

Comparison of hygiene standards and food safety practices between sole-proprietor and corporate-managed restaurants in Lebanon

Dima Faour-Klingbeil and Victor Kuri
Plymouth University, Plymouth, UK, and
Ewen Todd

Ewen Todd Consulting, Okemos, Michigan, USA and
Michigan State University, East Lansing, Michigan, USA

Abstract

Purpose – The objectives of this study were to compare the hygiene standards and food handling practices between sole-proprietor and the corporate-managed restaurants in Lebanon and to determine whether the variations between both groups are explained by and directly related to the type of management.

Design/methodology/approach – An in-depth observation assessment of food safety environment and practices was conducted on a convenient sample of 50 food businesses in Beirut, which are typical of foodservice outlets in Lebanon and in many countries of the Middle East. The observation assessment checklist comprised six constructs of 2–7 components for analysis. It covered all areas including documentation and record-keeping requirements, which are crucial parts of a food safety system.

Findings – There was a significant difference in the visual assessment score between sole-proprietor (77.9 ± 18.4) and corporate group (48.5 ± 12.8). Food handlers' behavior and hygiene standards were significantly associated with the type of management. However, there were still critical gaps in the food safety performance of the corporate group suggesting other underlying factors than the type of management.

Practical implications – Additional elements were drawn from this study for future food safety culture research. Understanding the food safety attitudes and perception of risks of the management representatives, leaders, or food business owners is vital to develop appropriate food safety interventions and foster a positive food safety culture in the foodservice industry.

Originality/value – To the authors' knowledge, this is the first study not only in Lebanon (or MENA) but also in other regions to measure the association of management type, that is, sole-proprietor management and corporate management, with the food hygiene standards and food safety practices in the foodservice establishments. This paper presents new findings that will be of value for researchers in food safety and will complement the existing literature on food safety culture in the foodservice industry.

Keywords Foodservice, Observational assessment, Food safety practices, Hygiene standards, Food safety standards

Paper type Research paper

1. Introduction

Several studies showed that restaurants are important settings for foodborne disease transmission (Luo *et al.*, 2017; Lee and Hedberg, 2016). Foodborne outbreaks linked to food consumed in foodservice establishments (FSEs) were reported worldwide ranging from 25 percent in Europe to more than 50 percent in the United States (US) (Gould *et al.*, 2013; EFSA and ECDC, 2017). The typical causes of the microbial contamination of foods are an unsafe source of foods, cross-contamination, poor personnel hygiene practices, inappropriate food



storage temperatures, and insufficient cooking (Jones *et al.*, 2008; Todd *et al.*, 2010; Gould *et al.*, 2013). Food safety problems arising from food handlers' malpractices are thought to be preventable with strategies focusing on education and training. The latter proved to be efficient in enhancing food safety knowledge, but not necessarily in promoting safer practices (Soares *et al.*, 2012) due to various constraints. These included the work pressure, financial resources, and organizational factors such as the safety climate (Abidin *et al.*, 2014).

It is widely accepted that organizational food safety culture is a vital factor for improvement in food safety practices (Pragle *et al.*, 2007; Abidin *et al.*, 2014). In this context, top management's role and responsibilities in providing a supportive environment and adequate resources and skills to their managers are essential to create and maintain a positive food safety culture at all levels (Griffith *et al.*, 2010a). The terms food safety culture/climate have been used interchangeably in the literature. Flin (2007) and Guldenmund (2000) proposed that the safety climate is a situation determined by employees' attitudes toward the organization's safety at a given point in time based on a specific criterion. Neal *et al.* (2000) consider this to be a snapshot of the prevailing aspects of an organization's safety culture. However, Abidin *et al.* (2014) consider that food safety culture is more complex to measure than simple snapshots. This culture is a behavior-based system that focuses not only on the processes but also on the people and the organizational culture of the establishment.

Maintaining a positive food safety culture requires that businesses perceive food safety as equally important as their other business priorities. To be effective, this attitude needs to be translated in specific objectives that have high levels of compliance with documented systems and management sharing effective food safety systems and practices at all levels of the organization, not only management (Griffith *et al.*, 2010a; Neal *et al.*, 2012). Griffith *et al.* (2010b) identified six indicators or components in relation to food safety performance: management system and style, leadership, food safety communication, accountability, risk perception, and food safety environment as perceived by food preparation staff. Poor management commitment, limited support, and communication policy were demonstrated as causes of foodborne illness outbreaks and to a prevailing poor food safety culture (Powell *et al.*, 2011). Further contribution by understaffing could hinder and discourage food handlers from applying proper practices (Green *et al.*, 2007) and effective food safety documentation systems (Griffith *et al.*, 2010a, b). This is much likely to be the case in small sole-proprietor food businesses, where structured management, understaffing, and delegation of responsibilities prevail (Fairman, 2004) hampering a culture of food safety. Furthermore, the implementation of approved food safety systems is more often perceived as a burden for small and medium-sized enterprises (SMEs) than for larger companies or food manufacturers (Fairman and Yapp, 2004; Charalambous, 2011). Both SMEs and larger companies share factors that can interfere with a commitment to a positive food safety culture, including an incomplete understanding of the perception of the risks throughout by the company workforce, incomplete incorporation of food safety parameters into business objectives, and infrequent monitoring and optimizing the organization's food safety performance (Nyarugwe *et al.*, 2016; Park *et al.*, 2019). Ownership could bring specific values to an enterprise; a report by Cascino *et al.* (2010) showed that determinants of accounting quality differ across family and nonfamily firms, with family-owned business conveying financial information of higher quality than their counterpart. On the other hand, Ji and Weil (2015) discussed how franchising ownership was more likely to promote noncompliance with regulations and wages standards in fast-food outlets, in contrast with company-owned establishments. While the dynamics of self- and family-owned businesses are complex (Goel *et al.* 2014), the values and styles are likely to affect service and products. To date, the direct influence of business ownership and type of management (sole-proprietor management and corporate management) on industry food hygiene standards and practices has not been studied. The experience and attitude of the owner-manager is a major determinant of management strategies. Nevertheless, problem-solving and training in SMEs were shown to

