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**Restaurant Environment and Its Possible Effects on Food  
Safety: Case Study of Restaurants in Palestinian  
Ramallah-Bireh District**

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المجلد (41)، العدد (3)، أيلول 2007

Volume (41), Number (3), September 2007

Established 1965

ISSN: 0446- 9283

# Restaurant Environment and Its Possible Effects on Food Safety: Case Study of Restaurants in Palestinian Ramallah-Bireh District

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## Abstract

**Objective and Methods:** This study examines the infrastructure of restaurants, in addition to some other related factors that affect the food safety in Ramallah-Bireh District in Palestine, taking into consideration the effect of restaurant location in villages and towns, refugee camps, and cities.

**Results:** It was found that more than the half of the restaurants have a small area that ranges between 4 to 50 square meters; more than two thirds of these restaurants are unlicensed; 81.7% do not have a special storage area; the main sanitary facilities for the kitchen were not available in many of them; and 21.8% do not have toilets. It was found that 65.5% of the restaurants lack cleanliness for different reasons. Nearly 14% of the restaurants are damp, which was mostly noticed on the walls of kitchens.

**Conclusion:** All these indicators could have negative impacts on the safety of foods, and should be taken into consideration for improving the infrastructure and food safety of these restaurants.

**Keywords:** Restaurants, location, infrastructure, sanitation, Palestine.

*(J Med J 2007; Vol. 41 (3): 145- 152)*

*Received*

*Accepted*

*September 18, 2006*

*April 4, 2007*

## Introduction

Contaminated foods cause different diseases and sickness to their consumers, reducing their performance and comfort. Food-borne diseases that is resulted from the contamination of foods can be considered as the main source of morbidity and mortality in the world.<sup>1, 2</sup> The number of sickness cases that result from food contamination differs from one country to another, and it depends on several factors, out of which new kinds of pathogens emerge, such

factors are like; ways of food storage, the availability of suitable sanitation, the degree of people's awareness of the methods of securing food safety, and the diagnosis and registration of sickness cases that result from food contamination.<sup>3</sup>

The high prevalence of diarrhoeal diseases in many developing countries suggests major underlying food safety problems.<sup>4</sup> According to Peter Ben Embarek, WHO Food Safety Department scientist, the yearly mortal rate caused by food and water-borne diarrhoea in the

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Near East is almost 260,000 people.<sup>5</sup> In the United States of America, the number of sickness cases that is resulted from food contamination was estimated at 76 million cases of illness, 325,000 cases of hospitalization, and 5,000 cases of mortality.<sup>6</sup>

There are many factors and conditions that may lead to food contamination in restaurants such as: insufficient architectural planning of the restaurant from the beginning, narrow space, unavailability of suitable infrastructure, unsuitability of the building for this purpose, in addition to lack of hygiene and others.<sup>7</sup> Restaurant licensing can help in minimizing the possibility of food-borne illness by setting up and operating the restaurant in a safe, sanitary, and healthy manner, as there are basic requirements for obtaining the license. In Palestine, restaurant licensing is a mandatory requirement for operating a restaurant.<sup>8</sup> In addition, good planning helps to ensure a suitable infrastructure for the restaurant, including space and facilities for storing, food preparation, cooking, food consumption, washing dishes and equipment, a warehouse, toilets, washbasins, in addition to the choice of a suitable location for the restaurant.<sup>9</sup>

The aim of this study was to evaluate the current conditions of restaurants in Ramallah-Bireh District in Palestine with regard to their infrastructure, licensing, cleanliness, and other environment-related factors that affect food safety.

### **Methodology**

The population of this study comprises all restaurants in Ramallah-Bireh District, 236 in number, distributed in the cities, towns, villages, and refugee camps. The study included 202 (85.6%) restaurants, as the reject percentage was 14.4% (34 restaurants). During the field work, the key persons (owners or managers) of the restaurants were cooperative and happy to facilitate the process of data collection.

The instrument for our data collection was a semi-structured questionnaire that consists of two parts. The first part was designed to be answered by the key person in the restaurant through a personal interview, and the second part was a checklist used for recording field observations. This questionnaire included many aspects such as restaurant licensing, area, storing places, kitchen, preparation area, cracks in the building, special area for workers, dampness in the restaurant, toilets, and cleanliness of the restaurant in general.

