




 Juliana Costa Liboredo¹
 Iara Bank Setti²
 Natália Caldeira de Carvalho³

¹ Universidade Federal de Minas Gerais , Escola de Enfermagem, Departamento de Nutrição. Belo Horizonte, MG, Brasil.

² Universidade Federal de Ouro Preto , Escola de Nutrição. Departamento de Alimentos. Ouro Preto, MG, Brasil.

³ Universidade Federal de Ouro Preto , Escola de Nutrição. Ouro Preto, MG, Brasil.

Correspondence
Natália Caldeira de Carvalho
natalia.carvalho@ufop.edu.br

Assistant Editor
 Lucileia Grahen Tavares
Colares

Hygiene and safety measures during the COVID-19 pandemic and its associated factors: a study in a sample of Brazilian food services

Medidas de higiene e segurança durante a pandemia de Covid-19 e fatores associados: estudo em uma amostra de serviços de alimentação brasileiros

Resumo

Este estudo teve como objetivo avaliar o desempenho de serviços de alimentação em relação ao cumprimento de medidas de higiene e segurança para prevenção da disseminação da Covid-19 e identificar fatores associados. Trata-se de um estudo transversal, realizado entre maio e agosto de 2021, com 137 serviços de alimentação localizados na região dos Inconfidentes, estado de Minas Gerais, Brasil. Foi realizada regressão logística multivariada para identificar os fatores associados ao desempenho dos serviços de alimentação quanto ao cumprimento das medidas de higiene e segurança. A amostra foi composta principalmente por restaurantes (35,8%) e lanchonetes/*fast food* (22,9%). Apenas 30,7% dos estabelecimentos apresentaram mais de 75% de conformidade com as medidas de higiene e segurança. A presença de nutricionista na equipe (OR=34,7), a existência de manual de boas práticas implementado (OR=4,5), a redução do horário de funcionamento (OR=3,66), a dificuldade na implementação do serviço de *delivery* (OR=3,74) e a dificuldade em encontrar orientações sobre protocolos de segurança (OR=0,16) associaram-se independentemente à maior probabilidade de o serviço de alimentação apresentar mais de 75% de conformidade. Conclui-se que a prevalência de serviços de alimentação com mais de 75% de conformidade durante a pandemia de Covid-19 foi baixa. Estratégias para reduzir as dificuldades enfrentadas pelos serviços de alimentação, bem como a presença de nutricionista e Manual de Boas Práticas, podem contribuir para a melhoria no desempenho desses estabelecimentos em relação à conformidade com essas medidas.

Palavras-chave: Boas práticas de manipulação. Covid-19. SARS-CoV-2. Restaurante.

Abstract

This study aimed to evaluate the performance of food services in relation to compliance with hygiene and safety measures to prevent the spread of COVID-19 and factors associated. A cross-sectional study was performed from May to August 2021 with 137 food services located in the Inconfidentes

region, state of Minas Gerais, Brazil. Multivariate logistic regression was performed to identify the factors associated with performance of food services in relation to compliance with hygiene and safety measures. The study sample was mainly composed of restaurants (35.8%) and snack bars/fast food places (22.9%). Only 30.7% of the establishments presented over 75% compliance with hygiene and safety measures. Having a dietitian on the team (OR=34.7), having an implemented good practices manual (OR= 4.5), decreasing in the operating hours (OR= 3.66), have difficulty in implementing the delivery service (OR= 3.74) and having difficulty to find guidance on security protocols (OR= 0.16) were independently associated with the likelihood of food service complying over 75% of the hygiene and safety measures. In conclusion, the prevalence of food services with more than 75% compliance with hygiene and safety measures during the COVID-19 pandemic was low. Strategies to reduce the difficulty faced by food service, as well as the presence of a dietitian and good practices guidelines may improve the performance of food services in relation to compliance with these measures.

Keywords: Good manufacturing practice. COVID-19. SARS-Cov-2. Restaurant.

INTRODUCTION

Food services must guarantee the hygiene and sanitary quality of food. However, failures can occur at any point in the process of producing food, including cross-contamination, insufficient sanitization, unsuitable food handling conditions, improper conservation and storage, and other issues that can compromise food quality and result in food-borne illnesses.^{1,2} These diseases are a public health problem caused by eating food contaminated with bacteria, viruses, parasites or chemical substances such as heavy metals.³ Unsafe food contributes to 600 million - almost 1 in 10 people - foodborne illness incidents and 420,000 fatalities globally year.⁴ In Brazil, 6,874 foodborne outbreaks were reported, between 2014 and 2023, by the Department of Health Surveillance that caused 110,614 illnesses and 121 deaths. Residence and food establishments are the main place in outbreaks in the country, being responsible for 34.0% and 14.6% of the cases, respectively.⁵ In order to prevent food-borne illness, the implementation of hygiene measures in food services are crucial.

Recently, hygienic practices were intensified in food services due the COVID-19 pandemic caused by SARS-CoV-2 (novel coronavirus). Although there is no evidence that food is a likely source or route of transmission of novel coronavirus,⁶ during the pandemic, food services should pay greater attention to compliance with hygiene in addition to other safety measures, including procedures related to food, workers and the environment.⁷⁻¹⁰

Some recommended measures related to food included: adequate cooking of all food parts reach a temperature of at least 70°C; washing and disinfecting of packages of raw material; and reinforcing the cleaning routines of inanimate surfaces, porters and drivers' hands during the transportation of foods and raw materials.^{11,12}

In relation to food handlers the protocols to prevent SARS-CoV-2 transmission included the daily monitoring of food service employees in order to identify any suspicious cases of the disease; workplace physical distancing among employees, regular and thorough hand washing with soap and water, frequent using of alcohol-based hand sanitizers, using of good respiratory hygiene, frequent cleaning/disinfection of work surfaces, and avoiding contact with individuals showing symptoms of respiratory illness.¹³ Additional procedures about personal protective equipment (PPE) were also taken during this pandemic, as not sharing them and only wearing it during work,¹⁴ using use of masks (especially when it was not possible to ensure a minimum distance of one meter between workers or customers) and frequent changing of gloves.¹³ Moreover, the employees should receive training on the correct use of PPE to prevent these equipment becoming the focus of COVID-19 transmission, since the use of gloves, masks or other PPE does not replace hygiene practices.^{13,14} Food handlers from food services — who were usually those individuals at the front line — were at higher risk of infection.¹⁵ A failure in the safety measures could result in food-handlers transferring the virus to customers, work staff, and the various other surfaces one comes into contact with.¹⁵

Regarding equipment and utensils, routines for improvement of procedures cleaning and disinfecting were recommended.^{13,16} All surfaces, equipment, and utensils in direct contact with food during meal preparation should be cleaned and disinfected before and after performing a task with different foods.¹⁵ Other measures included physical structure adjustments to guide food services on how to reopen such as managing incoming and outgoing customers; ensuring distance between individuals in lines; disinfecting tables and chairs after each customer use; cleaning bathrooms more frequently;¹³ making disposable gloves available to customers to serve meal, offering cutlery in individual packages and spices in sachets; and offering utensils in a protected way.¹⁷ Other physical structure adjustments were suggested, such as to restrict the number of customers to allow the distancing between tables; hand sanitizer available to customers; barrier in checkout counter and salivary protectors in buffet tables;¹³ and preferable natural

ventilation in indoor environments.¹⁷ In addition, food service establishments should review their food supply options and, whenever possible, avoid offering services such as buffet and drinking stations (self-service), to minimize the contamination risk among individuals due to the sharing of utensils and surfaces.¹⁸