be more successful when customized to suit the specific situation (Macpherson and Jayawarna, 2007). Some studies have assessed the management commitment to food safety and support, however, based on employees' perceptions (Abidin *et al.*, 2014; Neal, 2012). Employees' perceptions of management commitment and onsite support are not a reliable indicator being shaped by the level of their knowledge in food safety and awareness of management role in food safety (Faour-Klingbeil *et al.*, 2015). Therefore, an empirical assessment and direct observation of the relationship of management to food safety practices are instrumental to gain insights into what hinders compliance with the basic requirements of food safety and deters organizations from attaining a positive food safety culture.

The objectives of this study were to compare the hygiene standards and handling practices between sole-proprietor and corporate-managed restaurants and to measure whether the type of management is associated with the differences in food safety performance between both groups

2. Material and methods

2.1 Selection and sampling processes

An in-depth observation assessment of food safety environment and practices was conducted on a convenient sample of 50 food businesses in Beirut, which are typical of foodservice outlets in Lebanon and in many countries of the Middle East (Faour-Klingbeil *et al.*, 2015, 2016).

Beirut is a city where identification of corporate-managed outlets is not complex in view of their market standing, network with food professionals, and reputation. The corporate-managed FSEs operate several food outlets in different geographical areas and within the same city through central management. The sole-proprietor food businesses are individual or family-owned businesses managed by the owner or by a head chef with assistants. They are often small bistros, café restaurants, or traditional fast-food street outlets, and usually known by family names or as time-honored local restaurants. The traditional or sole-proprietor food businesses tend to be informal and lack management structure; they also share common socioeconomic features.

The sampling method involved two-stage samplings (cluster sampling), first, by concentrating on a geographical area, second, sampling respondents (businesses) within those areas. The choice of the geographical area was affected by three factors: i) businesses that are more readily accessible due to limited information on locations and addresses in other geographical areas, ii) limited fund and time frame of the funded project, iii) the fact that the selected area is well-known for being a hub of a high number of restaurants business of all levels and types of cuisines.

The selection of participants was based on the size of the establishment, that is, micro-small, small, medium as per the classification criteria in Table I; the types of food served, that is, raw vegetable salads in addition to other varieties of hot and cold ready-to-eat (RTE) foods; and the high number of customers at peak hours, which was estimated by observation and local knowledge.

Criterion of SMEs	Micro	Small	Medium
Maximum number of employees	<10	<50	<250
Maximum turnover	≤ € 2 m	≤ € 10 m	≤ € 50 m
Balance sheet total	≤ € 2 m	≤ € 10 m	≤ € 43 m

Table I.
Classification of SMEs
into sizes according to
EC criteria

Source(s): EC, 2015

A greater percentage of the participating FSEs (70 percent) were micro-sized businesses employing less than 10 food handlers, 22 percent were small-sized with 10–15 food handlers, and 8 percent were medium-sized food businesses.

Owners and directors of the FSEs were contacted by phone to introduce the project objectives and to obtain permission to conduct the interview and observations on premises. Some businesses were approached by email.

The survey, including follow-up calls and meetings with owners/managers, was carried out over a period of four months.

In our study, the term “food handlers” refers to executive chefs, chefs, assistant chefs, and owners involved in different functions of food handling, that is, receiving, storing, preparing and cooking food.

2.2 Survey design

This study complements earlier works on the hygienic status of food establishments in Beirut (Faour-Klingbeil *et al.*, 2015, 2016). The present data were extracted from the questionnaires employed for the face-to-face interviews (Faour-Klingbeil *et al.*, 2015) and the observational assessment checklist (Faour-Klingbeil *et al.*, 2016).

2.2.1 The development of the food safety practices questionnaire. The questionnaire used for collecting data on food safety practices consisted initially of four sections designed to be administered in a face-to-face interview with food handlers ($n = 80$) to study the food safety knowledge, attitudes, and practices of food handlers (Faour-Klingbeil *et al.*, 2015).

Section 1: this was designed to obtain demographic information and each food handler’s profile such as gender, age, education, working experience, food safety training course attendance.

Section 2: this contained 16 multiple-choice questions (each with four or five possible answers), three closed questions, and one open question to assess food handlers’ knowledge on food poisoning, cross-contamination prevention, temperature control, personal hygiene, and sanitation. In order to avoid chances that food handlers select correct answers and any answer by chance, the multiple-choice answers included “I do not know.”

The questions were based on the content of a basic-level training courses in food safety and adapted from the work of Tokuç *et al.* (2009) and Walker *et al.* (2003) with some modifications.

Section 3: this aimed at understanding food handlers’ attitudes on a Likert-type scale that indicates the degree of agreement of respondents to 16 statements on food safety using a three-point rating scale (disagree = 1, uncertain = 2, agree = 3). The score ranged between 0 and 48. The sum of scores was converted to 100 points.

Section 4: this demonstrated the frequency of safe handling practices. It included 19 questions on sources of personal hygiene, temperature control, cross-contamination prevention, cleaning, storage, and display of food on a five-point rating scale (never = 1, rarely = 2, sometime = 3, often = 4, and always = 5). The score range was standardized between 0 and 100.

