FOOD FOR COLLECTIVES
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Knowledge of good practises and the perception of health risks by food handlers at a public hospital

Conhecimento em boas práticas e percepção de risco sanitário em manipuladores de alimentos de um hospital público

Abstract

Introduction: Despite recent technological advances, foodborne diseases persist as a global public health problem. In this context, outbreaks have been traced to food handlers, due to inadequate personal hygiene and the inadequate food handling. *Objective:* To evaluate the knowledge of Good Handling Practices (GHPs), the perception of the risk of foodborne diseases, and the existence of the phenomenon known as the optimism bias in the food handlers of a public hospital in Rio de Janeiro, Brazil. *Methods*: The present exploratory case study was based on a structured questionnaire divided into three blocks of questions (1 - sociodemographic profile; 2 - evaluation of the knowledge of Good Handling Practices; and 3 - perception of the risk of foodborne diseases and the optimistic bias). The questionnaire was applied to 50 food handlers. The data were analyzed using descriptive statistics, Chi-square test, for the identification of associations, and Student's *t* test, to analyze similarities between pairs of means. *Results:* The majority of the individuals of the sample analyzed were at least 41 years old (70%), female (82%), high school graduates (46%), and had at least 6 years' experience as food handlers (64%), including participation in training within the three months preceding the study (84%). The average level of knowledge of GHPs was satisfactory. Regarding risk perceptions in foodborne diseases, the respondents also demonstrated high perception to identify sanitary risk, and no evidence of optimism bias was found in their responses. *Conclusion:* Although the food handlers presented a satisfactory level of knowledge on GHPs, some gaps were observed, and it is still important to evaluate whether this knowledge translates into safe and adequate attitudes and practices.

Keywords: Food Service. Collective Feeding. Food services. Collective food. Hospital food. Food safety. Optimism bias.

Resumo

Introdução: Apesar dos avanços tecnológicos, as doenças transmitidas por alimentos (DTA) continuam sendo um problema de saúde pública global. Nesse contexto, o manipulador de alimentos tem sido associado a muitos surtos, principalmente em função de falhas na higiene pessoal e na manipulação inadequada dos alimentos. *Objetivo:* Avaliar o conhecimento em Boas Práticas de Manipulação (BPM), a percepção de risco em DTA e a existência do fenômeno conhecido como viés otimista em manipuladores de alimentos de um hospital público. *Método*: Foi realizado um estudo de caso exploratório, utilizando um questionário estruturado dividido em três blocos de perguntas (1 - perfil sociodemográfico; 2 - avaliação do conhecimento de Boas Práticas de Manipulação; e 3 - percepção de risco em Doenças Transmitidas por Alimentos e viés otimista) com 50 respondentes. Os dados foram analisados por estatística descritiva, utilizando os testes Qui-quadrado, para identificar associações,

e *t*-Student, para análise de similaridade entre variáveis. ***Resultados:*** O perfil da amostra foi de ≥ 41 anos (70%), sexo feminino (82%), ensino médio completo (46%) e experiência ≥ 6 anos na função (64%), com participação em treinamento há menos de três meses (84%). A média do grau de conhecimento em BPM foi satisfatória. Com relação à percepção de risco em DTA, os respondentes demonstraram alta percepção para identificar fatores de risco sanitário, não sendo observado viés otimista nas respostas. ***Conclusão:*** Apesar de os manipuladores apresentarem conhecimentos satisfatórios em BPM, algumas lacunas foram observadas, sendo importante ainda analisar se o conhecimento se transforma em atitudes e práticas adequadas e seguras.

Palavras-chave: Serviços de alimentação. Alimentação coletiva. Alimentação hospitalar. Segurança dos alimentos. Viés otimista.

INTRODUCTION

Hospital food service plays an essential role in the treatment and recuperation of patients by providing an adequate diet, thus contributing to the improvement of their nutritional status.[1] As most hospital patients have a weakened immune system, they tend to be more susceptible to disease, which means that the meals provided by hospital food service must not only be palatable, but should also be completely free of any possible type of contaminant, which highlights the need for the utmost care to ensure food safety.[2]

Foodborne diseases are a major public health problem in many countries. The World Health Organization (WHO) estimates that, annually, 600 million people are taken ill and 420,000 die after consuming contaminated food.[3]

Outbreaks of foodborne diseases tend to be determined by a small number of factors related to food handling The most common problems are the premature preparation and incorrect storage of the food, inadequate cooking or reheating, cross-contamination, and a lack of adequate personal hygiene of food handlers.[4,5]