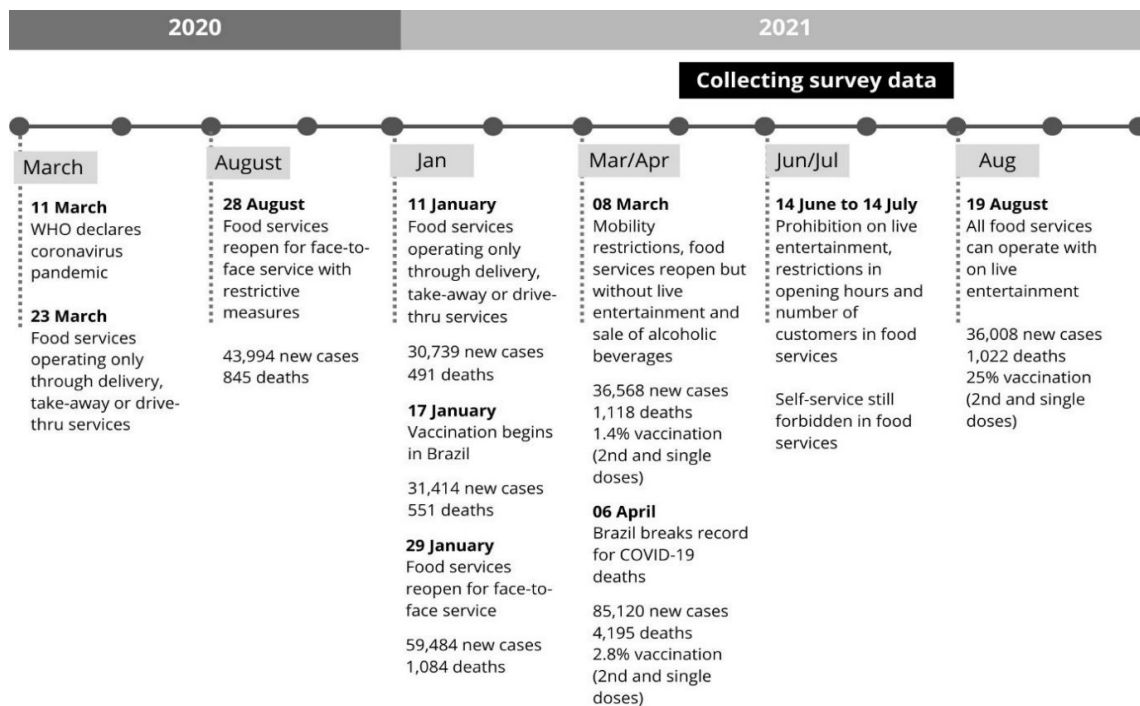
With these recommendations and governmental requirements for COVID-19 control, food hygiene practice in food establishments was expected to increase during the COVID-19 pandemic.¹⁹ However, information about the implementation of hygiene and safety measures in food service in the pandemic context is still scarce. Some studies found a high prevalence of poor food hygiene practices among food handlers working in food establishments.^{19,20} However, some studies reported improvement in the hygiene practices in restaurants²¹ and food business⁹ during the pandemic. To our knowledge, only one study has been conducted on this topic in Brazil, in the city of Curitiba (state of Paraná), to identify the key adjustments made by food unit managers during the epidemic.²² Thus, this study aimed to evaluate performance of a sample of Brazilian food services in relation to compliance with hygiene and safety measures to prevent the spread of COVID-19 and identify associated factors.

METHODS

Study design

A cross-sectional study was carried out with food service located in three municipalities that comprise a region popularly called “Inconfidentes”, located in Minas Gerais state, southeastern region of Brazil. Ouro Preto, Mariana and Itabirito have 74,821, 61,387 and 53,365 inhabitants, and Human Development Index (HDI) of 0.741, 0.742 and 0.730, respectively.²³ The survey was performed from May to August 2021, about 15 to 18 months after the pandemic began. During this period, there were some changes in restrictions on the operation of the food services in the municipalities surveyed, as shown in Figure 1, but these establishments were opened for face-to-face service.

Figure 1. Timeline of the COVID-19 pandemic[†] and the situation of food services from the beginning of the health crisis to the survey period[‡].



Note:[†]The collecting survey data took place from May to August 2021; [‡]Data on new cases, deaths and vaccination rates against COVID-19 correspond to the entire Brazilian population (Source: State Health Departments - <https://covid19br.wcota.me/>).

Food services recruited were those registered in the Vigilância Sanitária — VISA (Sanitary Surveillance) from the municipalities, as well as establishments available on food delivery apps (Ifood and Aiqfome). Contact with these establishments was made via telephone calls limited to five attempts (at different times and days of the week). Food services that were closed since the pandemic began were excluded from the study.

The initial few minutes of the phone conversation were recorded to document the reading of the consent form and the participant's assent. When the managers/owners consented to participate in the study, an interview was conducted to collect data. The interview was conducted by trained researchers using a structured questionnaire. The interview took roughly 15 minutes to complete.

This survey was approved by the institutional Research Ethics Committee (CAAE 34.335.120.0.0000.5150). In addition, all procedures followed the Declaration of Helsinki.

Instrument

Questionnaire was developed by researchers and tested by 10 individuals to refine the questions and ensure data accuracy. Thus, the final questionnaire used in the study was composed of three sections: 1) *Operation and financial situation* - included multiple-choice and open questions about type of food service; presence of a dietitian in your work team; presence of an implemented good practices handbook; and change in operating hours; number of employees; number of menu options; revenue and profit during the pandemic. 2) *Difficulties faced* - included a multiple-choice question about faced difficulties by food services during the pandemic, such as: price increase; delay or lack of raw materials; drop in revenue; attraction customers; maintaining the employees number; adherence of customers to security protocols; adjust the physical structure; implementation the delivery service; adapting to new hygiene routines; adjusting the menu; access to guidance on security protocols. 3) *Hygiene and safety measures* - included a multiple-choice question about 17 procedures adopted in the food services in order to prevent COVID-19 spread, including: procedures with employees (health monitoring; using masks and gloves; training; frequent hand washing); food (care of food packaging; cleaning vegetables and fruits before storing or preparing); equipment and environment (dishwasher using; cleaning of tables at each customer exchange; frequent cleaning of the environment, surfaces and equipment); consumers (offer of disposable cutlery and cups, packaged cutlery and gloves; availability of sink for hand washing and hand sanitizer; portioning of food made by the customers or employees). Questions about hygiene and safety measures adopted in the food services were based in previous documents, such as food safety guidance for food businesses from WHO (World Health Organization),¹³ technical notes published in Brazil by the Brazilian Health Regulatory Agency - Agência Nacional de Vigilância Sanitária (ANVISA)^{11,14,18} and manuscripts related to the topic.^{15,24,25}

Data analysis

To analyze the data, the proportion of measures implemented by each food service was determined in relation to the total number of measures questioned in the interview, using the following formula: [*Compliance level of food service = (number of hygiene and safety measures adopted x 100)/total number of hygiene and safety measures investigated*]. The percentage of hygiene and safety measures adopted by each food service was divided into quartiles. For analytical purposes, a 75% cutoff point was adopted to define higher levels of compliance with hygiene and safety measures. This threshold was established based on two complementary rationales. First, it corresponds to the third quartile of the distribution of compliance scores within the