Only the data obtained in section 4 were included in this study.

The attitudes and practices questions were adapted from the work of Angelillo *et al.* (2001) with some modifications.

A separate letter of consent for owners and for the participants was read explaining the objectives of the research and signed by the researcher and participants.

The questions were clearly read to the respondents in a private setting to avoid discomfort or peer and management influence.

Inspection constructs	Individual inspection components
Construct 1: Structural compliance	<ol style="list-style-type: none"> (1) General maintenance conditions and evidence of pest in the production environment (2) Zoning (separation of fresh produce from raw meat and poultry) (3) All major pieces of equipment such as fridges, freezers, ovens, hot holding equipment, cold holding equipment are fitted with working temperature monitoring gauges (4) Availability of proper handwashing sink
Construct 2: Personal hygiene	<ol style="list-style-type: none"> (1) Wearing a hair cap (2) Appropriately clean personnel protective clothing
Construct 3: Sanitation	<ol style="list-style-type: none"> (1) Clean floors, walls, overall facilities, and implements (2) Waste containers are covered, kept clean (3) Sanitizers for work surfaces readily available for use during food preparation (4) Containers used to drain vegetables are kept clean
Construct 4: Evidence of procedures and management system control	<ol style="list-style-type: none"> (1) Record-keeping for verification of temperature monitoring and system audits (during cooking, cooling, storing) (2) Cleaning system and schedule (3) Where a chemical sanitizer is used, there are records to show levels are maintained
Construct 5: Contamination and cross-contamination control measures	<ol style="list-style-type: none"> (1) Staff cleaning tools are stored in an appropriate manner and not at risk of contaminating food or equipment during preparation (2) Staff's personal belongings are stored in an appropriate manner and not at risk of contaminating food or equipment during preparation (3) Received fresh vegetables are stored in protected areas (4) Washing sink designated for fresh produce only (5) Unprocessed raw vegetables are prepared so that contamination and cross-contamination do not occur (separate cutting boards and utensils) (6) Visitors or unauthorized staff are granted protective clothing upon entry (7) Entry for authorized personnel only
Construct 6: Safe and hygienic handling practices	<ol style="list-style-type: none"> (1) Appropriate use of gloves and handwashing (2) Frozen food is properly thawed (3) Vegetable sanitizers are made up correctly (4) Food on hold is covered

Table II.
The six different constructs comprised in the visual assessment survey in SMEs

Source(s): Faour-Klingbeil *et al.*, 2016

The same questionnaire comprised an open question on the barriers against the implementation of hygienic and safe practices. The respective answers were analyzed and included in this study.

A pilot study was conducted on seven restaurants, but the results were not usable because additional questions were later considered, and the questionnaire was subjected to a few modifications in the section related to practices. It was resubmitted to the ethical approval committee at the American University of Beirut and Plymouth University.

In general, the interview took approximately 45 min depending on the level of knowledge and education of the interviewees (Faour-Klingbeil *et al.*, 2015).

2.2.2 Observational assessment. The observational checklist comprised essential components in which the good hygiene practices (GHP) and other prerequisites proposed by the Alimentarius, (2003) were included for the general assessment criteria (Faour-Klingbeil *et al.*, 2016). It covered all areas including documentation and record-keeping requirements,

which are crucial parts of a food safety system (CAC, 2010). The criteria defined for each component are available as supplementary materials (Table AI).

The observation assessment checklist comprised six constructs of 2–7 components for analysis (Faour-Klingbeil *et al.*, 2016) (Table II).

A reliability analysis test was performed to measure the internal consistency in the survey questionnaire. Cronbach's alpha was 0.928, which indicates a high level of internal consistency for our scale (Faour-Klingbeil, *et al.*, 2016).

To ensure consistency and unbiased data records, the data collection and visual assessment were carried out by one of the authors, a registered experienced auditor.

3. Statistical analysis

All data were analyzed using the IBM SPSS version 22. Data were collected and grouped according to foodservice management type, that is, sole-proprietor or corporate-managed food businesses.

Observational assessment of 26 components was based on a three-level scale (adequate = 3, incomplete = 2, inadequate = 1) for each one. The sum of the awarded points (total score) on the adequacy level for each sampling location ranged between 26 and 78 points, and it was converted to a 100-point scale before further analysis.

Components that were either “not observed” or “not applicable” were not included in the statistical comparisons or tabulations, hence omitted from scoring.

The frequency of rating on adequacy level in each component was obtained, and an independent *t*-test was also used to determine differences in total score on a visual assessment of all components between corporate-managed and sole-proprietor-managed FSEs. The frequency of food businesses in each adequacy level for each category was calculated.

Spearman's rho correlation test was performed to examine the strength of association between types of management and scores on the visual assessment of overall components.

For further understanding at the level of each single component, Chi-square, cross-tabulations, Fisher's exact tests in addition to Somers' Delta (Somers' D), an ordinal measure of association appropriate to distinguish between a dependent and independent variable, were used to understand the association pattern between types of management operating food production and the adequacy level of conditions and handling practices.

Logistic regression was performed to test the extent to which management can be an explanatory or predictor to total inspection score.

4. Results

4.1 General hygiene conditions and safe practices

In general, the *t*-test revealed a statistically significant difference between both types of management in relation to their overall visual assessment score across all components of hygienic conditions and practices on premises ($t = 5.91$, $df = 48$, $p < 0.001$). Premises operated by corporate companies reflected a better commitment to hygienic conditions and practices and had a higher mean score in the overall visual assessment (77.8 ± 18.4) than food businesses operated by sole-proprietors (48.5 ± 12.85) (Table III).

