

Food safety in collective catering: knowledge, attitudes and correct application of GHP/GMP knowledge among foodservice workers

Chiara Disanto,¹ Giuseppe Celano,²
Angela Dambrosio,³ Nicoletta Cristiana
Quaglia,³ Giancarlo Bozzo,¹
Antonio Tritto,⁴ Gaetano Vitale Celano¹
¹Department of Veterinary Medicine;
²Department of Soil, Plant and Food
Science; ³Department of Emergency and
Organ transplants, University of Bari
Aldo Moro; ⁴Agency for the Right to
University Study of Apulia Region,
ADISU Bari, Italy

Abstract

Food safety critically relies on the behaviors adopted by foodservice personnel, involved in various stages of meal preparation, from the supply of raw food materials until its distribution to the consumer. The purpose of this work was to collect information on the level of knowledge on food safety, the correct application of the Good Hygiene Practices (GHP) and Good Manufacturing Practices (GMP) and the attitudes of the operators involved in collective catering. The survey was conducted among 15 social catering companies in Apulia (Italy) using a modified Sharif and Al-Malki (2010) anonymous questionnaire intended to assess the knowledge, attitudes and practices of the food handlers. The results highlight the need to improve both knowledge and practices regarding food hygiene and safety in order to minimize the risk of transmitting foodborne diseases. More careful planning, implementation, monitoring and evaluation of training programs for foodservice workers is required, taking into consideration the provisions of European food laws.

Introduction

The typological characteristics of restaurants and catering business have constantly evolved in response to the changes in social needs, lifestyles and technological innovations (Ünlüönen and Cömert, 2013). The term “collective catering” refers to a type of catering that serves a large number of people, who are united by their use of a common service,

such as the workers of a company, students, soldiers of a barracks and hospital patients (Sharif *et al.*, 2013). This sector has developed rapidly and undergone extensive changes over time. However, these changes have not always been accompanied by equal improvements in terms of food safety, as shown by Chapman *et al.* (2010). In particular, meals prepared outside of the home represent a risk factor for foodborne illnesses and have been implicated in up to 70% of outbreaks of foodborne disease in Europe. The collective catering industry, is directly subject to the application of good practice guides (Ko, 2013). In the past, risk management, in canteens, was limited to the monitoring of the prepared meal, whereas current national and international regulations cover the entire food production process, from the procurement of raw food materials to the food administration phase (Kizen and Guner, 2018). Therefore, the restaurant and catering business must comply with the general hygiene requirements and assume the obligation to implement and maintain permanent procedures based on Hazard Analysis and Critical Control Point (HACCP) principles (Gomes *et al.*, 2013). In accordance with the current legislation, the systematic application of HACCP by catering services would serve to guarantee safe food preparation via the adoption of precautionary measures, identification of risks during the production process and establishment of preventative strategies (Garayoa *et al.*, 2012). However, in order to ensure effective implementation of HACCP, there are several prerequisites (Oliveira *et al.*, 2016), such as a documented system that describes good hygiene practices (GHP) and good manufacturing practices (GMP) required for effective management of food safety (Oliveira *et al.*, 2016). In order to achieve this goal, training programs are needed for collective catering Food Business Operators (FBO) that are relevant to their specific roles in the food production process. The need for appropriate attitudes related to hygiene among foodservice workers has been highlighted by the decision of the World Health Organization (WHO, 1998) No. 785/89 which stated that routine health checks (public health certificate) were not adequate for the prevention of foodborne diseases, and that suitable training and continuous updating the knowledge and skills of catering operators with the in regard to the use of appropriate technologies is more useful (Webb and Morancie, 2015). In addition to the knowledge acquired during the course, a focus on good hygiene practices is fostered: however, this is dependent on the workers’ level of education, living and working environment, and personal interest

Correspondence: Chiara Disanto, Department of Veterinary Medicine, University of Bari Aldo Moro, Italy.
E-mail: chiara.disanto@uniba.it