Many foodborne diseases outbreaks are attributed to food handlers, principally in relation to a lack of personal hygiene or the inadequate food handling Given this, the training and qualification of the workers that handle food are fundamentally important for the prevention of foodborne diseases .[6,7]

In addition to knowledge on Good Handling Practices (GHPs), food handlers also need to perceive the potential health risks associated with food handling[8] A sanitaryrisk can be defined as the intrinsic potential of an activity, service or substance to provoke harmful or damaging effects on human health.[9] The understanding of sanitary risks is essential to ensure the success of training programs for food handlers, as well as guaranteeing that they both implement GHPs effectively and in ther compliance with the current sanitary legislation.[10,11]

The perception of risk by an individual may be affected by optimism bias, which is important to evaluate in food handlers, in order to ensure the most reliable possible description of their perceptions of sanitary risks. Optimism bias is a psychological phenomenon that leads the individual to believe that they are less likely to experience negative events and more likely to experience positive ones, in comparison with other individuals.[12] In other words, a food handler may perceive that the risks associated with their own behavior are lower in comparison with the other handlers in the same team.

A potential negative consequence of optimism bias is that it may lead to personal resistance to behavioral changes by not adopting preventive measures defined by GHP, since efforts efforts to reduce risks may be seen as either unnecessary or only applicable to their colleagues.[11,13,14]

Overall, then, the combined analysis of food handlers' knowledge of GHP, their personal perceptions of the risks associated with foodborne diseases, and their optimism bias may provide important insights for the development of strategies for the improvement of training procedures and the implementation of behavioral adjustments. This would improve food safety and guarantee best practices in the production of meals by food services. In this context, the present study evaluated the knowledge of food handlers at a public hospital in relation to GHPs, their perception of the risks for foodborne diseases and the potential existence of optimism bias.

METHODS

Study design and sample size

This in depth,[15] transversal, and exploratory case study was conducted in 2018 at the Food and Nutrition Unit (FNU) of a large public hospital specialized in oncology, located in the municipality of Rio de Janeiro, Rio de Janeiro state, Brazil.

The participants in the present study work as food handlers in this unit, as part of a team composed of 80 members, including 60 that were involved directly in food handling, while the other individuals had different functions (such as cleaners, nutritionists, and nutrition technicians). For the present study, 50 of the food handlers (62% of the FNU team and 83% of the total number of food handlers in the unit) were selected by non-probabilistic and convenience sampling.

While the sample size is smaller than what is recommended for statistical inferences (N≥100),[16] the decision to restrict the study to sample rather than census analysis (which even if census would be with N <100) was motivated by resources constraints, since the study in question corresponded to the initial phase of a more comprehensive research project, which involved the collection of samples from the same participants for microbiological analysis.

Application of the questionnaire

A structured questionnaire, formulated based on a literature review and adapted from questionnaires used in previous studies on the subject was adopted as a data collection tool divided into three blocks of questions.[11,17]

The questionnaire was developed in two steps: (i) qualitative evaluation[18] of the suitability of the content to respondents profile particularly regarding the language adopted,[19] This evaluation was based by collecting expert opinion, through in-depth interviews [19] with five professionals (experts) of food safety area, with long experience of direct contact with this public, and (ii) the application of a pre-test using the revised questionnaire after step (i), to a sample of 22 food handlers from a hospital.[19-21]

The revised questionnaire after these two steps was then applied by one of the authors to the target group defined above. The questionnaire was applied during working hours at the food handlers' workplace in November and December 2018.

Block 1 of the questionnaire has six questions designed to obtain sociodemographic information of the respondents, including gender, age, education, length of service as a food handler, participation in GHP training courses, and their function in the FNU.

Block 2 was composed of 11 multiple-choice questions designed to evaluate the knowledge of the food handlers on GHP, according to the principles established by the current Brazilian health legislation (RDC ANVISA no. 216/2004).[17] Each question had three possible answers (yes, no, and don't know). For scoring purposes, correct answers were assigned 1.0 point (yes or no, depending on the question), and no points were assigned when the respondent did not know the answer, or when the answer was incorrect, following the methodology proposed by Rossi et al.[11] The knowledge of each food handler was classified as sufficient when at least 70% of the answers were correct, and insufficient when fewer than 70% were correct, following the methodology adopted in the study by Ferreira et al.[22]

Block 3 was composed of 10 questions about the perception of risks associated with foodborne diseases, assessed by a modified Likert scale of six-point (1 - extremely low, 2 - very low, 3 - low, 4 - high, 5 -

very high, and 6 - extremely high). There is no general consensus on the most appropriate number of items for a Likert type scales, including whether odd or even number of items, although there are authors who argue that scales with an even number of items have the advantage of avoiding central- positioning bias, which is why a modified six-point scale was adopted.[19,23,24]

The data obtained in this block were expressed as mean and standard deviation, considering that the higher the mean, the greater the risk perception, while the lower the mean, the lower the risk perception.