Pilot field visits to five restaurants were conducted, and five questionnaires were filled in order to test the suitability of the questionnaire for restaurants in Ramallah-Bireh District. Some modifications were made on the questionnaire and on the way how it should be completed. Eight field workers were thoroughly trained in all the aspects of data collection before the execution of the field work.

The field work of the study started on December 6<sup>th</sup>, 2004 and finished on March 2<sup>nd</sup>, 2005. The data were directly collected by the fieldworkers. The questionnaires were reviewed during the field work by the fieldworkers, and again before data entry by the main person who entered the data into the computer. Then they were coded, and a guideline was prepared for that purpose. The incomplete or inaccurate questionnaires were handled by coding the unclear answers as missing data.

The coded data of the questionnaire were entered into the computer and analyzed using the Statistical Package for Social Sciences (SPSS) version 12.0.

In addition, an in-depth interview with the head of the Environmental Health Department in Ramallah,<sup>8</sup> who is responsible for the food sanitation and safety system in the West Bank of Palestine, was conducted on January 24<sup>th</sup>, 2006 in order to clarify and explain some related subjects.

## **Results**

**Restaurant Size:** The estimated areas of the smallest and largest restaurant were 4 and 935 m<sup>2</sup> respectively, and the mean area was 94.4 m<sup>2</sup>. The area of 57.5% of restaurants was between 4 and 50 m<sup>2</sup>, while the percentage of restaurants with an area greater than 100 m<sup>2</sup> was 25.7% as shown in table (1).

**Restaurant Licensing:** Only 67 (33.2%) restaurants from the study population do have a valid license, out of which only 9.4% were fixing the license in clear places in the restaurant as shown in table (1). Nearly 17% of restaurant owners did not answer the question whether their restaurant was licensed or not.

**Storage of Foodstuffs and Cleaning Materials:** Out of the 202 restaurants surveyed, only 37 (18.3%) restaurants have a special store for foodstuffs. Of those few restaurants that have a storage room, many do not satisfy the conditions specified for storage, as shown in figure (1). It was found that 93.3% of the restaurants have cleaning materials for their equipment, utensils and floors, but only 75.4% of the restaurants store the cleaning materials in a proper way.

### **The Kitchen and Its Facilities:**

#### **a) The Kitchen**

It was found that there is a kitchen for food preparation in 168 (83.2%) of the restaurants of the study. Unfortunately, major facilities were missing in many of them as shown in table (2).

#### **b) Salads Exhibitor**

The number of restaurants that have a salads exhibitor were 128 (63.4%), out of which 98 (76.6%) have suitable salads exhibitors, where the salads are protected from the pollution that may result from customers' direct contact with them. In the other 30 (23.4%) restaurants, the salads are uncovered and not protected.

#### **c) Thermometer**

Thermometers for food preparation in kitchen were found only in 11 restaurants, and most of

the key persons in the restaurants were surprised by the question about the existence of thermometers in their restaurants.

### **Miscellaneous Items:**

#### **a) Solid Wastes**

Most of the restaurants (95.1%) have wastebaskets or containers for solid waste collection, out of which 82.8% have bags inside them. In the other restaurants that do not have baskets for solid waste disposal, it was noticed that the solid wastes were spread all over the restaurants; which made them dirty and untidy.

#### **b) Special Rest Area for the Employees**

Only 20 (9.9%) of the restaurants have a special area for the employees to have their meals, to smoke, change clothes and rest.

#### **c) Toilets**

Of the 202 restaurants, 158 (78.2%) had toilets as shown in figure (2); 109 (54.0%) have only one toilet, and 49 (24.2%) have two toilets or more. The availability of the basic requirements for restaurant toilets is summarized in table (2). For example, hot water for hand wash basins near toilets is available in only 82 (55.4%) out of 158 restaurants that have toilets.

#### **d) Crevices and Moisture**

Most of the walls, ceilings and floors of the restaurants were free from crevices and cracks. It was found that 28 (13.9%) restaurants are affected by moisture, mainly in the walls of the kitchen.

#### **e) General Cleanliness of the Restaurant**

It was found that 132 (65.3%) restaurants were unclean, while the rest were clean in general. The indicators used for determining the lack of cleanliness are:

1. Lack of kitchen cleanliness and arrangement as floor is unclean and kitchen vessels are not tidy and unclean.
2. Toilet is not clean as required and its situation is not suitable.
3. Sinks are not clean and there is no soap.
4. The restaurant floor is not clean and the situation of solid waste is not suitable.