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in updating their level of professional competence. Surveillance systems have shown that the incidence of Foodborne Diseases (FBD) is almost never associated with the health status of foodservice workers (0.6% of cases) but it is, however, associated with procurement, preparation, storage and administration of food (Merican, 2017). Cross-contamination, lack of personal hygiene, food handling errors, and failure to consider the time-temperature combination during cooking, cooling and heating of foods are the most common mistakes made by foodservice workers (Osaili *et al.*, 2013). The purpose of this study was to collect information on the level of food safety knowledge, correct application of Good Hygiene Practices (GHP) and Good Manufacturing Practices (GMP) and the attitudes of operators involved in collective catering.

Materials and Methods

The survey was conducted among 15 collective catering companies in Apulia through the administration of an anonymous questionnaire. To select kitchens to be surveyed for the study, we contacted the main collective catering companies located in different provinces in Apulia (Italy). A letter explaining the purpose of the study and requesting cooperation was sent to each company. The contacted companies which

produce over 25 million meals annually and employs approximately 4,000 people, supply meals to schools, universities, hospitals, state ministries, police forces, armed forces, and public authorities. In addition, the confidentiality of the information gathered was ensured. A modified Sharif and Al-Malki (2010) questionnaire for assessing the knowledge, attitudes and practices of the foodservice workers was used. The questionnaire consisted of an initial set of general questions (age, gender, educational level, experience in the sector, current position in the company) followed by 39 questions that were divided into three main sections. Part one included 11 questions about knowledge on food safety with true or false answers, part two included 17 questions about GHP and GMP with “yes or no” answers and part three included 11 questions about related to the attitudes of the food handlers towards food safety.

The time required for completing the questionnaire was 20 minutes. The visits to the kitchens were conducted when the food handlers were undertaking their daily tasks.

Results and Discussion

General Part

Among the 156 employees who participated in the survey, 52% were female

(Figure 1A). The answers to the first section indicated that the respondents had an average age of between 40 and 50 years (33% of respondents) (Figure 1B) and the possession of a high school diploma (58%) (Figure 1C). The results revealed there was a weak and indirect association between the length of employment in the foodservice industry and food safety knowledge indicating that persons who had been employed for a longer period had higher levels of food safety knowledge than those with employees with shorter length of experience. These findings contradict those of Webb and Morancie (2015) who stated that employees with longer service had lower levels of food safety knowledge than employees with shorter experience but confirm those of Brannon *et al.* (2009) and Johnson *et al.* (2003). No difference in food safety knowledge was observed between employees in various roles. Most operators (33%) also declared to have gained work experience in the sector over 10 years (Figure 1D). The positions occupied by the participants in the study were as follows: 84 food handlers, 48 cooks, 24 other roles. The observations made during the visits showed that in almost all the kitchens the operators wore the appropriate protective clothing and Personal Protective Equipment (PPE), even if the following deficiencies were detected: presence of jewelry (60 %) and absence of masks (50%).

First section – food safety knowledge

Based on their answers to questions in the section on food safety knowledge, operators seem to be aware that environmental temperatures, storage temperatures and handling of raw and cooked foods affect the safety of the prepared food. Correct answers were given to questions related to staff hygiene, such as wearing clean and appropriate uniforms, removing jewelry from the hands, applying protections in case of wounds/cuts to the hands. However, results indicated that 8% of the operators lacked appropriate knowledge of food storage temperatures (Table 1). This result contradicts previous findings that the knowledge of critical temperatures among their study participants is high (Barjaktarovic-Labovic *et al.*, 2018). The lack of knowledge regarding temperature control among food handlers reported in some studies in Italy (Buccheri *et al.*, 2007; Marais *et al.*, 2007; Panchal *et al.*, 2011) is very similar to the present results. Poor cleaning practices represent the main ineffectiveness of utilizing hazards and problems of monitoring temperatures (especially at thermal treatment) and cross-contamination (Walker and Jones, 2002). HACCP implementation in small and medium-sized food businesses in the UK focused on temperature control and the data showed poor results (60%) (Walker *et al.*, 2003). Almost all the operators (94%) agreed