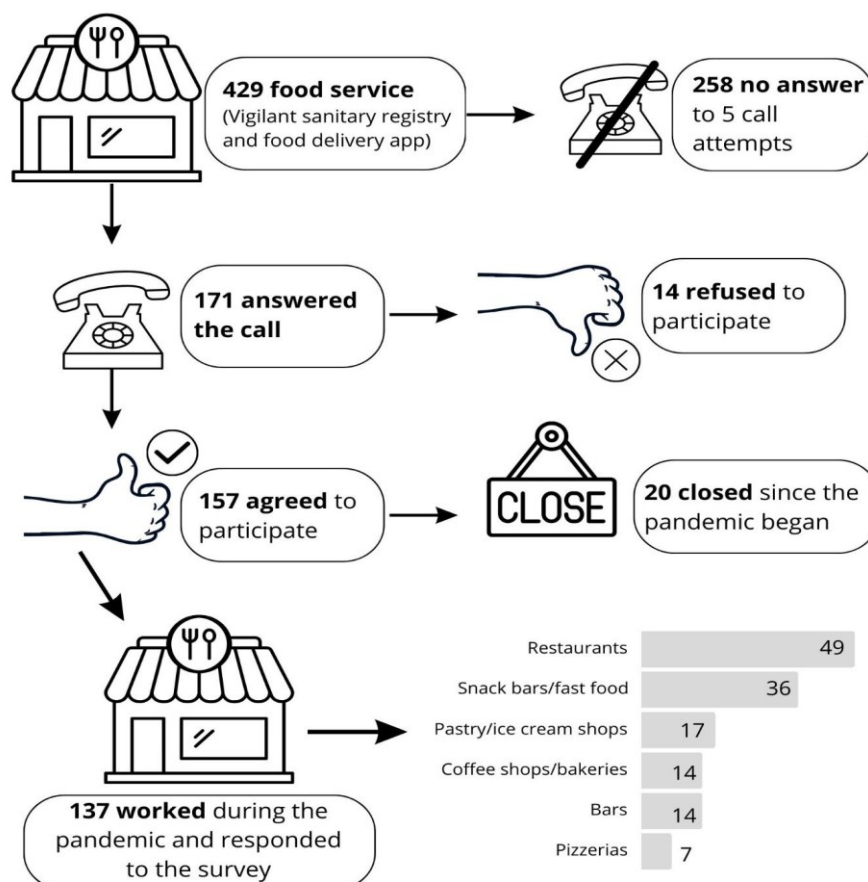
sample, allowing the identification of establishments with relatively higher adherence. Second, this cutoff is consistent with the criterion used by the Brazilian regulatory agency ANVISA (RDC No. 275/2002)²⁶ to classify food service establishments as satisfactory in relation to good manufacturing practices. Considering that the pandemic context imposed atypical operational conditions and challenges not anticipated in this regulation, this cutoff was not employed as a legal or normative parameter of compliance during COVID-19, but rather as an analytical tool to identify factors associated with higher levels of adherence to recommended measures. Thus, in this study, food services were classified into two groups: those that had implemented 75% or fewer hygiene and safety measures, and those that had implemented more than 75%.

To evaluate the factors independently associated with performance of the food services in relation to adoption of hygiene and safety measures, univariate and multivariate logistic regression models were performed considering those who achieved more than 75% compliance. Multivariate logistic regression analysis used variables with p less than 0.2 in univariate analysis. The backwards method was used with variables retained in the model. The level of significance adopted was 0.05. Data were analyzed using the Statistical Package for Social Sciences (SPSS version 22.0).

RESULTS

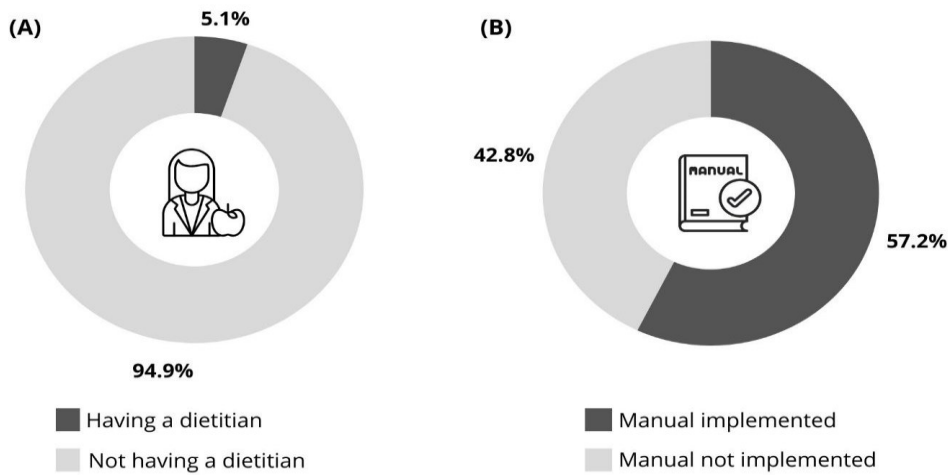
Of the 429 food services contacted, 137 (36.6%) actually participated in the study, 272 (63.4%) were lost (no answer to call attempts or no agreement to participate), and 20 (4.7%) were excluded for not meeting the inclusion criteria as shown in Figure 2.

Figure 2. Number of food services recruited (n=429) and excluded (n=20), losses (n=272) and number and types of establishments participating (n=137) in the study.



The study sample was mainly composed of restaurants (35.8% of the participating establishments) and snack bars/fast food places (22.9%). Only 5.1% (n=7) establishments had a dietitian in their work team and 48.2% (n=66) had implemented a good practices handbook (Figura 3).

Figure 3. Presence of a dietitian on staff (A) and implementation of a Good Practices Handbook (B) in the food service surveyed (n=137).



Among recommended hygiene and safety measures to prevent COVID-19 spread, only 30.7% of the establishments presented over 75% compliance (Figure 4). Restaurants (44.9%) and coffee shops/bakeries (35.7%) were the types of food services with the highest number of establishments with more than 75% compliance with the measures evaluated, while none of the pizzerias achieved this percentage.

Figure 4. Compliance level of all food service and per types of establishments with recommended hygiene and safety measures to prevent the spread of COVID-19.

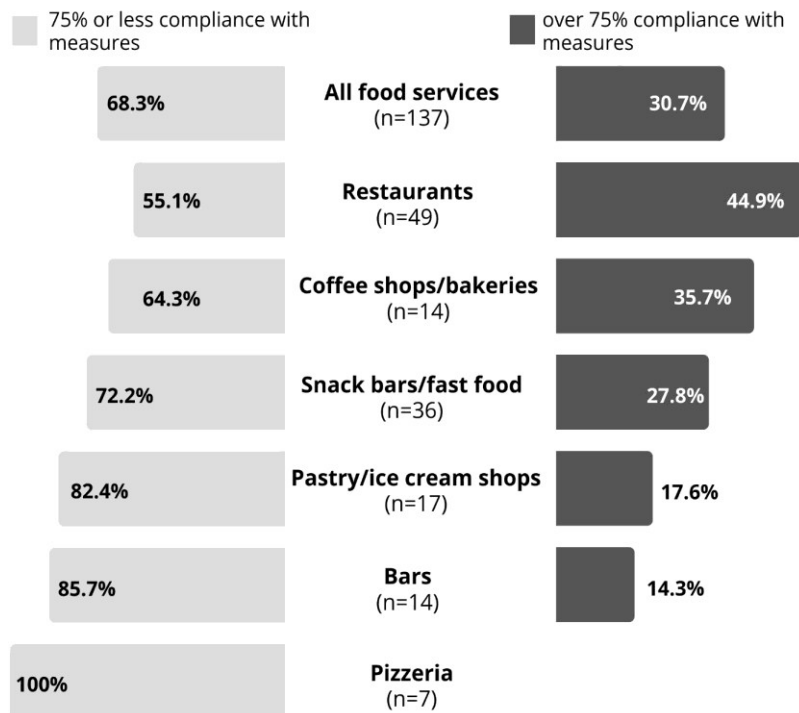


Table 1 shows the operation/financial situation and difficulties faced according to the level of adequacy of food services to the hygiene and safety procedures. Dietitians (14.6%) and good practice manual (68.3%) were most frequently found in the establishments with more than 75% compliance. Difficulties in maintaining staff numbers (75.6%) and implementing delivery services (43.9%) were more frequently observed in establishments with over 75% compliance. Meanwhile, difficulty in finding guidance on security protocols was more frequent among establishments that did not achieve over 75% compliance (31.3%).