5. The restaurant has only one room for preparing, it is crowded and storing foods inside it is not suitable.
6. The storage room is not tidy and materials are piled in an inappropriate way.
7. There is no sewage drainage for the sinks of kitchen or toilet.
8. The kitchen utensils are not clean.

According to the Environmental Health Department, Ministry of Health, Ramallah, Palestine,<sup>10</sup> the percentage of unaccepted tested food samples taken from the restaurants of Ramallah-Bireh district in 2005 were 32.6% for Total Aerobic Count (TAC); 59.8% for Total Coliforms (TC); 33.3% for Faecal Coliforms (FC); 0.9% for *Staphylococcus aureus* (Sa); 59.0% for yeasts and 15.8% for moulds.

**Table 1: Distribution of restaurants in localities according to area and license status, number and (percentage).**

	Area (m <sup>2</sup> )							License status		
	4-10	11-20	21-30	31-40	41-50	51-100	>100	total	Licensed	Not Licensed
<b>City</b>	4 (2.8)	19 (13.2)	18 (12.5)	17 (11.8)	17 (11.8)	23 (16.0)	46 (31.9)	144 (100.0)	51 (35.4)	62 (43.1)
<b>Village or town</b>	0 (0.0)	11 (23.4)	11 (23.4)	7 (14.9)	2 (4.3)	10 (21.3)	6 (12.8)	47 (100.0)	15 (31.9)	29 (61.7)
<b>Refugee camp</b>	3 (27.3)	4 (36.4)	1 (9.1)	1 (9.1)	1 (9.1)	1 (9.1)	0 (0.0)	11 (100.0)	1 (9.1)	10 (90.9)
<b>Total</b>	7 (3.5)	34 (16.8)	30 (14.9)	25 (12.4)	20 (9.9)	34 (16.8)	52 (25.7)	202 (100.0)	67 (33.2)	101 (50)

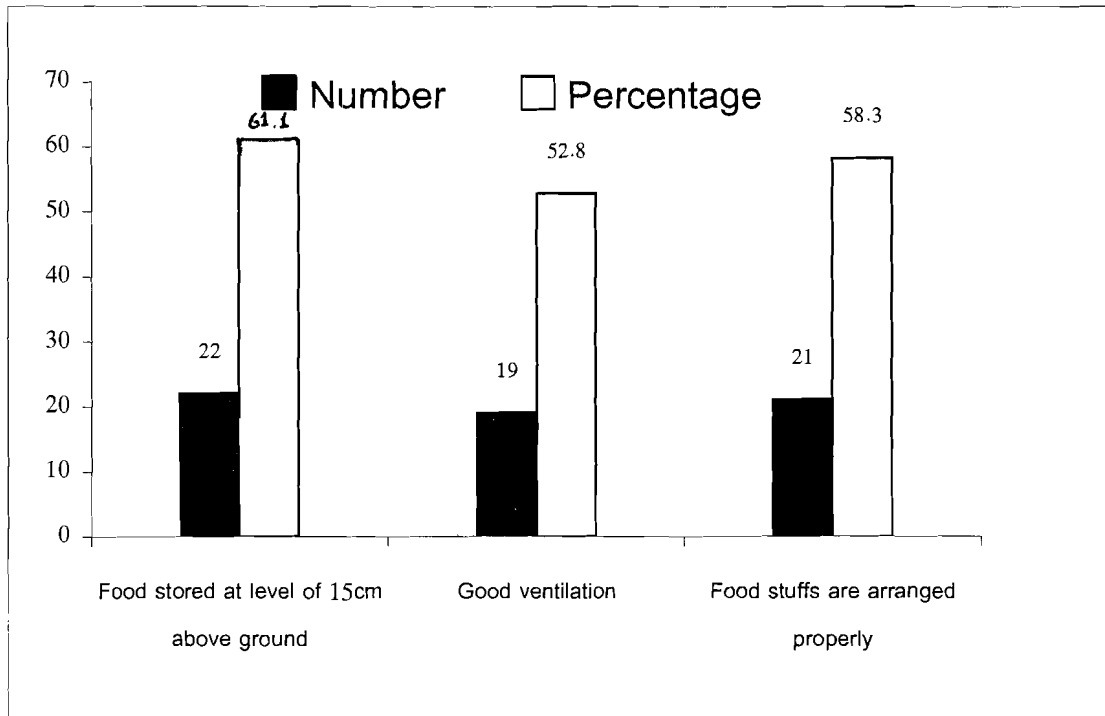
**Table 2: Distribution of restaurants by availability of necessary facilities in the kitchen and the basic requirements for toilet.**