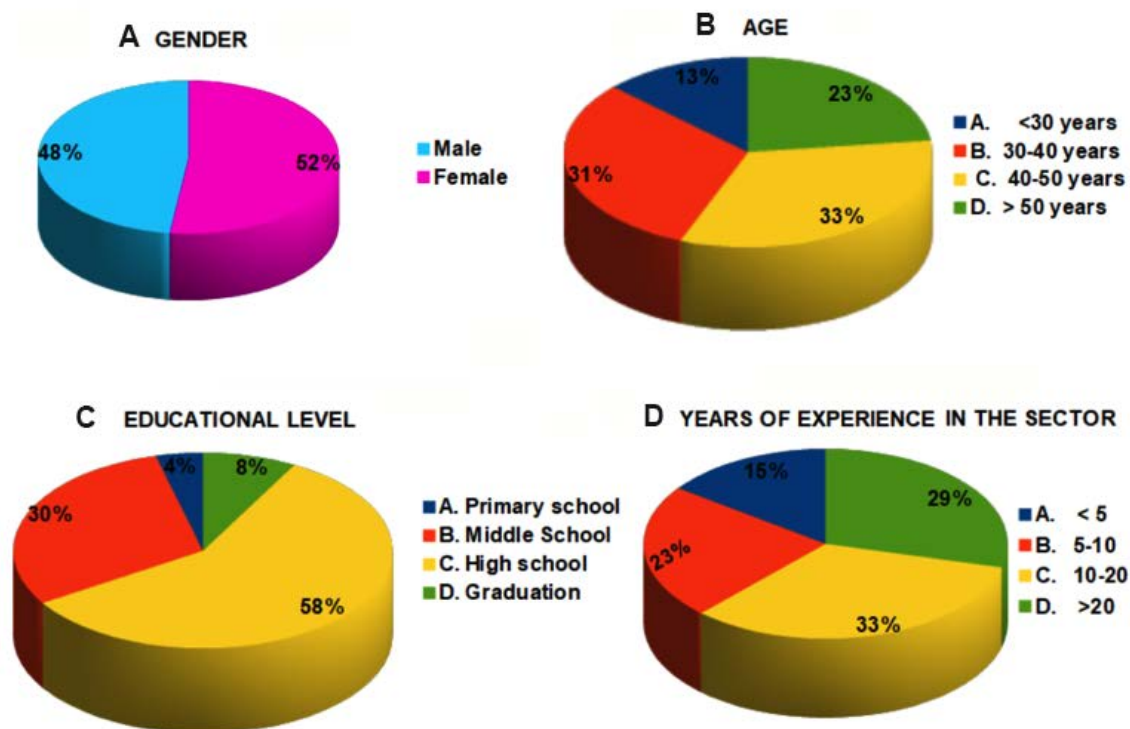


Figure 1 . General part. A) Gender; B) Age; C) Educational level; D) years of experience in the sector.

on the need necessity to keep cooked foods separate from raw ones (Table 1) indicating a good understanding of the cross-contamination. Cross-contamination, which refers to the transfer of pathogenic microorganisms from contaminated (usually raw) foods to other non-contaminated (usually cooked) foods can occur under various when the same kitchen utensils are used for the handling of raw and cooked foods, without replacing or washing and disinfecting them between uses or during the handling of cooked foods, that are ready for consumption, without a appropriate hand washing (Sharif *et al.*, 2015). Therefore, because cross-contamination is the most widespread form of food contamination, it is essential that foodservice workers have a basic knowledge of GMP and GHP principles and, importantly, awareness of putting these principles into practice. In question n.10, we asked to the foodservice workers if the failure by operators to adopt

good hygiene practices could cause food contamination. As shown in Table 1 this information has been preserved, over time, by almost all operators. Foodservice workers recognize the importance of adequate GHP and GMP procedures to reduce the risk of food contamination and consider it important to wash their hands before handling foodstuffs. In their answers to question n.11 almost all participants in our survey indicate that they are aware of the risks due to repeated heating of food, before consumption. Ready-to-eat foods must be adequate adequately heated, to ensure that entire volume of the food product reaches the pasteurization temperature ($> 72^{\circ}\text{C}$ for a few minutes). The true answers given to question 4 are questionable: "Do knives and cutting boards only need to be washed at the end of each working day?". If the cleaning of tools and of work surfaces was carried out only at the end of the working day, this would result in the accumulation of food

residues and dirt on the equipment and promote the growth of microorganisms.