Table 1. Operation/financial situation and faced difficulties according to the level of adequacy[†] of food services (n=137) to the hygiene and safety procedures for operation during the COVID-19 pandemic in Brazil. Ouro Preto, MG, 2021.

<i>Operation and financial situation</i>	< 75% [†]	> 75% [†]
	n (%)	n (%)
Dietitian	1 (1.0)	6 (14.6)
Good Practices Handbook	37 (38.5)	28 (68.3)
Operating hours		
Reduced	46 (47.9)	32 (78.0)
Maintained	42 (43.8)	8 (19.5)
Increased	8 (8.3)	1 (2.4)
Number of employees		
Reduced	41 (42.7)	28 (68.3)
Maintained	47 (49.0)	12 (29.2)
Increased	8 (8.3)	1 (2.4)
Revenue reduction	71 (74.0)	37 (90.2)
Profit reduction	68 (70.8)	34 (82.9)
Menu changes	47 (49.0)	20 (48.8)
<i>Faced difficulties</i>	< 75% [†]	> 75% [†]
	n (%)	n (%)
Price increase and delay or lack of raw materials	83 (86.5)	34 (82.9)
Drop in revenue	77 (80.2)	36 (87.8)
Attract customers	71 (73.9)	32 (78.0)
Keep the employees number	47 (48.9)	31 (75.6)
Adherence of customers to security protocols	48 (50.0)	28 (68.3)
Adjust the physical structure	36 (37.5)	13 (31.7)
Implement the delivery service	29 (30.2)	18 (43.9)
Adapt to new hygiene routines	32 (33.3)	13 (31.7)
Adjust the menu	28 (29.2)	14 (34.1)
Find guidance on security protocols	30 (31.3)	5 (12.2)

[†] Level of adequacy refers if the establishment achieved or not over 75% compliance with recommended hygiene and safety procedures to prevent the COVID-19 spread.

Table 2 presents the operation/financial situation and faced difficulties that were significantly associated with the likelihood of food service achieving over 75% compliance with hygiene and safety measures to prevent the spread of COVID-19. These variables were having a dietitian and a good practice manual, operating hours, number of employees, revenue, implementing the delivery service, finding guidance on security protocols, and keeping the employees number that reached the pre-established criterion of $p < 0.20$ to enter the adjusted analysis.

Table 2. Univariate logistic regression analysis for the operation/financial situation and faced difficulties associated with the level of adequacy[†] of food services (n=137) to the hygiene and safety procedures for operation during the COVID-19 pandemic in Brazil. Ouro Preto, MG, 2021.

<i>Operation and financial situation</i>	OR (95%CI)*	p value**
Dietitian ^a	15.67 (1.82 - 134.7)	0.012
Good Practices Handbook ^a	3.50 (1.61 - 7.58)	0.002
Operating hours ^b		
Reduced	3.85 (1.60 - 9.28)	0.003
Increased	0.66 (0.07 - 5.99)	0.709
Number of employees ^b		
Reduced	2.84 (1.28 - 6.28)	0.010
Increased	0.49 (0.06 - 4.30)	0.520
Revenue ^c	3.21 (1.04 - 9.94)	0.043
Profit ^c	1.99 (0.79 - 5.01)	0.147
Number of menu options ^d	0.93 (0.45 - 1.92)	0.841
<i>Faced difficulties</i>	OR (95%CI)*	p value**
Price increase and delay or lack of raw materials ^a	0.61 (0.23 - 1.64)	0.330
Drop in revenue ^a	1.85 (0.64 - 5.34)	0.256
Attract customers ^a	1.24 (0.52 - 2.96)	0.629
Keep the employees number ^a	3.27 (1.45 - 7.39)	0.004
Adherence of customers to security protocols ^a	1.96 (0.92 - 4.18)	0.082
Adjust the physical structure ^a	0.74 (0.34 - 1.59)	0.435
Implement the delivery service ^a	1.71 (0.81 - 3.62)	0.163
Adapt to new hygiene routines ^a	0.88 (0.40 - 1.93)	0.754
Adjust the menu ^a	1.20 (0.55 - 2.61)	0.652
Find guidance on security protocols ^a	0.29 (0.11 - 0.82)	0.019

[†] Level of adequacy refers if the establishment achieved or not over 75% compliance with recommended hygiene and safety procedures to prevent the COVID-19 spread;

^a Reference categoric of these variables correspond to “no”;

^b Reference categoric of these variables correspond to “maintained”;

^c Reference categoric of these variables correspond to “did not reduce”;

^d Reference categoric of this variable correspond to “did not change”;

*OR: Odds Ratio and 95%CI: Confidence Interval of 95%; **Significance difference in univariate analysis at p<0.2.

The final regression model contains five independent variables that are statistically significant (Table 3). The presence of a dietitian and implemented Good Practices Handbook increases, respectively, 34.7-fold (95%CI: 2.24-538.21) and 4.5-fold (95%CI: 1.78-11.45) the likelihood of food service complying more than 75% of the hygiene and safety measures compared to establishments without dietitian and Good Practices Handbook. Establishments that decreased their operating hours are 3.66 times (95%CI: 1.38-9.70) more likely to achieve over 75% compliance than those that maintained their schedule. The difficulty in implementing the delivery service was associated with higher likelihood (OR= 3.74; 95%CI: 1.36-10.30) of establishment to achieve over 75% compliance. The difficulty to find guidance on security protocols decreases the likelihood (OR= 0.16; 95%CI: 0.05-0.56) of food service complying with more than 75% of the hygiene and safety measures compared to food services that found these guidelines.

Table 3. Final multivariate regression model for the operation situation and faced difficulties associated with the level of adequacy[†] of food services (n=137) to the hygiene and safety procedures for operation during the COVID-19 pandemic in Brazil. Ouro Preto, MG, 2021.

<i>Operation and financial situation</i>	OR (95%IC)*	p value**
Dietitian		
No	1	
Yes	34.7 (2.24 - 538.21)	0.011
Good Practices Handbook		
No	1	
Yes	4.52 (1.78 - 11.45)	0.001
Operating hours		
Maintained	1	
Reduced	3.66 (1.38 - 9.70)	0.009
Increased	0.13 (0.01 - 2.33)	0.165
<i>Faced difficulties</i>	OR (95%IC)*	p value**
Implement the delivery service		
No	1	
Yes	3.74 (1.36 - 10.30)	0.011
Find guidance on security protocols		
No	1	
Yes	0.16 (0.05 - 0.56)	0.004

[†]Level of adequacy refers if the establishment achieved or not over 75% compliance with recommended safety procedures to prevent the COVID-19 spread;

* OR: Odds Ratio and 95%CI: Confidence Interval of 95%;

** Significance difference in multivariate analysis at p<0.05; Percentage of classifications= 78.1%.

Pseudo R²: 28,5%

DISCUSSION

The COVID-19 outbreak highlighted the food safety importance.²⁷ Although there is no evidence that SARS-CoV-2 can be transmitted through food intake and contact with food packages, concerns about food hygiene had grown during the pandemic, and food service establishments had to review, enhance, and supplement hygiene practices/routines and food safety management systems to prevent coronavirus spread.^{28,29}

Moreover, these establishments also needed to adopt other safety procedures to continue operating, such as implementing the delivery service, restrictions on opening hours, monitoring the health and personal hygiene of employees, wearing masks and gloves, social distancing measures, installing physical barriers, offering remote or contactless payment methods, and limited number of customers.^{12,13,16,24,30} Despite the recommendations to prevent COVID-19, in the present study, only 30.7% of the establishments presented over 75% compliance with hygiene and safety measures.