Optimism bias was also evaluated in questions 1–4 of block 3, with the questions being arranged in two pairs (1- 2 and 3 - 4). For this assessment, an indirect questioning method was used, whereby respondents was first asked to indicate their own personal risk of causing foodborne diseases in a patient that had consumed a meal prepared by them, and then the same risk comparatively attributed to a meal prepared by a colleague co-worker.[11] Thus, different answers assigned to pairs of questions would indicate the tendency of optimistic bias by the respondent, which was statistically evaluated by analyzing the similarity of the answers in each pair of questions.[14]

Statistical analysis

For data analysis, it was sought to statistically verify the association of the levels of knowledge in GHP with the education of the handlers, using Chi-square test. Optimism bias was analyzed using Student's *t* test, to compare the mean scores obtained for the two pairs of questions (1- 2 and 3 - 4) presented in block 3 of the questionnaire.

The results were considered statistically significant with $p<0.05$, adopting the SPSS v. 15.0 program for statistical analysis of the data.[25]

Ethical considerations

The present study was approved by the Research Ethics Committee of the Rio de Janeiro Federal Institute for Education, Science, and Technology (Instituto Federal de Educação, Ciência e Tecnologia do Rio de Janeiro, IFRJ), with approval number 2,900,236, and the Research Ethics Committee of the hospital at which the study took place (approval number 3,005,361). All the food handlers that participated in the study were informed about the objectives of the study and its procedures, and signed an Informed Consent Form.

RESULTS AND DISCUSSION

Table 1 presents the sociodemographic profile of the interviewees. Most of the individuals were female (82%), with a predominant age range of 41 – 50 years old (70%), complete high school education (46%), and had at least six years of experience as a food handler (64%). The majority worked in food services (70%) and had undergone recent GHP training (within the preceding 3 months) (84%).

Table 1. Sociodemographic profile of the food handlers of the Food and Nutrition Unit (FNU) of a public hospital in Rio de Janeiro, RJ (Brazil), in 2018.

Variable	Absolute frequency	Percentage (%)
Sex		
Female	41	82
Male	9	18
Age		
21–30 years	6	12
31–40 years	9	18
41–50 years	18	36
More than 51 years	17	34
Education		
Middle school (incomplete)	5	10
Middle school graduate	9	18
High school (incomplete)	13	26
High school graduate	23	46
FNU Experience		
Less than 1 year	1	2
1–5 years	17	34
6–10 years	17	34
More than 10 years	15	30
FNU Function		
Cook	7	14
Cupbearer	35	70
Kitchen assistant	7	14
Pastry chef	1	2
Most recent GHP training		
Less than 3 months ago	42	84
3–6 months ago	8	16

The predominance of female food handlers in the sample appears to be typical of hospital food service area.[8,14,22] This pattern appears to be related to the fact that food care tasks have been considered traditionally as a female occupation.[22]

Regarding education, it was observed a prevalence of individuals with complete high school education, a profile similar to that of other studies s.[8,14,26] In Brazil, employers do not require minimum level of education

or specific qualifications for food handlers[22] and most publications on collective feeding it is common to find this low level of formal education of workers, which is seen as one of the principal factors determining the transmission of foodborne diseases during meals production.[27]

All the respondents confirmed having taken some training course in food safety, with a majority (84%) receiving training within the three months preceding the study. The training and qualification of food handlers are considered to be primary measures for the reduction of the risk of foodborne diseases. However, the type and techniques used in training play an important role in the development of safe and adequate food handling behavior and practices.[28,29]

Brazilian health legislation determines food handlers to have specific GHP training. Resolution Nr. 216/2004 of the Brazilian Health Regulatory Agency (Agência Nacional de Vigilância Sanitária, ANVISA) determines that all those responsible for food handling should take training courses that cover at least the following four subjects: food contaminants, foodborne diseases, hygienic food handling, and GHP. However, the resolution does not determine the frequency with which this training should be taken.[17]

Table 2. Knowledge of Good Handling Practices (GHP) of the food handlers of the Food and Nutrition Unit (FNU) of a public hospital in Rio de Janeiro, RJ (Brazil), in 2018.