More specifically, the mean scores on adequacy level for each of the six different constructs assessed during the observation were significantly higher for premises managed by corporates than those managed by sole-proprietors in relation to structural conditions of premises ($t = 7.07$, $df = 37$, $p < 0.001$), cleanliness and sanitation ($t = 5.91$, $df = 37$, $p < 0.001$), and cross-contamination preventive measures ($t = 5.86$, $df = 26.5$, $p < 0.001$) (Figure 1) and for individual component levels (Table IV); there was significant difference in the mean of scores across the personal hygiene indicators indicating greater commitment observed in corporate-managed locations in terms of personal hygiene, such as wearing protective

clothing ($t = -3.63$, $df = 25.924$, $p < 0.001$) and wearing hair cap ($t = 4.29$, $df = 48$, $p < 0.001$) and correct use of gloves during salad vegetables handling ($t = 4.76$, $df = 15.0$, $p < 0.001$).

However, despite marked differences between both groups and the higher performance level of the corporate group with respect to sanitation and cross-contamination preventive measures, there was a lack of evidence of internal records and audits for internal control by the management. Recording and monitoring the temperature of foods during holding, cooling, and cooking were not adequately performed in both groups (Figure 2). Food handlers in the sole-proprietor group relied on the external digital thermometer display of cooling appliances or their own experience by touching and feeling to tell if foods were properly cooled or hot. About one-third (37 percent) and an additional 16 percent did not have properly functioning temperature monitoring gauges or internally fitted thermometer in all or in at least one of their cooling appliances, respectively, which was predominantly observed in the sole-proprietor group (Figure 2).

As a result of limited working spaces commonly observed in sole-proprietor locations, various risk factors inside food preparation premises were observed. A large proportion of sole-proprietor restaurants (71 percent) did not have separate areas for food handlers' personal clothing and shoes and for cleaning tools that were seen kept on shelves nearby implements or food ingredients in the food production areas. In addition, high-risk and low-risk foods and appetizers were prepared at the same time in a very small area that hardly fit a handwashing sink in 65.8 percent and 8 percent of sole-proprietor and corporate-managed businesses, respectively (Table V).

Chi-square and Fisher's exact test showed a significant association between the type of management and the adequacy level of compliance. More specifically, there was a significant

Table III.
Mean value of scores on the visual assessment of overall components in SMEs

Management type	N	Mean [†] ± SD
Corporate	12	77.88 ^a ± 18.45
Sole-proprietor	38	48.47 ^b ± 12.83
Total SMEs surveyed	50	55.53 ± 19.01

Note(s): [†]over possible 100 points, different superscript letters above the means in the same column denote statistically significant differences at $p < 0.05$

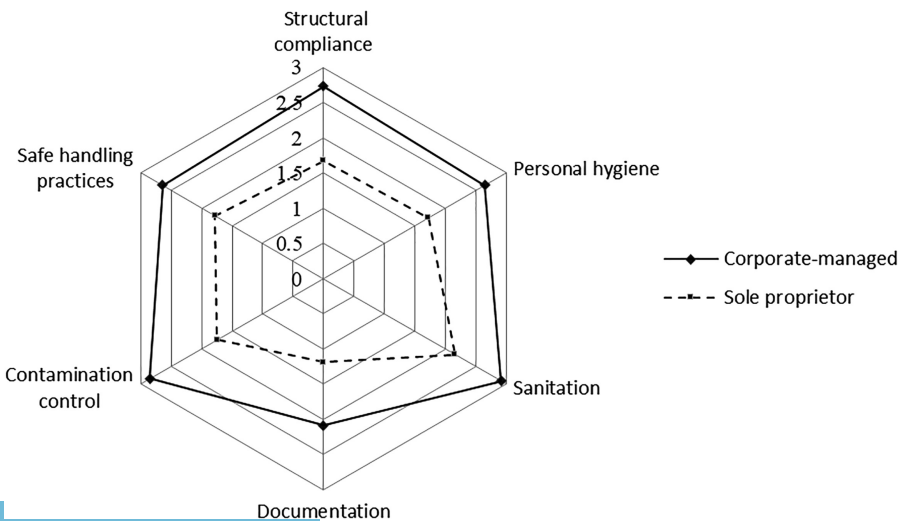


Figure 1.
The mean score of hygiene and safe handling compliance by type of management based on three units' scale (adequate = 3, incomplete = 2, inadequate = 1)

association between the type of management and the adequacy level of premises, for example, well-maintained walls, drains, protection against pest entry, and measures taken to ensure separate preparation of raw and cooked foods ($p < 0.001$). This was also found in relation to the adequate use of washing sinks designated for fresh fruits and vegetables and use of sanitizers for contact surfaces and implements on premises at a value of 22.9 and 25.8 ($p < 0.001$), respectively. Cramers' V and Phi test values indicated generally strong relationships (0.67–0.75). In parallel to Chi-square analysis, Somer's D test also showed a strong and statistically significant association between the assessment components and the type of management. Somers' D coefficient ranged between 0.52 and 0.78 ($p < 0.05$) for all components with the exception to components related to temperature monitoring and record systems and use of sanitizers (0.18–0.36) (supplementary materials – Tables AII and AIII). Accordingly, it was shown that more than 50–78 percent of the adequacy levels on the different constructs are explained by the type of management. Additionally, Spearman's rho correlation indicated a statistically significant association between management and overall adequacy score ($r_s = 0.571, p < 0.001$).