Other studies also found low adherence to the recommended measures. In a survey with food workers in China (including restaurants), only 11.7% of them always adhered to WHO against COVID-19 hygiene

practices and the average correct rate of knowledge about hygiene practices was only 51.1%.³¹ In East Gojjam and West Gojjam Zones (Ethiopia), Alamneh et al.¹⁹ found that only 48.8% of food handlers workers in food establishments had a good level of food hygiene practice, since they scored 60.0% and above of the food hygiene practice investigated. Being both a cook and a waiter, having access to personal protective equipment, having piping water in the kitchen, having a supervisor, and having a separate dressing room were all significantly associated with food hygiene practice among handlers.¹⁹ According to the study conducted by Haryanti and Suryantngsih,²⁰ most food handlers and presenters in food services applied very little food hygiene and sanitation; however, those with higher levels of knowledge presented better compliance in adopting food hygiene.

On the other hand, others study found improvement in hygiene practices during the pandemic. In Tehran (Iran) desirable practices of restaurant food handlers were significantly increased after training intervention on the health and food safety.²¹ Young, Desta, and Sekercioglu³² observed a decrease in total infraction rates during the pandemic and an increase in inspection pass rates in food safety in Toronto, Canada. However, this effect recovered to pre-pandemic levels by 2022, suggesting the need for reinforcement so that advancements are sustainable.³²

Food services have historically struggled to comply with appropriate hygiene measures, even back before the pandemic began. Several prior investigations have discovered poor sanitary practices in food services.³³⁻³⁵ The difficulties in implementing these may have grown with the backdrop of the pandemic, notably with the expansion of measures that needed to be implemented to prevent the COVID-19.

In addition, the pandemic impacted substantially the food service sector from an operational and financial perspective.³⁶ The food service industry had to deal with increased costs brought on by these safety measures as well as the decreased income from customers' decreased demand.^{29,36} In Brazil, the out-of-home food sector recorded a loss in turnover of around \$11 billion in 2020 and, between 2020 and 2021, 300,000 establishments closed their doors in the country and 1.2 million workers were dismissed.³⁷

In the present study, no access to guidance on these security procedures decrease the chance of establishment to achieve 75% compliance. Many guidelines were prepared by regulatory agencies, universities, associations, class councils and consulting firms targeted to support food services in the context of the COVID-19 pandemic. However, as these information are scattered across various documents, it may hinder access and implement measures by food service establishments. A single protocol that brings together all precautionary measures to ensure safe operation of food services could facilitate access to the information, the new routines implementation, and training of employees.

In Brazil, including the municipalities where this study was performed, a sanitary protocol was drawn up to monitor the COVID-19 pandemic and create protocols for the gradual and safe resumption of economic activities. Considering the indicators of health care capacity and the spread of the disease, a risk matrix was put together that segmented economic activities into waves (green, white, yellow, red and purple) and, depending on the classification wave, the establishment could open or not and had to follow certain restrictions.³⁸ This classification and the guidelines changed a lot during the pandemic and this possibly caused confusion about what measures establishments must adopt.

The findings of the present study showed that implementing a Good Practices Handbook was positively associated with compliance of the food service to over 75% hygiene and safety measures to prevent COVID-19 spread. All food service establishments, in Brazil, must have a Good Practices Handbook. This manual is a document that describes all procedures and routines that must be adopted by food services in order to ensure the hygienic and sanitary quality and compliance of food with health legislation.³⁹ Although it is a

mandatory document, in the present study it was found that less than half of the food service had implemented a Good Practices Handbook.

This manual along with the Standardized Operating Procedures are documents that help in preventing food contamination and ensuring higher-quality service, since these are important to implement and comply with good handling practices.⁴⁰ Adopting good handling practices, the food service ensures food safety and prevents foodborne illnesses. Food establishments are the second place in foodborne outbreaks in Brazil.⁵ Thus, if these establishments do not have Good Practices Handbook, they are less likely to follow basic hygiene measures and even less likely to intensify these measures to prevent COVID.

Although not legally required, the presence of a dietitian in commercial food services may support the implementation of good handling practices and help reduce the risk of foodborne outbreaks associated with these establishments. Our findings showed that having a dietitian increased the likelihood of achieving more than 75% compliance. Given the close relationship between nutrition and food safety - since optimal health depends on being both well-nourished and protected from foodborne illness⁴¹ - food safety is considered an essential component of a dietitian's professional competencies⁴² and plays a key role in meeting sanitary legislation requirements in food services.⁴³ In this context, the involvement of a dietitian may facilitate the adoption of appropriate handling practices and, consequently, improve adherence to COVID-19-related measures. Despite this advantage, our study found that very few establishments had a dietitian on staff. This is possibly related to the financial restrictions of these establishments in Brazil, since 70% of the food service are sole proprietorship businesses.⁴⁴

The reduction in operating hours also enhanced the likelihood that food service to achieve more than 75% compliance. This finding was expected, because food handlers may find it more difficult to follow the suggested good practices during busiest periods of operation. Studies have found that productivity declines as more hours are worked.^{45,46} Thus, decreased operating hours can have improved the food handlers productivity, contributing to compliance with the hygiene and safety measures.

We found that the challenge of implementing the structure for the delivery service, during the pandemic, increased the likelihood of the establishments to comply with over 75% of the hygiene and safety measures. It is possible that the food service owners/managers who reported difficulty in implementing the delivery service had sought more information or even professional help to structure the service. The demand for problem-solving can be challenging for employees because it requires people to broaden their knowledge and skills base, so it's an opportunity for learning and growth that becomes an incentive to constantly try to solve problems.⁴⁷ In the first year of the pandemic, guidelines on safe food delivery were published and disseminated by health authority,^{11,12,14,16,18} restaurant associations,¹⁷ business support entities⁴⁸ professional council,⁴⁹ and print, broadcast and digital media in Brazil, which it may have helped people seeking this knowledge.

We have found few studies in the literature on the reality of food services in Brazil during the COVID-19 pandemic, and all of them were regional (conducted in one or two cities) and included a limited number of establishments. Considering hygiene and safety practices, the procedures with the lowest adherence by food services, according to the studies found, were: (a) the adequate frequency of mask changes by food handlers, installation of impermeable barriers, and minimum distancing demarcations in establishments (n=18) located in the city of Santos;⁵⁰ (b) the presence of exclusive handwashing sinks, sanitization of raw material packaging, and the absence of a protocol for employees in contact with infected individuals in food services (n=3) located at a Public University in Rio de Janeiro;⁵¹ (c) provision of specific visual communication resources, demarcation of minimum distancing, readjustment of the work environment, prioritization of contactless payment systems, mandatory use and provision of sanitizing mats, and placement of barriers on

equipment displaying prepared food in establishments (n=13) located in the cities of Fortaleza and Aquiraz, in Ceará.⁵² Although there are difficulties in implementing the same hygiene and safety practices, these studies indicate that these can also vary according to the location of the establishments, demonstrating the importance of studies with regional focuses or capable of identifying these specificities of the location.