Question	Correct answers (%)
1. Does the use of adornments such as earrings, rings, wedding bands, watches, and cell phones in the kitchen favor the contamination of meals?	94
2. Contaminated water may transmit disease, but when it is frozen, does the risk decrease?	56
3. To avoid contaminating food, should the hands be washed under running water using a neutral detergent, and then drying them with paper towels?	22
4. Can the contact between raw and cooked foods, such as the use of unwashed parsley and chives in hot dishes, contaminate the food?	90
5. Does the consumption of food that is one day past its expiry date represent a health risk?	88
6. Does food that is unfit for consumption always smell bad and taste off?	42
7. Are vegetables that have been washed and soaked in water with vinegar safe to eat?	88
8. Should food be defrosted with or without water in the sink, on table or bench?	68
9. Can a food handler in full uniform leave the kitchen and go outside the hospital?	100
10. Can a food handler have a moustache or beard, as long as it is trimmed?	100
11. Does a food handler with an illness such as diarrhea, flu or a sore throat represent a food contamination risk?	94

Table 2 presents the percentages of correct answers provided by the food handlers to the questions of block 2 of the questionnaire, which evaluate the GHP knowledge of the respondents, according to ANVISA Resolution Nr. 216/2004.17 A majority of the food handlers (76%) respondents presented a level of knowledge of GHHP considered sufficient.

In the present study, the food handlers presented a good level of knowledge in aspects such as the importance of not wearing adornments while handling food , cross-contamination, not using food after its expiration date, proper washing of vegetables, personal cleanliness and hygiene, and the handler's health status.

The question with the lowest percentage of correct answers referred to correct hand washing techniques (question 3). Only 22% of the food handlers perceived that the procedure described in the questionnaire was incorrect because it did not mention the use of bactericidal soap. This is an essential question in food handling, given that inadequate hand washing, together with a reduced frequency of this procedure, can increase considerably the risk of foodborne diseases 30

Correct hand washing has been identified as one of the most effective ways of preventing the dissemination of pathogens and, in turn, of foodborne diseases.8 As a simple and effective way of reducing cross-contamination, hand-washing has long been adopted as a public health strategy around the world.31,32 A study of 816 outbreaks of foodborne disease linked the majority of cases to incorrect hand washing.32

Another question with a low percentage of correct answers (42%) was that which associated contamination with alterations in the smell and taste of the food (question 6). In this question, 52% of the respondents confirmed that contaminated food invariably presents alterations in its smell or taste. This association between contamination and alterations in palatability was also found in a study that evaluated the knowledge of food handlers in restaurants of the Brazilian city of São Paulo, in which 81% of the respondents confirmed that they could only identify contaminated food when it presented some alteration in its color, odor or taste.8 While this may reflect a common-sense perception, it is not recommended by either GHP or the current Brazilian health legislation (ANVISA RDC Nr. 2016/2004).17 When food handlers trust this criterion, they will also tend to believe that palatable food is always safe.

A number of previous studies10,34 have found correlation between formal education and knowledge of GHP, which indicates that education may have a direct influence on the effectiveness of GHP training, possibly because individuals with higher level of education may be able to understand the content of training courses more easily. In the present study, however (Table 3), no significant association ($p>0.05$) was found between these variables.

Table 3. Association between the formal education of the food handlers and their knowledge of Good Handling Practices (GHP) at the Food and Nutrition of a public hospital in Rio de Janeiro, RJ (Brazil), in 2018.

Education	Level of GHP knowledge					p^1
	N	Insufficient		Sufficient		
		N	%	N	%	
Middle school graduate	9	4	44.4	5	55.6	
Middle school (incomplete)	5	0	0.0	5	100.0	0.211

Table 3. Association between the formal education of the food handlers and their knowledge of Good Handling Practices (GHP) at the Food and Nutrition of a public hospital in Rio de Janeiro, RJ (Brazil), in 2018.

Education	Level of GHP knowledge					p^1
	N	Insufficient		Sufficient		
		N	%	N	%	
High school graduate	23	4	17.4	19	82.6	
High school (incomplete)	13	4	30.8	9	69.2	
TOTAL	50	12	24.0	38	76.0	

[1]*p* value for the Chi-square test of association.
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This lack of association may be related to the fact that, even for the individuals with low education levels, experience working as a food handler (64% of the respondents had more than six years of job experience as food handler), in addition with the frequent and effective GHP training adopted by the FNU (84% of the respondents reported had attended a training course within the preceding 3 months), may compensate for any potential deficiency in formal education. It is nevertheless important to note that the observed lack of association may also may still occur due to a limitation arising from the small sample size (N<100).