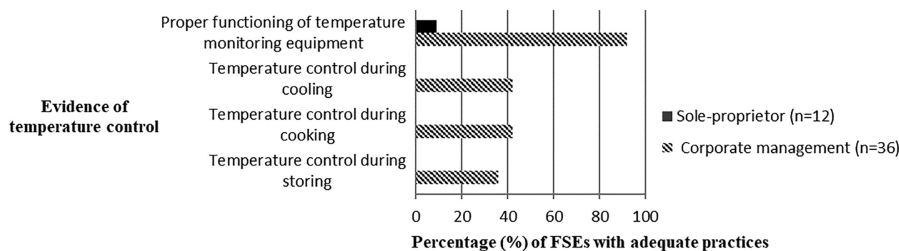
The regression analysis showed that management could statistically and significantly predict the total inspection score, $F(148) = 38, 51, p < 0.001$ and accounted for 44.5 percent of the explained variability in the overall score.

In our earlier work, the self-reported handling practices of the same studied groups were determined *via* the 19 questions on sources of personal hygiene, temperature control, cross-contamination prevention, cleaning, storage, and display of food and analyzed on a five-point rating scale (never = 1, rarely = 2, sometime = 3, often = 4, and always = 5). The score range was standardized between 0 and 100 (Faour-Klingbeil *et al.*, 2015). We ran a comparison

Conditions and practices	Management	N	Mean ± SD
Food handlers wearing gloves correctly and appropriately	Corporate	12	2.42 ^a ± 0.79
	Sole-proprietor	38	1.24 ^b ± 0.59
Floors, work surfaces, utensils, and equipment are kept clean	Corporate	12	3.00 ^a ± 0.00
	Sole-proprietor	38	2.13 ^b ± 0.90
Correct use of cutting boards and utensils to prevent cross- contamination	Corporate	12	2.83 ^a ± 0.58
	Sole-proprietor	38	1.58 ^b ± 0.82
Premises' structural conditions	Corporate	12	3.00 ^a ± 0.00
	Sole-proprietor	38	1.92 ^b ± 0.09
Use of sanitizers for work surfaces	Corporate	12	2.83 ^a ± 0.57
	Sole-proprietor	38	1.55 ^b ± 1.06

Note: Different superscript letters above the means in the same column indicate significant difference within groups at $p < 0.05$

Table IV. Mean value of adequacy level in practices related to cross-contamination, safe handling, and sanitization by type of management



Note(s): Due to restricted access or activities not performed at the time of the visit, one sole-proprietor restaurant was not observed for temperature monitoring activity during storage and two corporate-managed restaurants were not observed

Figure 2. Distribution of adequacy level in temperature monitoring by type of management

Observation components	Visual assessment rating	% of total corporate-managed food businesses (<i>n</i> = 12)	% of total sole-proprietor-managed food businesses (<i>n</i> = 38)
Zoning and space	Adequate	41.3	13.2
There are hand-washing facilities in food handling areas supplied with warm soap and disposable towels	Adequate Not observed	75.0 0.0	5.3 10.5
The cleaning schedule is visible	Adequate Not observed	33.3 33.3	0.0 13.2
Sanitisers for work surfaces are readily available for use during food preparation	Adequate Not observed	91.7 0.0	10.5 10.5
Floors, work surfaces, utensils, and equipment are clean	Adequate	100.0	39.5
Waste containers are covered, kept clean	Adequate	91.7	29.7
Food handlers use gloves appropriately and correctly	Adequate	58.3	7.9
Unprocessed raw vegetables prepared so that contamination and cross-contamination do not occur	Adequate	91.7	13.2
The received fresh produce is stored in protected areas	Adequate Not observed	91.7 8.3	31.6 15.8
There is a washing sink designated for fresh fruits and vegetables only	Adequate	75.0	7.9

Note: Not observed: The component under assessment was not existing/taking place at the time of the observation assessment

Table V.
The distribution of adequacy level in hygienic and safe practices by type of management

between the self-reported data (Faour-Klingbeil *et al.*, 2015) and those obtained by the actual observation of this study. The observational assessment showed inconsistency and disparity in handling practices across different indicators related to personal hygiene, safe handling of food, and risk control measures when compared to self-reported practices in the same facilities (Figure 3). Self-reported practices concerning compliance to the use of protective clothing and gloves, the use of separate cutting boards for raw meat and vegetables, and the application of disinfection as well as storing of fresh vegetables in protected areas were not consistent with the results obtained during the simultaneous observation of the same respondents on the same day of the interviews. There was a great discrepancy between those who reported that they wore protective gloves to prevent cross-contamination and those very few who were observed performing crucial tasks wearing the gloves. The frequency level of essential practices for ensuring safe food production was reported by food handlers in 36 to a maximum of 42 surveyed food service businesses. In contrast, respondents did not show and translated what they reported in practice. Correct practices were visually assessed as “adequate” in only 10 to a maximum of 20 inspected locations (Figure 3).

4.2 Perceived barriers

The interview with food handlers identified several barriers to implement basic food safety requirements. Many respondents (21 percent) expressed discouragements due to a lack of space and limited resources. In addition to the 16 percent of the food handlers who did not