Necessary facilities in the kitchen	Number	Percentage
Presence of hand wash basin	66 *	39.3
Presence of hand cleaning material	42 **	62.7
Presence of hand towels	39 **	59.1
Adequate ventilation system above the cooking area	107*	64.5
Basic requirements for toilet	Number***	Percentage***
Provision of toilets with water	157	99.4
Presence of hand wash basin inside or near the toilets	148	94.9
Presence of hot water for hand wash basins near toilets	82	55.4
Presence of cold water for hand wash basins near toilets	147	99.3
Presence of hand cleaning material for the hand wash basins near toilets	127	85.8
Presence of hand drier near the hand wash basins	112	76.2
Suitable ventilation for the toilets	79	52.3

\* Out of 168 restaurants that have a kitchen.

\*\* Out of 66 restaurants that have a kitchen and a hand washing sink.

\*\*\* Out of 158 restaurants that have toilets.



\* Note: the percentage in this table is out of 37 restaurants that have a storage area.

Figure 1: Number and percentage of restaurants that satisfy some necessary storage conditions.

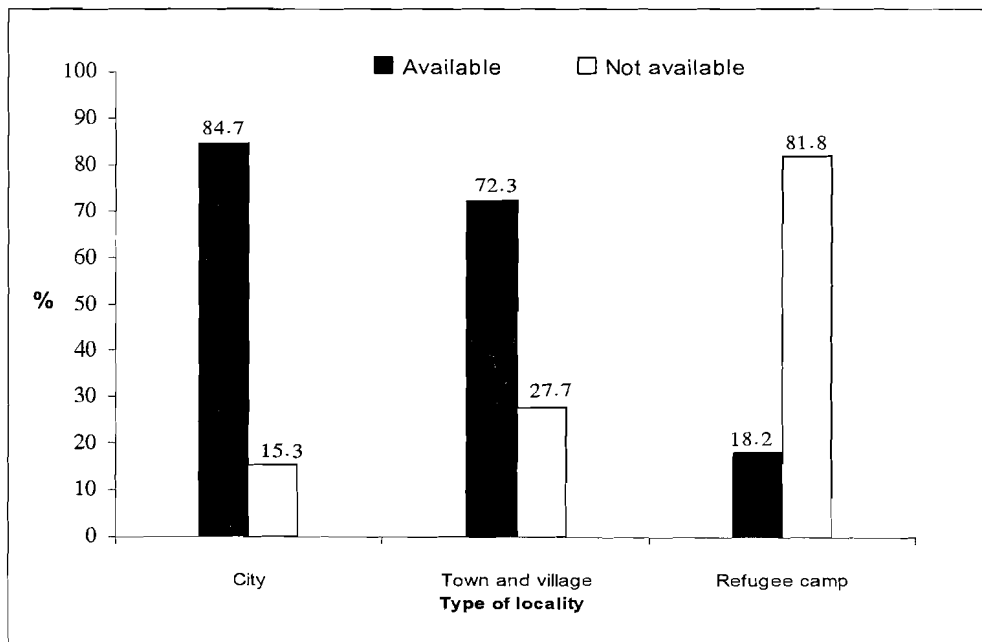


Figure 2: Percentage distribution of the availability of toilets in restaurants by locality.

## **Discussion**

The number of licensed restaurants in Ramallah-Bireh District is small. According to Fisher's Exact Test, it is found that there is a statistically significant relationship between the licensing of restaurants and the type of locality (Chi Square = 14.445,  $p=0.004$ ), as 35.4%, 31.9%, and 9.1% of restaurants in the cities, villages and towns, and refugee camps, respectively, were licensed as shown in table (1).