The risk perception of the food handlers is shown in Table 4. The respondents associated a high risk for the occurrence of foodborne diseases to the following practices: the use of adornments (question 6), inadequate cooking temperatures (question 7), use of expired food (question 8), the inadequate washing of utensils (question 9), and inadequate defrosting (question 10). The respondents showed high risk perception, recognizing that the adoption of inadequate food handling practices may influence the occurrence of foodborne diseases.

Table 4. Perception of the risk of foodborne diseases by the food handlers of the Food and Nutrition Unit (FNU) of a public hospital in Rio de Janeiro, RJ (Brazil), in 2018.

Question	Mean [a]	Standard deviation
1. What is the risk of a patient having stomach problems or vomiting (food poisoning) after eating a meal that you prepared?	2.98	2.1
2. What is the risk of a patient having stomach problems or vomiting (food poisoning) after eating a meal prepared by a colleague of your staff?	3.20	2.0
3. If a colleague of your team does not wash his hands, what is the risk of a patient having stomach ache and/or vomiting (food poisoning) after eating a meal prepared by him?	5.58	0.9
4. If you do not wash your hands, what is the risk of a patient having stomach ache and/or vomiting (food poisoning) after eating a meal you have prepared?	5.56	0.9
5. If a patient consumes contaminated food, what is the risk of acquiring a serious illness or dying?	5.54	1.1
6. If you wear earrings, jewelry, or have uncovered hair while you work, what is the risk of a patient having stomach ache and/or vomiting (food poisoning) after eating a meal you have prepared?	5.20	1.2
7. What is the risk of a patient having stomach ache and/or vomiting (food poisoning) after consuming a hot meal that has not been heated to 70°C in the center?	4.96	1.3
8. If you prepare/distribute to a patient a meal with an ingredient that is past its expiry date, what is the risk that the patient will have stomach ache/vomiting (food poisoning) after consuming the meal?	5.56	0.9
9. If you do not wash a utensil adequately, what is the risk of a patient having stomach ache and/or vomiting (food poisoning) after consuming a meal prepared in the hospital?	5.36	1.12
10. If you prepare meat that has been defrosted inadequately, what is the risk of the patient having a stomach ache and/or vomiting (food poisoning) after consuming the meal?	4.22	1.75

Legend: a – Mean based on the ranking of the answers: 1 = Extremely low risk; 2 = Very low risk; 3 = Low risk; 4 = High risk; 5 = Very high risk; 6 = Extremely high risk.

It is interesting to note that, despite the reduced percentage of correct answers to the question on correct hand washing (question 3, Table 2), the food handlers perceive a high risk in association with this practice (questions 3 and 4, Table 4). One possible explanation for this apparent contradiction would be that, even though the food handler recognizes the need to wash their hand to prevent spreading foodborne diseases, their perception may not translate into safe practice, either because the individual does not agree with the practice or because working conditions do not permit the expected behavior.[33] The knowledge acquired during the training courses may not have been absorbed by the food handlers due to a lack of adequate explanation, and contextualization, of the norms of hygiene, given that, in many cases, the workers are unaware of the reasons for adopting these norms.[10,14]

An adequate perception of the risks of food safety and foodborne diseases by food handlers is fundamental, given that a low perception may often lead to inadequate behavior in terms of the norms and procedures determined by GHP.[35]

An individual's perception of the risk involved in a given task is a good indicator of their willingness to adopt a particular practice or behavior. It is essential for food handlers to understand that food safety has real risks, which have real consequences. This means that training courses should focus primarily on the tasks and behaviors that present the greatest risk or are most frequently associated with foodborne diseases.[36]

Inadequate personal habits, such as touching or tasting food with unwashed hands, drying the mouth or hands on aprons, and using cloths to dry food or utensils, can contaminate food, and should thus be properly addressed during training courses.[8]

The food handlers did not perceive a high risk in their answers to questions 1 and 2, which were also used to evaluate the occurrence of optimism bias. This indicates that the food handlers do not perceive that either they or their colleagues are potential transmitters of foodborne diseases.