Second section - application of Good Hygiene Practices and Good Manufacturing Practices

In the second section of the questionnaire, the operators confirm their knowledge of the methods of application of the HACCP system, and that they follow their own food self-control plans. Operators appeared to be aware that environmental temperatures, storage temperatures, and handling of raw and cooked foods affect the safety of the preparations prepared foods. Further, 96 % of the respondents understood that the HACCP system is aimed at food safety (Table 2). Almost all of the respondents (98% and 94%) agreed the knowledge and control of the refrigerator and freezer temperatures (question No. 25) and incorrect management and handling of food (question no. 24) play an important role

Table 1. Responses to the questionnaire "Knowledge on food safety".

Knowledge on food safety	True/False %
1 Foodborne diseases are caused by pathogenic microorganisms	88.4
2 Should operators with infected cuts on their fingers apply protection and avoid touching food?	100
3 Food handlers must wear clean and appropriate uniforms, remove jewelry from hands	100
4 Do knives and cutting boards need to be washed only at the end of each working day?	87
5 The correct refrigeration temperature is below 10°C	92
6 Packaged raw foods can be placed directly on the floor	100
7 Mixing raw and cooked foods increases the risk of cross-contamination	94
8 Eating raw or undercooked meat could cause foodborne diseases	94
9 Eating raw unwashed vegetables could cause foodborne diseases	100
10 Food handlers who do not adopt good hygiene practices could be a cause of food contamination	100
11 Can reheating foods increase the risk of food contamination?	98

Table 2. Responses to the questionnaire "Good hygiene practices and good manufacturing practices".

Good hygiene practices and good manufacturing practices	Yes/no %
12 Do you know about what HACCP means?	94
13 Do you think that the prerequisites for HACCP are necessary?	96
14 Do you respect the objectives of the HACCP plan?	98
15 Does the HACCP system prefer prevention to inspection?	87
16 The HACCP system is a method to ensure food safety	96
17 The HACCP system applies to the quality of the final product and not to the preparation procedures	23
18 Do you usually follow the HACCP plan to ensure food safety?	96
19 Do you have practical difficulties in carrying out the provisions of food self-control manual?	19
20 Does food hygiene knowledge allow you to do your job correctly?	100
21 Do you maintain adequate levels of food hygiene during the various phases of food preparation?	98
22 Do you have informations on your suppliers and carry out checks on incoming raw materials?	90
23 Do you record operations during your daily work?	92
24 The correct management and hygienic handling of food is part of your job responsibilities	94
25 Is it important to check the temperature of the refrigerator to prevent foodborne diseases?	98
26 Vegetables and fruit must be washed thoroughly to prevent the risk of foodborne diseases	96
27 Raw vegetables and meat should not be cut using the same knife	85