It was noticed that there is a statistically significant relationship between restaurant cleanliness and its license (Chi-Square = 16.096,  $P=0.000$ ), as the percentage of licensed clean restaurants was 82.1%, while the percentage of unlicensed clean restaurants was 52.5%. It was found also that there is a statistically significant relationship according to Fisher's Exact Test between the range of cleanliness indicators in restaurants and type of locality, (Chi-Square = 22.928,  $P=0.000$ ), as the percentage of clean restaurants were 75.0%, 46.8% and 18.2% in cities, villages and towns and camps, respectively.

The infrastructure such as the kitchen and storage area has a direct impact on food quality prepared and served in restaurants. It was found that more than 50% of the restaurants have a small area, and lack the necessary infrastructure like storage area. Normally, they serve national foods that are prepared and served without a place for customers to sit.

Having a sink for washing hands in the kitchen is essential for the safety of foods in restaurants and general hygiene in the kitchen, and the cleaning materials are very important for the disinfection of the workers hands. If the disinfecting material is not available, utensils and other equipment will serve as vehicle of food-borne pathogens and toxins.<sup>11, 12</sup> The absence of towels near the workers allows them to use their working clothes to dry their hands, and often their clothes are not clean.

According to Fisher's Exact Test, it was found that there is a significant statistical relation between the type of locality and the presence of a kitchen in the restaurant (Chi-Square = 12.827,  $p = 0.001$ ), as 11.8% of the restaurants in the cities, 23.4% in villages and towns, and 54.5% in refugee camps do not have kitchens in their restaurants. This relates to what was mentioned earlier about the small size of restaurant areas in villages and refugee camps.

The lack of good ventilation in the kitchen of 35.5% of the 168 restaurants that have a kitchen allows for the accumulation of oils, fats, fog, and odours; which may produce some harmful yeasts and moulds in foods. A significant statistical relation was found between the lack of a good ventilation system and the presence of humidity on the walls of the kitchen (Chi-Square = 6.139,  $p = 0.017$ ), as the absence of good ventilation increases the humidity on the walls.

There is also a significant statistical relation between the presence of toilets in restaurants and type of locality (Chi-square = 22.623,  $p = 0.000$ ). The percentage of restaurants with toilets is higher in cities than in towns and villages, and in towns and villages higher than in refugee camps as shown in figure (2).

Some of the basic requirements for toilets in the restaurants were fulfilled, while others were not. For example, there was water in 99.4% of the toilets, while hot water was not available in the sinks near the toilets in 55.4% of the restaurants. This indicates the lack of good planning, hygiene, and sanitation in many of the restaurants, which may negatively affect the quality of foods they offer, and may result in food-borne diseases.<sup>13, 14</sup>

Field observations indicate a serious problem with food handling in general, beginning with unsanitary kitchens, ending with questionable sanitary equipment and utensils. For example, hand-washing soap for use by workers and customers is often not available in many restaurants.



The presence of thermometers in only 11 (5.4%) of the restaurants disregards the real need for thermometers in restaurants. It was noticed that most restaurant owners and managers were unaware of the importance of thermometers in their restaurants, and most of them felt surprised when they were asked this question.

Normally, moulds and yeasts require a high moisture level, and grow with or without oxygen.<sup>15</sup> However, field observations denoted inadequate ventilation in 35.5% of the cooking areas in the restaurants that have kitchens, and in more than 50% of the storage areas, with high moisture levels in some of them.

The above-mentioned situation was reflected by the high percentage of unaccepted food samples taken from the restaurants in Ramallah-Bireh district in 2005. The results of this study completely agreed with a research conducted in the province of Karak in Jordan, in which it was shown that dairy products samples were highly contaminated because of the serious faults in production hygiene, unsatisfactory sanitation and unsuitable storage temperature.<sup>16</sup>

### **Conclusions and Recommendations**

The results of this study show that there is a lack of adequate infrastructure in a large number of restaurants in Ramallah-Bireh district, mainly in refugee camps and villages, and in those with small-size area. This situation could negatively affect the quality of food they serve. In order to improve the general conditions in the restaurants, the following recommendations could help:

- The Ministry of Health (MoH) should issue regulations and action plans for restaurants, supervise their implementation, and ensure a suitable infrastructure for them.
- The owners of restaurants should pay attention to the infrastructure of their restaurants and ensure that they always have the suitable environment.
- The owners of restaurants should take more care about cleanliness in their restaurants.

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