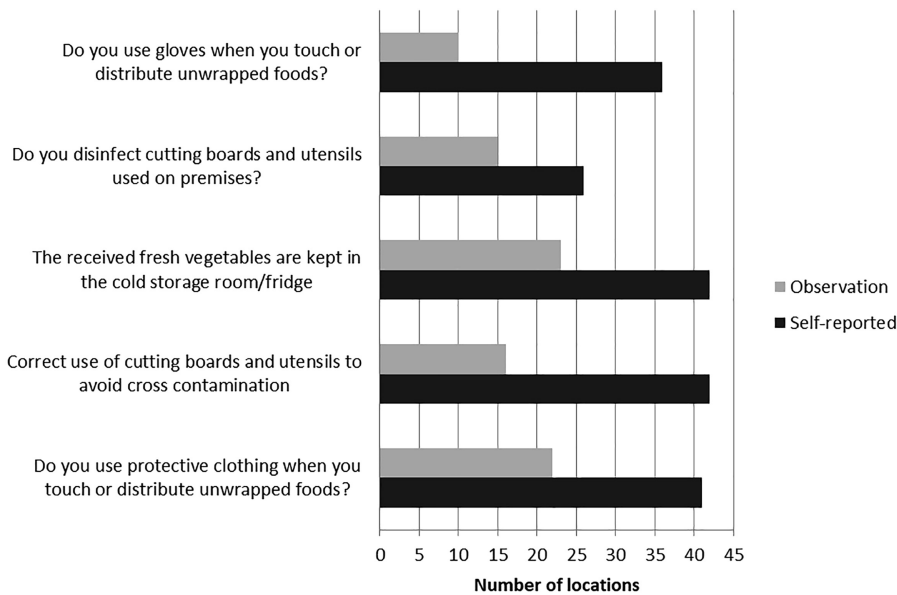


Figure 3. Self-reported food handlers' practices as frequently performed (i.e. always) in comparison to actual practices assessed by observation

have the expertise and education to know how their actions can affect the safety of the food they handle, 13 percent considered that time and work pressure, especially in peak hours of food production, are hurdles to follow safe food handling practices, which are particularly challenging because of understaffing. The 12 percent of the respondents believe that the improvement of the work environment and implementation of food safety systems are not possible because of the high cost and lack of financial support by owners to maintain the facility and equipment in good conditions or to provide the necessary tools. The access to food safety information and guiding procedures was the main concern for 10 percent of respondents in the sole-proprietor FSEs. They stated that information resources and guidance for the understanding and implementation of hygiene procedures are not available. Guidance is needed to attain adequate hygienic conditions and practices.

Ten percent of the respondents in the sole-proprietor group complained about the inefficient role of local health authorities' inspectors, which encourages noncompliance. The health inspectors issued reports with no subsequent follow-ups or guidance for corrective measures. In addition, 12 percent commented on the deficits in the food safety control system throughout the food supply chain; thus, the application of food safety preventive measures on premises is not necessary. For instance, it was stated that: "The system is lacking across the supply chain and it already predisposes our own raw materials to unavoidable hazards." The lack of management support was also cited as a barrier by the remaining few food handlers, while others did not give an answer.

5. Discussion

According to the international recommendations on the general principles of food hygiene (CAC/RCP 1-1969), the sole-proprietor businesses showed critical gaps in food handling and general hygiene conditions, that is, poor cross-contamination preventive measures, deficient storage, inadequate conditions, lack of handwashing sinks, small food preparation areas, and poor cleanliness; in addition, this group was characterized by a common lack of specialists in food safety and quality and understaffing. The food handlers in this group are reportedly

involved in multiple tasks at one time and have inadequate knowledge on food safety due to limited resources and no access to information and guidance on food safety (Faour-Klingbeil *et al.*, 2015). Understaffing and limited resources in the sole-proprietor group constitute a major barrier for training food handlers in food safety (Faour-Klingbeil *et al.*, 2015). Similarly, Fairman (2004) showed that understaffing and limited management structure in small restaurants are major constraints to safer practices.

Conversely, the corporate group showed remarkable compliance with proper structural and sanitary conditions, higher hygiene standards, and adherence of food handlers to personal hygiene and safer food preparation practices. This group provided a supportive environment for food production through adequate spaces for food preparations, equipment provisions, staff training on food safety, and food safety management that oversees hygiene standards and communicates top management decisions to food handlers (Faour-Klingbeil *et al.*, 2015). The FDA (2011) emphasized that the supervisory function is key for ensuring improved food safety practices and that the manifestation of effective management control through active engagement in the implementation of the food safety practices and fostering supervisory control functions are regarded pivotal for maintaining safe practices. Bran *et al.* (2010) made an interesting observation that the size of a company is a driver for environmental performance because large enterprises are more visible. This observation can also explain the higher standards of the corporate-managed group compared to sole-proprietor driven by their brand image and market standing. FSEs with renowned eateries are exposed to the market and to the attention of health inspectors. In this sense, they are driven to maintain clients' trust and legal expectations by ensuring appropriate structural and hygiene operations. Moreover, the food outlets of the corporate group are directly managed by the food operations management that acts as a link between the corporate central management and the production unit to ensure proper implementation of management decisions and execution of corporate policy. The firm size and the type of products (e.g. branded products/services) are proven to be incentives that influence the motivation and perception of benefits for the adoption of food safety quality assurance systems (Seddon *et al.*, 1993; Macheke *et al.*, 2013). Hence, a small firm handling an undifferentiated product will likely have a different perspective from a large firm handling a differentiated product.

Regression analysis showed that the type of management explains 44.5 percent of the variations in the overall assessment of practices and the food safety environment and hygiene standards, suggesting other underlying factors that should be explored at the level of the organizations. For instance, the corporate-owned food outlets did not have adequate preventive measures to minimize the risk of foodborne illnesses, which explains the weak correlation between the type of management and the assessment components related to documented temperature control and internal control records. The poor implementation of food safety documentation systems and lack of internal controls may suggest a limited involvement of the top management in overseeing or managing food safety. Apparently, this group focuses on gearing the resources toward the prerequisites for food safety systems by promoting environmental conditions that are favorable for food production, yet not all the way to prevention and control of food safety risks. During the interviews in one of the corporate-managed locations, the food safety officer mentioned that the top management gives the highest priority to personnel hygiene and cleanliness in the restaurant instead of reinforcing a food safety program to control potential risks and hazards through the flow of the foodservice production (Faour-Klingbeil *et al.*, 2015). Such a case reflects the importance of management commitment to establishing, implementing, and maintaining an effective food safety system (Clarke, 2000).