in the prevention of foodborne diseases (Table 2). Our results indicated that 85% of food handlers knew that raw vegetables and meat should not be cut using the same knife (question no. 27). Our findings were similar to those of a Slovenian study (Jevšnik *et al.*, 2008). In question n.28 we asked if hand washing, before handling food, could reduce the possibility of contamination of the foods. Table 2 clearly shows how this information has been preserved over time by most operators (73%). In Manning and Snider's study (1993), most respondents recognized the importance of washing their hands before handling food materials. However, a significant proportion of operators (27%) did not believe that washing hands before handling food materials increases the risk of food contamination, leads to consider this as a consequence of the task performed. It is possible that these respondents haven't do not fully understand the consequences of their actions, suggesting that further training may be valuable in their case. Overall, different results were found in relation to HACCP documentation and HACCP practice. Responses indicated that the participants were better at documenting HACCP principles than implementing them practically, which adversely affected food safety (Trafialek and Kolanowski, 2014). In order to be effective, HACCP practices must be underpinned by knowledge and skills of both management and staff (Fletcher *et al.* 2009). A lack of knowledge in this area is well documented (Rebouças *et al.*, 2017; Sibanyoni and Tabit, 2017). Effective food safety systems are reliant on adequate funds, support from management, and dedicated food preparation consultants. In this way the common resistance of staff to the implementation (Garayoa *et al.*, 2011; Sibanyoni and Tabit, 2017).

Third section – attitudes towards food safety

Despite the skepticism of some operators toward completing the questionnaire, the attitudes towards food security as a whole were positive among all the operators interviewed, respondents showed an interest in deepening their knowledge of food safety through reading newspaper articles, enrolling on training courses, and attending seminars and discussions with consultants of the food self control. Furthermore all respondents agreed that the use of gloves and adequate protective clothing (question n.34) play an important role in the prevention of foodborne diseases (Table 3). All food handlers surveyed considered that monitoring the fridge/freezer temperatures was important in order to reduce the risk of food spoilage. In two different studies, results indicated that the respondents' knowledge about of food freezing varied. Among the participants, 57% believed that microbial growth arrested at temperatures below -18°C while 21% consider that freezing kills all bacteria (Walker and Jones, 2002).

Conclusions

The results of the present study highlight the urgent need to remodel food safety education and training systems to include regular workshops and training sessions. In this setting, participants will receive hands-on experience in measures to reduce contamination, they would be trained to correctly read and interpret measurements (*e.g.*, using food thermometers), and receive guidance on appropriate cleaning and sanitation measures. The present results indicate that training programs should be

accompanied by practical experience that is as relevant as possible to the working context and actual tasks carried out. The improvement of food safety standards throughout the food service industry is strongly affected by social, economic and environmental factors. The lack of, or insufficient, adoption of good hygiene practices by foodservice workers may not always result from ignorance, but also arise as a consequence of "external" circumstances (Martins *et al.*, 2014). Therefore, appropriate management of food service staff is critical: a positive and motivational atmosphere in the workplace contributes significantly to greater productivity and general improvement in the application of HACCP procedures. Furthermore, managers must set the right example by practicing correct food safety measures during operations. They should also educate employees on food safety policies and management systems, such as HACCP in order to encourage employees to practice safe food handling from a conscious rather than instructive stand point. Finally, this study revealed moderate level of knowledge and practice among the foodservice employees indicating the need for stronger regulations in relation to training, legislation, and certification, as well as continuous assessment for retaining food badges. Moreover, awareness programs aimed at improving food safety knowledge are critical for foodservice employees. The present findings may additionally be used by public health officials and foodservice professionals to plan, evaluate, and modify food safety education programs in order to increase food safety knowledge and improve food handling practices across the food industry.

Table 3. Responses to the questionnaire "Attitude towards food safety".

Attitude towards food safety		Yes/no %
29	Do you know the current food safety legislation?	79
30	Would you read more newspapers about food safety to increase your knowledge about food hygiene?	98
31	Do you attend training courses or consult your food self-control consultants to keep up to date on food safety?	88
32	Do you think that attending a seminar on food hygiene could improve your behavior in this area?	98
33	Are food handlers responsible for preventing food borne diseases?	98
34	The use of headgear, mask, protective gloves and adequate clothing reduces the risk of food contamination	100
35	It is important to know the temperature of the fridge / freezer to reduce the risk of food spoilage	100
36	Do operators need to undergo periodic health checks?	100
37	Do you think keeping the kitchen clean is a good way to control food safety?	100
38	Is the application of food self-control system important for restaurants and institutions?	100
39	Do you think that food safety is a prerequisite?	98

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