When the food handlers were asked whether they might transmit foodborne diseases (Table 4), most individuals indicated that there was a very low risk of this happening (2.98 ± 2.17). Their answers were very similar (3.20 ± 2.08) (Table 4) when asked to define the risk level for the transmission of foodborne diseases by their work colleagues.

A similar situation was observed when the food handlers were asked to evaluate the level of risk of the occurrence of foodborne diseases in relation to a lack of hand washing by the respondent (5.56 ± 0.99) or by their colleagues (5.58 ± 0.97).

Statistical analysis of these data (Table 5) show that the differences between the answers provided for each pair of questions are not significant ($p>0.05$) in either case. This finding indicates a lack of optimism bias in the food handlers respondents in the present study.

Table 5. Results of the analysis of the optimism bias in the food handlers of the Food and Nutrition Unit (FNU) of a public hospital in Rio de Janeiro, RJ (Brazil), in 2018.

	Personal risk	Risk of other food handler	p^a
	Mean ± SD	Mean ± SD	
Question 1 *vs.* Question 2[b]	2.98 ± 2.17	3.20 ± 2.08	0.301
Question 4 *vs.* Question 3[c]	5.56 ± 0.99	5.58 ± 0.97	0.799

Legend: SD = Standard Deviation

[a] The p-value is related to the difference in paired means for each pair of questions with a 95% confidence interval.

[b] Comparison between the handler's own risk and that of a colleague in causing foodborne disease.

[c] Comparison between the risk of the handler himself and a colleague causing foodborne disease by not washing their hands

The answers obtained for these questions may reflect the level of trust of the food handlers in the GHP training they have received in the FNU. Well-trained workers may be overly confident in their own abilities, even though the theoretical knowledge does not always translate into safe attitudes.

The evaluation of a possible optimism bias is extremely important, given the general tendency for food handlers to answer the question relatively optimistically, invariably attributing themselves a low to moderate level of risk, and not accepting the possibility of being a transmitter of microorganisms, as observed in some previous studies.[8,11] This is a common attitude, a typical human pattern identified in some behavioral studies, in which the individual always believes in a positive future, with very optimistic expectations in comparison with the actual reality of the situation.[11]

The lack of any optimism bias in the food handlers respondents in the present study indicates that they perceive themselves as posing the same level of risk as their colleagues, which may reflect a certain level of team spirit in this group. Team work is extremely important in food service.

The lack of optimism bias may also indicate an adequate level of risk perception, not influenced by an excessively optimistic self-evaluation, which might lead the food handler to neglect some preventive measures, and thus contaminate food.[11] It is important to note, however, that the reduced number of questions used to evaluate specifically the existence of this phenomenon (only two pairs of questions) may have limited the potential of the study to evaluate optimism bias.

Given the high percentage of correct answers to the proposed questions (76%) recorded in the present study, the food handlers appear to have sufficient knowledge of GHP, although there is no guarantee that this knowledge is applied adequately in practice, given that the present study did not evaluate this association. It is also important to note that the training of food handlers is a complex challenge, which involves behavioral approaches and the transformation of knowledge into habits.[37]

The food handler can be considered to be a unique and multi-faceted diamond, and it is necessary to understand their work from this perspective.[30] The knowledge of the food handler should thus be viewed from a more ample perspective, which considers social and cultural aspects, and reflecting the limitations and specific features of their workplace[35]

CONCLUSIONS

The results of the present study indicate that a majority of the food handlers of the sample analyzed presented a sufficient level of knowledge on good handling practices. However, some of the questions were answered incorrectly by a large percentage of the interviewees, which indicates probable lacunas in their knowledge of the current health legislation. The food handlers of the sample analyzed nevertheless had a high level of risk perception, and recognized that a lack of good handling practices may influence the occurrence of foodborne diseases. The lack of optimism bias is a positive finding, given that an overly optimistic food handler may overlook certain essential preventive measures, and thus contaminate the food they serve.

Although the food handlers in the sample analyzed presented a satisfactory level of theoretical knowledge on good handling practices, it is important to analyze whether this knowledge translates into adequate attitudes and practices. Given this, further, complementary study is needed to evaluate not only the knowledge of these individuals, but also their behavior reflected in attitudes and daily practices.

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Contributors

Cunha RO participated in the conception and development of the project, and the analysis and interpretation of the data; Garcia-Gomes AS participated in the conception and development of the project, the analysis and interpretation of the data, and the review and approval of the final version of the manuscript; Alves S participated in the conception and development of the project, the analysis and interpretation of the data, and the review and approval of the final version of the manuscript.

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