Accordingly, the corporate group fits with the classification of a proactive type of management defined by Wright *et al.* (2013) as "Management provides a lead in encouraging compliance for sake of the business . . .but may not go beyond good practice." The limited involvement of the corporate group management in food safety is possibly attributed to its

perception of food safety risks or the profit policy that overtakes food safety concerns. The corporate strategy is usually driven by stakeholders' trust and protection of corporate brands or even the reputation for the adoption of sustainability issues (Manning, 2007; Todd, 2017). Hence, additional factors such as the food safety knowledge, attitudes, and perception of risks of food business leaders and owners remain assumptions to be clarified in further research to understand what would drive food safety to be viewed as a critical issue.

The thermometers for monitoring food and storage temperature were lacking in almost all the locations surveyed in both groups, which contradicts with the statements of a great majority of the respondents who agreed on the importance of controlling the temperature of food and that they receive management support to apply and improve food safety (Faour-Klingbeil *et al.*, 2015). This study corroborates with the results of our earlier work and showed that food handlers' perception of management support is affected by their limited knowledge in food safety and their food safety attitudes (Faour-Klingbeil *et al.*, 2015).

Furthermore, the analysis showed that self-reported practices of food handlers did not parallel their actual practices, particularly in relation to personal hygiene practices and temperature control. The inconsistent translation of food handlers' affirmative opinions toward food safety into actual practices is documented (Manning, 1994; Neal *et al.*, 2012; Abdullahi *et al.*, 2016; Ovca *et al.*, 2018). Additionally, Bermudez-Millan *et al.* (2004) demonstrated through household observations that claims of food safety behaviors related to handwashing and sanitation were not necessarily put in practice.

There were several barriers that prevented food handlers from applying safe behaviors. These were consistent with numerous studies such as the lack of time, training, and resources, besides the inconveniently located hand sinks and lack of space (Howells *et al.*, 2008; Wallace *et al.*, 2018). Such shortfalls serve as barriers to proper handwashing, cleaning work surfaces, and use of thermometer (Clayton *et al.*, 2002; Green *et al.*, 2006; Howells *et al.*, 2008; Faour-Klingbeil *et al.*, 2016).

6. Limitations

The limitation of this study is the relatively small sample size due to limited funds and the project timeframe. Despite the reliability of observational studies as a tool to capture food safety practices (Clayton and Griffith, 2004), they require intensive time and human resources. Getting approval from food businesses owner to enter their food premises was the main challenge in this work. This survey, including follow-up calls and meetings with owners/managers, was carried out over a period of four months. The rejection rate was 50 percent for several reasons including no interest to participate, no time, and work pressure or worries from suspected connections with local health authorities.

Even though all the interviews were conducted in the Beirut region, as mentioned in section 2.1, given that the corporate-managed FSEs manage all of their food outlets equally in different areas of Lebanon under the same central management system, and that sole-proprietor food businesses share common socioeconomic features, the sample size would confer a reasonable degree of reliability to this work for the whole country.

7. Conclusion

The sole-proprietors' businesses showed critical shortfalls in food safety that may predispose foods to microbial risks. Nevertheless, this study demonstrated that foods served in the corporate-managed FSEs may not be safer. The operators of the corporate-managed group were not proactive in the sense of implementing the necessary control measures to prevent, eliminate, or reduce the risks of foodborne diseases.

The type of management was a significant predictor of food handlers' behavior and hygiene standards. Nonetheless, other confounding factors interfered with the degree of this

association and these need to be explored in future research. For instance, despite adequate hygiene standards and the adherence to safer practices by food handlers in the corporate group when compared to their counterparts in the sole-proprietor group, food safety systems and internal control were not well implemented. We assume that this is attributed to the leaders/decision-makers' lack of awareness of the risks associated with food safety or to the profit-oriented strategies or other interfering factors given the weak enforcement of the food safety law in Lebanon and the limited communication of food safety risks with the food industry (Bou-Mitri *et al.*, 2018).

The understanding of the food safety attitudes and the perception of risks of the management representatives, leaders, and food business owners is crucial in future research to develop appropriate food safety interventions and foster a positive food safety culture in the foodservice industry.

On the other hand, drawing a generalization on the incompetency of sole-proprietor businesses is inaccurate because food safety performance can vary in different countries with different levels of regulatory enforcement activities. Therefore, our study underlined the need for necessary improvements in the sanitary conditions and hygienic practices in the sole-proprietor SMEs in Lebanon to reduce the risk of foodborne illnesses. The role of the local authorities in bringing up incentives and benefits for SMEs to adopt robust food safety systems is imperative. An example is the Safer Food Better Business developed by the Food Safety Agency in the United Kingdom, which assisted small businesses in adopting safer practices (Food Standards Agency, 2018). This system offers a practical and simple documentation approach for the SMEs' "diary," which is essential for food safety assurance. Although this study was carried out in the central, western, and northern districts in Beirut, the methodology and recommendations are pertinent to all similar operations worldwide.

