. monocytogenes* in 25% of smoked fish in Nigeria.

### Salmonella

There was no *Salmonella* detected in the food samples analyzed. However in a similar study conducted by Diaz-Lopez et al [13] and Yan et al [16], they reported high counts *Salmonella* spp. in street vended foods in Mexico and Northern China, respectively. Cardinale et al. [10] found that 20.1% of the street vended foods and 10.1% of poultry based dishes were contaminated with *Salmonella*. In separate studies conducted in Japan [17-20]. *Salmonella* spp. Contaminated most of the poultry meat dishes. Most studies [10,13,17] attributed bacterial contamination to workers unhygienic food preparation methods which included not washing their hands, dirty clothes or that they did not wash the vegetables. The researchers in this study

**Table 2:** Comparison of E.Coli contamination between Qatar and other countries.

Country	E.Coli
Qatar (2013)	3 % (NP E.Coli )
South Africa (2000)	13% (NP E.Coli )
Taiwan & Philippines (2013)	72% (Taiwan ), 50 % (Philippines ) (NP E.Coli )
Mexico (2011)	11.6% (E.Coli O157:H7 )
Mexico (2013)	7.9% (E.Coli O157:H7)
Korea (2011)	3 % (E.Coli O157:H7 )

**Table 3:** Comparison of *Listeria monocytogenes* contamination between Qatar and other countries.

Country	<i>Listeria monocytogenes</i>
Qatar (2013)	Not detected
Taiwan & Philippines (2013)	Not detected
Mexico (2011)	Not detected
Korea (2011)	Not detected
Malaysia(2013)	11.4% ready-to-eat (RTE) foods samples contaminated with <i>L. monocytogenes</i>
Nigeria (2008)	Presence of <i>L. monocytogenes</i> in 25% of smoked fish.

**Table 4:** Comparison of *Salmonella* contamination between Qatar and other countries.

Country	<i>Salmonella</i> contamination
Qatar (2013)	Not detected
Mexico (2011)	High prevalence of <i>Salmonella</i> in grilled chicken from street vendors in Mexico.
Northern China (2010)	20.9% <i>Salmonella</i> contamination in the foods analyzed
Senegal (2005)	20.1 % of total 148 street-restaurants studied and 10.1% of poultry dishes were contaminated with <i>Salmonella</i> .

did not explore the factors contributing to microbial contamination of the analyzed foods.

From observation of street vendors the researchers noticed that there was no addition of spices or condiments to the foods after serving it, therefore reducing the risk of cross contamination. During transportation and handling, the foods were kept hot at a temperature above 65°C rendering the foods safe to eat. Despite the low microbial contamination rate, there should be continuous monitoring of the food safety aspects of food as a preventive measure to avoid any food borne illnesses. The low microbial contamination rate could also be attributed to the training requirement and the strict license requirements to open a food business as mandated by the Supreme Council of Health and the Ministry of Trade. In addition, the Municipality performs regular inspection visits by health inspectors to monitor the overall quality of street vended foods. Over the past decade, employment of risk management tools and strengthening of the infrastructure in food safety in the MENA region have been established [21].

## Conclusion and Recommendations

Street vended foods were analyzed for microbial pathogens from different vendors in Souq Waqif. The collected samples were analyzed for presence or absence of *Salmonella* spp., *Listeria monocytogenes*, *Escherichia coli* and *E. coli* 0157:H7.

In this study, *E. coli* was present in two food samples collected on two different days. The study did not isolate any of the other organisms in the tested food samples.

Although the vendors follow the safety food precaution, two samples “Biryani” and “Khabess” were found to contained a microbial contamination. This could be related to many factors such as poor personal hygiene, dirty utensils, vegetables not washed properly, multifunctional hands, or personal health status of vendors. Safe food storage temperatures were rarely applied to street foods.

Food borne illness of microbial origin is a major international health problem associated to food safety and an important cause of death in developing countries. The vendors are usually less educated working under crude unsanitary conditions, increasing the risk of

acquiring food borne diseases in the people.

The low microbial contamination rate in this study could be traced back to the fact that the vendors were licensed by the Ministry of Municipal, all of them passed a medical checkup and they were found fit to work. More importantly, they followed the food safety, food protocols such as washing hands, wearing gloves, nails kept short, and maintaining a clean environment for serving the food. The vendors were very careful while serving the food for customers, they did not remove or open the cover; they just opened very small space while serving to make sure that the food stays hot.

In conclusion, the researchers suggest the development of educational campaigns to educate the general population about food safety and its application from household to retail level. Local governments could provide support for small food business in terms of temperature control utilities. Finally, this will assist in the implementation of a systematic evaluation of food borne pathogens in all food service organizations and all food handlers working in food service. There should also be a high priority given to street vended foods due to the high susceptibility of these foods to microbial contamination.

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