In addition to hygiene and safety practices, other studies have observed the occurrence of the same operational and financial situation in establishments located in other Brazilian states during the COVID-19 pandemic. Of the 18 establishments visited by Pinto and Marcelino⁵⁰ in the city of Santos, São Paulo, the presence of a nutritionist was recorded in only six of them. Rocha⁵³ found that the main negative changes faced by food services (n=30) located in the city of Piracicaba, São Paulo, were the reduction in the number of employees and working hours, and the drop in revenue. The health crisis caused by COVID-19 highlighted management problems that many food services in Brazil already had, such as low revenue and working capital, precarious accounting situation (example: lack of control over production costs), and ineffective methods or absence of quality control systems, such as the application of good practices.⁵⁴

This study has some limitations. The first is the loss of an important percentage of the food services initially recruited (almost 60.0%). However, significant results were observed, which are of major importance given that there are relatively few studies on this subject. The second is that hygiene and safety measures implemented were self-reported rather than directly examined by researchers. However, other studies on this subject were also conducted this way during the COVID-19 pandemic.^{19,21} In addition, the implementation of hygiene and safety practices may have been different throughout regions of Brazil and between countries, as each place was affected differently by the COVID-19 epidemic, and thus the precautions required and suggested varied accordingly. Furthermore, adherence to the measures is likely to have fluctuated throughout the pandemic, particularly when people were vaccinated and activities resumed.

Furthermore, intentional non-probability sampling, combined with the response rate obtained, is limited by the nature of the selection and does not allow for the generalization of results to all establishments. However, the adoption of intentional non-probability sampling is justified by the distrust and insecurity of restaurant owners/managers in engaging in academic studies, coupled with the scarcity of information about the reality faced by this sector in the literature. Considering this challenge, opting for another sampling method could make the present research unfeasible. It highlights that the intention of the research was not to infer about the situation of all food services or to promote a statistical generalization, but rather to outline a panorama of the reality faced by establishments during the period of health crisis that can initially support actions and policies to support this sector in a crisis scenario, such as that faced during the COVID-19 pandemic. Research like this can also help in gaining the trust of food business owners/managers, allowing the adoption of other sampling techniques.

Another limitation of the study was the collection of data through self-reported information provided by participants during a telephone interview, without any on-site assessment conducted by the researchers. However, during a pandemic, self-reporting represented the most feasible and safest method, since in-person inspections were not viable or possible due to the altered operating conditions of food service establishments. Even considering a possible overestimation, it was observed that only a minority of establishments achieved high levels of compliance, suggesting that the real scenario may be even more critical. Therefore, the findings remain highly relevant to public health and contribute to understanding the vulnerabilities of the sector during a sanitary emergency.

Despite its limitations, the study provides very relevant findings. Less than a third of food services participating adopted more than 75% of hygiene and safety measures. The low adherence to hygiene

practices observed in most establishments may reflect structural challenges historically present in the Brazilian food service sector, such as high levels of informality, workforce turnover, low educational attainment among food handlers, and limitations in the operational capacity of sanitary surveillance for continuous monitoring. These factors may have been exacerbated during the pandemic, further hindering the effective implementation of the recommended measures. This demonstrates the importance of reinforcing hygiene practices in food services, as well as compliance with fundamental and necessary procedures (regardless of pandemic status), such as the application of the good practices' manual.

Furthermore, our findings indicate that implementing a Good Practices Handbook, hiring a dietitian for the team, reducing operating hours, providing assistance in dealing with difficulties, providing information, and facilitating access to security protocols are critical to improving food hygiene and safety practice. Our results also highlight the need for greater attention from government officials, including policies that encourage the hiring of nutritionists, the provision of technical training for small business owners, financial and operational support mechanisms for micro- and small enterprises, and the strengthening of sanitary surveillance structures. These findings also may be useful in developing strategies to improve the implementation of best practices in food services, mainly in potential future pandemic and sanitary crisis circumstances. These improved practices may help to reduce food contamination and the occurrence of foodborne diseases in food services.

Future studies could examine whether hygiene standards were maintained beyond the COVID-19 outbreak, as well as investigate whether consumers observe food service hygiene or whether it has become less relevant to them after disease control. In addition, future research should broaden the study area to increase the number of participating food service establishments and explore different regions or countries.

CONCLUSION

In summary, less than one-third of food service implemented most hygiene and safety practices during the COVID-19 pandemic. Having a dietitian on the team, having an implemented Good Practices Handbook, reducing operating hours, not having difficulty implementing the delivery service, and having difficulty finding guidance on security protocols were all independently associated with the likelihood of food service, complying with 75% of hygiene and safety standards. Thus, strategies for reducing the difficulty faced by food service, the presence of a specialist professional with knowledge of best practices, adjusting working hours, and implementing mandatory documentation may all contribute to improving food service performance in terms of compliance with hygiene and safety measures. More attention from government officials in relation to guidelines on good practices to be followed and the inspection of food services are also recommended.

However, it is important to acknowledge that the generalizability of these findings is limited. The results are based on self-reported data and may be influenced by reporting bias, social desirability, or variations in respondents' understanding of the evaluated practices. Moreover, the study context—shaped by specific regional regulations and pandemic-related constraints—may not fully reflect the reality of food services in other settings or post-pandemic scenarios. Therefore, caution is warranted when extrapolating these conclusions to broader populations or different operational environments. Future research should incorporate complementary methodological approaches, particularly direct observation of hygiene and sanitary practices, to provide a more objective assessment of compliance and to validate or refine the associations identified in this study.

ACKNOWLEDGEMENTS

The authors are very grateful to the volunteers who participated in this study.

REFERENCES

1. Lu D, Liu J, Liu H, Guo Y, Dai Y, Liang J, et al. Epidemiological features of foodborne disease outbreaks in catering service facilities — China, 2010–2020. *China CDC Wkly* 2023;5(22):479-484. <https://doi.org/10.46234/ccdcw2023.091>
2. Zhao J, Cheng H, Wang Z, Fu P, Guo Y, Yang S. Attribution analysis of foodborne disease outbreaks related to meat and meat products in China, 2002-2017. *Foodborne Pathog Dis* 2022;19(12):839-847. <https://doi.org/10.1089/fpd.2022.0028>
3. World Health Organization (WHO). Foodborne diseases. 2024. [Acesso em 6 maio 2025]. Disponível em: https://www.who.int/health-topics/foodborne-diseases#tab=tab_1
4. World Health Organization (WHO). Food safety. 2022 [Acesso em 15 Jun. 2025]. Disponível em: <https://www.who.int/news-room/fact-sheets/detail/food-safety>
5. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde e Ambiente. Surtos de doenças de transmissão hídrica e alimentar - Informe 2024. 2024 [Acesso em 15 jun. 2025]. Disponível em: <https://www.gov.br/saude/pt-br/assuntos/saude-de-a-a-z/d/dtha/publicacoes/surtos-de-doencas-de-transmissao-hidrica-e-alimentar-no-brasil-informe-2024/view>
6. European Food Safety Authority (EFSA). Coronavirus: no evidence that food is a source or transmission route. 2020 [Acesso em 15 jun. 2025]. Disponível em: <http://www.efsa.europa.eu/en/news/coronavirus-no-evidence-food-source-or-transmission-route>
7. Aranha FQ, Miano AC, Rosa CS da C, Santos CHE de S, Smith JB, Oliveira MCD, et al. Mudanças no serviço de alimentação coletiva devido a pandemia de COVID-19. *Rev. Alim. Cult. Amer*; 2020;2(2):252-67. <https://doi.org/10.35953/raca.v2i2.96>
8. Abdou A, Shehata HS. Assessment of restaurants precautionary measures during Covid-19 pandemic. *Academy of Strategic Management Journal* 2021;20(6):1-21.
9. Djekic I, Nikolić A, Uzunović M, Marijke A, Liu A, Han J, et al. Covid-19 pandemic effects on food safety - Multi-country survey study. *Food Control* 2021;122. <https://doi.org/10.1016/j.foodcont.2020.107800>
10. Olaimat AN, Al-Nabulsi AA, Nour MO, Osaili TM, Alkhalidy H, Al-Holy M, et al. The effect of the knowledge, attitude, and behavior of workers regarding COVID-19 precautionary measures on food safety at foodservice establishments in Jordan. *Sustainability* 2022;14(13):8193. <https://doi.org/10.3390/su14138193>
11. Agência Nacional de Vigilância Sanitária (ANVISA). Nota Técnica Nº 48 / 2020 / SEI / GIALI / GGFIS / DIRE4 / ANVISA. Documento orientativo para produção segura de alimentos durante a pandemia de Covid-19. 2020 [Acesso em 15 jun. 2025]. Disponível em: http://portal.anvisa.gov.br/documents/219201/4340788/NOTA_TECNICA_N_48__Boas_Praticas_e_Covid_19__Revisao_final.pdf/ba26fbe0-a79c-45d7-b8bd-fbd2bfbdb2437
12. Agência Nacional de Vigilância Sanitária (ANVISA). Nota Técnica Nº 18/2020/SEI/GIALI/GGFIS/DIRE4/ANVISA. Covid-19 e as boas práticas de fabricação e manipulação. 2020 [Acesso em 19 out. 2025]. Disponível em: http://antigo.anvisa.gov.br/documents/219201/5764725/SEI_ANVISA+-+1129727+-+Nota+Te%C2%B4cnica.pdf/19b94d04-a17f-4c7f-9c44-5919388c9609
13. World Health Organization (WHO). COVID-19 and food safety: guidance for good businesses. 2020 [Acesso em 31 jul. 2025]. Disponível em: <https://www.who.int/publications/i/item/COVID-19-and-food-safety-guidance-for-food-businesses>
14. Agência Nacional de Vigilância Sanitária (ANVISA). Nota Técnica Nº 47 / 2020 / SEI / GIALI / GGFIS / DIRE4 / ANVISA.