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Appendix

Inspection component	Criteria
1 Are the premises looking in good repair with clean drains, clean walls, no peeling paint, no holes or gaps where pests might enter, evidence of pests, etc.?	Adequate: yes Inadequate: no Incomplete: partially fulfilled requirements (i.e. evidence of pests, open to the external environment, open drain, equipment or garbage bins are left dirty while walls are clean and feature no hole or cracks)
2 Is there zoning in the food preparation facility?	Adequate: yes Inadequate: one space for all food production, no proper segregation of raw/cooked/waste areas Incomplete: there is an attempt, (i.e. proper segregation for one area but lacking complete zoning or only separate vegetable area yet receiving and waste flow is not segregated) Inadequate
3 Are received fresh vegetables stored in protected areas?	Adequate: clean baskets, elevated from the floor, stored in clean cold rooms, stored separately from raw meat/poultry/fish
4 Is the entrance to foodservice area controlled to staff only?	Adequate: entry is permitted with protective clothing. Doors are kept closed
5 Are unprocessed raw vegetables prepared so that contamination and cross-contamination do not occur?	Adequate: the vegetable preparation is the area that is kept clean, sanitized, and separated from raw meat/poultry/fish. Use of separate utensils Incomplete: there is an attempt to separate raw vegetable preparation yet there is a dirty surrounding or improper handling and use of unclean utensils Inadequate: whole area unprotected from chemicals, cleaning tools/materials, pests, dirty surfaces, or prepared in nonisolated areas from raw meat

(continued)

Table AI.
Criteria: visual
assessment
components

	Inspection component	Criteria
6	Is frozen food thawed properly?	Adequate: thawing in cold rooms/refrigerator
7	Are staff cleaning tools stored in an appropriate manner and not at risk of contaminating food or equipment during preparation?	Adequate: stored in separate areas from the food production unit Inadequate: there is clear evidence of detergents, pesticides, or other chemicals within food preparation areas and in close contact with food
8	Are floors, work surfaces, utensils, and equipment clean?	Adequate: yes Inadequate: no Incomplete: there is an attempt (i.e. showing clean floors, partially clean surfaces, yet cutting boards have crevices; small/heavy equipment have dirt)
9	All major pieces of equipment such as fridges, freezers ovens, hot holding equipment, cold holding equipment are fitted with working temperature monitoring gauges	Adequate: yes Inadequate: no Incomplete: at least one refrigerator has no apparent temperature gauges or an internally fitted thermometer
10	Is there a washing sink designated for fresh produce only?	Adequate: yes Inadequate: no Incomplete: when the designated sink for washing vegetable is kept unclean and/or exposed to the external environment
11	Are vegetable sanitizers made up correctly?	Adequate: yes Inadequate: no
12	Are staff personal belongings stored in an appropriate manner and not at risk of contaminating food or equipment during preparation?	Inadequate: there is clear evidence of staff belongings and clothing in the food preparation area
13	There are hand-washing facilities in food handling areas supplied with warm soap and disposable towels	Incomplete: there is no supply of soap or towel or it is not functioning properly
14	The cleaning schedule is placed and visible	Adequate: yes Inadequate: no
15	Where a chemical sanitizer is used, are there records to show levels are maintained?	Adequate: yes Inadequate: no
16	Are sanitizers for work surfaces readily available for use during food preparation?	Adequate: yes Inadequate: no Incomplete: improper dilution or misuse
17	Waste containers are covered and kept clean	Adequate: yes Inadequate: no
18	Containers used to drain vegetables are kept clean	Adequate: yes Inadequate: no
19	Food handlers use gloves appropriately and correctly	Adequate: yes Inadequate: no
20	Kitchen personnel wear appropriate protective clothing and protective head coverings	Adequate: complete protective clothing Incomplete: staff wearing incomplete protective clothing or only nylon apron above the regular daily clothing Inadequate: production staff is working with no protective clothing
21	Hair covered by all staff in food preparation facility	Incomplete: when at least one of the staff is permitted to the facility without a hairnet or paper cap is used inside the production unit

Table AI.

(continued)

Inspection component	Criteria
22 Visitors or unauthorized staff are granted protective clothing upon entry	Adequate: yes Inadequate: no Incomplete: when only the hair net is requested upon entry
23 Correct use of equipment/ utensils/cutting boards for fresh produce to prevent cross-contamination	Adequate: Proper color-coded separation and proper use Incomplete: the color-coded concept/separation exists, yet there is evidence of misuse Inadequate: use of the same CB for raw meat and raw vegetables
24 Is food on hold covered?	Adequate: yes Inadequate: no
25 Is there evidence of temperature control during storing?	Adequate: evidence of records
26 Is there evidence of temperature control during cooking?	Adequate: evidence of records
27 Is there evidence of temperature control during cooling?	Adequate: evidence of records

Source: Faour-Klingbeil *et al.*, 2016

Table AI.

	Visual assessment components [†]													
	1a	1b	1c	1d	2a	2b	3a	3b	3c	4b	5c	5d	5e	5f
Somer's D coefficient	0.66	0.49	0.58	0.65	0.67	0.52	0.55	0.61	0.61	0.56	0.41	0.78	0.71	0.74

Note: [†]Inspection components (dependent) were measured in relation to independent variable "Type of management" and coefficients showed a stronger association with components related to general hygiene practices, cleanliness, staff personal hygiene, and well-maintained facilities

Table AII. Statistical output of Somer's D association test of inspection components with management types

	Visual assessment components				
	4a cooking	4a cooling	4a storing	5g	6c
Somer's D coefficient	0.35	0.32	0.38	0.18	0.26
Approx. sign	0.007	0.007	0.02	0.036	0.008

Note: Rated by visual assessment with the type of management operating food service establishments

Table AIII. Measures of weak association of components

Corresponding author

Dima Faour-Klingbeil can be contacted at: dima@dfkfoodsafety.com

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