Uso de luvas e máscaras em estabelecimentos da área de alimentos no contexto do enfrentamento ao COVID-19 . 2020 [Acesso em 15 jun. 2025]. Disponível em: http://portal.anvisa.gov.br/documents/219201/4340788/NOTA_TECNICA_N_47.2020.SEI.GIALI_0_uso_de_EPIs.pdf/41979d87-50b8-4191-9ca8-aa416d7fdf6e

15. Shahbaz M, Bilal M, Moiz A, Zubair S, Iqbal H. Food safety and covid-19: precautionary measures to limit the spread of coronavirus at food service and retail sector. *J Pure Appl Microbiol* 2020;14(1):749–756; <https://doi.org/10.22207/JPAM.14.SPL1.12>
16. Agência Nacional de Vigilância Sanitária (ANVISA). Nota Técnica Nº 47/2020/SEI/COSAN/GHCOS/DIRE3/ANVISA. Recomendações sobre produtos saneantes que possam substituir o álcool 70% e desinfecção de objetos e superfícies, durante a pandemia de COVID-19. 2020 [Acesso em 15 jun. 2025]. Disponível em: <http://portal.anvisa.gov.br/documents/219201/4340788/Nota+Técnica+47.pdf/242a3365-2dbb-4b58-bfa8-64b4c9e5d863>
17. Associação Brasileira de Bares e Restaurantes (ABRASEL). Guia para uma entrega segura em casa para todos. 2020 [Acesso em 15 jun. 2025]. Disponível em: <https://abrasel.com.br/noticias/noticias/empresas-de-tecnologia-se-unem-e-lancam-guia-de-prevencao-ao-covid-19/>
18. Agência Nacional de Vigilância Sanitária (ANVISA). Nota Técnica Nº 49/2020/SEI/GIALI/GGFIS/DIRE4/ANVISA. 2020 [Acesso em 15 jun. 2025]. Disponível em: http://portal.anvisa.gov.br/documents/219201/4340788/NOTA_TECNICA_N_49.2020.GIALI__orientacoes_atendimento_ao_cliente.pdf/e3cb8332-e236-482f-b446-cb2a39dc4589
19. Alamneh AA, Ketema DB, Simieneh MM, Wubie M, LamoreY, Tessema MT, et al. Food hygiene practice and its associated factors among food handlers working in food establishments during the COVID-19 pandemic in East Gojjam and West Gojjam Zones, North West Ethiopia. *SAGE Open Med* 2022;10. <https://doi.org/10.1177/20503121221081070>
20. Haryanti DY, Suryaningsih Y. Food Safety Knowledge of Food Sanitation Hygiene Practices in the Era of Pandemic COVID-19. *The Indonesian Journal of Health Science* 2021;13(1). <https://doi.org/10.32528/ijhs.v13i1.5292>
21. Mohammadi-Nasrabadi F, Salmani Y, Esfarjani F. A quasi-experimental study on the effect of health and food safety training intervention on restaurant food handlers during the COVID-19 pandemic. *Food Sci Nutr* 2021;9(7):3655-3663. <https://doi.org/10.1002/fsn3.2326>
22. Fernandes dos Santos APG, Ribeiro CS, Fortuna GM. Boas práticas de fabricação de alimentos no contexto da Covid-19. *DEMETRA: Alimentação, Nutrição & Saúde* 2021;16:e61905. <https://doi.org/10.12957/demetra.2021.61905>
23. Instituto Brasileiro de Geografia e Estatística (IBGE). Brasil / Cidades e Estados. 2025 [Acesso em 15 jun. 2025]. Disponível em: <https://www.ibge.gov.br/cidades-e-estados>
24. Nguyen THD, Vu DC. Food delivery service during social distancing: proactively preventing or potentially spreading COVID-19? *Disaster Med Public Health Prep* 2020;14(3). <https://doi.org/10.1017/dmp.2020.135>
25. Rizou M, Galanakis IM, Aldawoud TMS, Galanakis CM. Safety of foods, food supply chain and environment within the COVID-19 pandemic. *Trends Food Sci Technol* 2020;102:293–299. <https://doi.org/10.1016/j.tifs.2020.06.008>
26. Agência Nacional de Vigilância Sanitária (ANVISA). Resolução RDC Nº 275, de 21 de Outubro de 2002. Dispõe sobre o regulamento técnico de procedimentos operacionais padronizados aplicados aos estabelecimentos produtores/industrializadores de alimentos e a lista de verificação das boas práticas de fabricação em estabelecimentos produtores/industrializadores de alimentos. Brasil; 2002 [Acesso em 15 jun. 2025]. Disponível em: https://bvsms.saude.gov.br/bvs/saudelegis/anvisa/2002/res0275_21_10_2002_rep.html
27. Batu Z, Irkin R, Onyeaka H. Impacts of the COVID-19 outbreak on food safety attitude, knowledge, and behavior. *J Agric Food Res* 2024;16. <https://doi.org/10.1016/j.jafr.2024.101073>

28. Souza TSP de, Miyahira RF, Matheus JRV, Nogueira TBB, Maragoni-Santos C, Barros FFC et al. Food services in times of uncertainty: Remodeling operations, changing trends, and looking into perspectives after the COVID-19 pandemic. *Trends Food Sci Technol* 2022;120:301–307. <https://doi.org/10.1016/j.TIFS.2022.01.005>
29. Vandenhoute H, Gellynck X, De Steur H. COVID-19 safety measures in the food service sector: consumers' attitudes and transparency perceptions at three different stages of the pandemic. *Foods* 2022;11(6). <https://doi.org/10.3390/foods11060810>
30. Centers for Diseases Control and Prevention (CDC). Considerations for Restaurant and Bar Operators. 2020 [Acesso em 15 jun 2025]. Disponível em: <https://stacks.cdc.gov/view/cdc/88184>
31. Wang M, Gong S, Tang J, Weng Z, Wu X. What motivates food workers to adhere with WHO guidelines to combat the COVID-19? A social cognitive theory perspective. *Front Public Health* 2023;11. <https://doi.org/10.3389/fpubh.2023.1187056>
32. Young I, Desta BN, Sekercioglu F. Impact of the COVID-19 Pandemic on Food Safety Inspection Outcomes in Toronto, Canada: A Bayesian Interrupted Time Series Analysis. *J Food Prot* 2023;86(9). <https://doi.org/10.1016/j.jfp.2023.100138>
33. Liu S, Liu Z, Zhang H, Lu L, Liang J, Huang Q. Knowledge, attitude and practices of food safety amongst food handlers in the coastal resort of Guangdong, China. *Food Control* 2015;47:457-461. <https://doi.org/10.1016/j.foodcont.2014.07.048>
34. Martins ML, Rocha A. Evaluation of prerequisite programs implementation at schools foodservice. *Food Control* 2014;39:30-33. <https://doi.org/10.1016/j.foodcont.2013.10.040>
35. Zanin LM, da Cunha DT, Stedefeldt E, Capriles VD. Seafood safety: Knowledge, attitudes, self-reported practices and risk perceptions of seafood workers. *Food Res Int* 2015;67:19-24. <https://doi.org/10.1016/j.foodres.2014.10.013>
36. Hakim MP, Zanetta LDA, da Cunha DT. Should I stay, or should I go? Consumers' perceived risk and intention to visit restaurants during the COVID-19 pandemic in Brazil. *Food Res Int* 2021;141. <https://doi.org/10.1016/j.foodres.2021.110152>
37. Associação Brasileira de Bares e Restaurantes (ABRASEL). Passaporte vacinal para bares e restaurantes é inefetivo e injusto com o setor (2021). 2021 [Acesso em 10 out. 2025]. Disponível em: <https://abrasel.com.br/noticias/noticias/passaporte-vacinal-para-bares-e-restaurantes-e-inefetivo-e-injusto-com-o-setor/>
38. Agência Minas. Governo de Minas divulga protocolos sanitários para retomada de atividades econômicas. 2020 [Acesso em 3 set 2025]. Disponível em: <https://www.agenciaminas.mg.gov.br/noticia/governo-de-minas-divulga-protocolos-sanitarios-para-retomada-de-atividades-economicas>
39. Agência Nacional de Vigilância Sanitária (ANVISA). Resolução RDC Nº 216, de 15 de Setembro de 2004. Brazil; 2004. [Acesso em 15 jun 2025]. Disponível em: <http://portal.anvisa.gov.br/legislacao#/visualizar/27436>
40. Belphman C, Szczerepa SB. Adequação do manual de boas práticas e dos procedimentos operacionais padronizados em serviços de alimentação de Ponta Grossa, Paraná. *Vigilância Sanitária em Debate* 2019;7(2):69-74. <https://doi.org/10.22239/2317-269x.01221>
41. Nordhagen S, Lambertini E, DeWaal CS, McClafferty B, Neufeld LM. Integrating nutrition and food safety in food systems policy and programming. *Glob Food Sec* 2022;32. <https://doi.org/10.1016/j.gfs.2021.100593>
42. Gould VJ, Evans EW, Redmond EC, Marklinder IM, Quinlan JJ, Ilic S. Exploring the role of dietitians in the delivery of food safety information. *Food Prot Trends* 2019;39(3).
43. Hussain Z. Role of dietitian in a food service industry. *Nutrition & Food Science International Journal* 2017;3(1). <https://doi.org/10.19080/nfsij.2017.03.555604>
44. Serviço Brasileiro de Apoio às Micro e Pequenas Empresas (SEBRAE). 2ª edição: Pesquisa. Situação e Perspectivas Do Segmento de Alimentação Fora Do Lar. 2020. [Acesso em 3 set 2025]. Disponível em:

[https://bibliotecas.sebrae.com.br/chronus/ARQUIVOS_CHRONUS/bds/bds.nsf/63f34fcab909ae3c973db346b653cc89/\\$File/19731.pdf](https://bibliotecas.sebrae.com.br/chronus/ARQUIVOS_CHRONUS/bds/bds.nsf/63f34fcab909ae3c973db346b653cc89/$File/19731.pdf)

45. Collewet M, Saueremann J. Working hours and productivity. *Labour Econ* 2017;47. <https://doi.org/10.1016/j.labeco.2017.03.006>
46. Delmez F, Vandenberghe V. Long working hours make us less productive but also less costly. *Labour* 2018;32(4). <https://doi.org/10.1111/labr.12128>
47. Ma L, Ma H, Zhan X, Wang Y. How do problem-solving demands influence employees' thriving at work: An explanation based on cognitive appraisal. *Sustainability* 2023;15(20):14879. <https://doi.org/10.3390/su152014879>
48. Serviço Brasileiro de Apoio às Micro e Pequenas Empresas (SEBRAE). Segurança dos alimentos: dicas de cuidados para o delivery em meio à COVID-19. 2020 [Acesso em 3 set 2025]. Disponível em: <https://sebrae.com.br/sites/PortalSebrae/artigos/dicas-de-seguranca-dos-alimentos-para-delivery-em-meio-ao-covid-19,3818ad41eab21710VgnVCM1000004c00210aRCRD>
49. Grisi A. Seu delivery seguro, seu alimento protegido. 2020 [Acesso em 3 set 2025]. Disponível em: <https://www.crn6.org.br/covid-19-crn-6-lanca-cartilha-seu-delivery-seguro-seu-alimento-protegido>
50. Pinto AMS, Marcelino MG. Segurança dos alimentos no contexto da pandemia de COVID-19: o papel dos restaurantes comerciais. *Revista Univap* 2024;30(65). <https://doi.org/10.18066/revistaunivap.v30i65.4487>
51. Medeiros MGGA, Castro LLG, Bezerra CS, Penha M da P, Lourenço MS. Evaluation of the food services of a public university in rio de janeiro during the COVID-19 Pandemic. *O Mundo da Saúde* 2022;46:503–514, <https://doi.org/10.15343/0104-7809.202246503514I>
52. Marques LC, Silva GP, Silva DP, Rodrigues MR, Carioca AAF, Adriano LS. Avaliação de boas práticas e de protocolos de segurança durante a pandemia de Covid-19 em unidades de alimentação e nutrição. *DEMETRA: Alimentação, Nutrição & Saúde* 2024;19:e74964. <https://doi.org/10.12957/demetra.2024.74964>
53. Rocha DG. Impactos da pandemia de COVID-19 nos serviços de alimentação: mudanças e tendências. [Mestrado em Ciência e Tecnologia de Alimentos] - Escola Superior de Agricultura Luiz de Queiroz da USP Piracicaba; 2023 [Acesso em 24 nov 2025]. Disponível em: <https://www.teses.usp.br>.
54. Monteiro MAM, Henriques GS, Garcia MAVT. Organization and management of the collective food sector in the post-Covid-19: challenges and perspectives. *Brazilian Journal of Development* 2021;7(10):97134–97158. <https://doi.org/10.34117/bjdv7n10-157>

Contributors

Liboredo JC participated in the conceptualization, data curation, formal analysis, methodology, project administration, writing – original draft, writing – review and editing; Setti IB participated in the investigation, writing – review and editing; Carvalho NC participated in the conceptualization, data curation, formal analysis, methodology, project administration, writing – original draft, writing – review and editing.

Conflict of Interest: The authors declare no conflict of interest.

Received: June 17, 2025

Accepted: January 17, 2026