

Effect of the Covid-19 pandemic on food handlers' practices and habits

Efeito da pandemia da Covid-19 nas práticas e hábitos dos manipuladores de alimentos

Efecto de la pandemia de Covid-19 en las prácticas y hábitos de los manipuladores de alimentos

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ABSTRACT. Objective: the research aimed to investigate the changes caused by the Covid-19 pandemic in food handlers' habits in restaurants in the city of Maringá, state of Paraná, Brazil. **Methods:** a cross-sectional study was carried out from November 8, 2021, to April 6, 2022, with an initial number of 832 restaurants, randomly selected, and 256 were visited, of which 50 agreed to participate in the research. The survey form consisted of 92 questions and was divided into six sections. **Results:** covering mouth when sneezing or coughing, wearing a mask and gloves when handling food, and sanitizing food packaging were the most frequently used practices throughout the pandemic. **Conclusion:** the results allow us to conclude that, although good handling practices are already well established in food services, there has been an intensification in practices adopted by food handlers during the Covid-19 pandemic.

Descriptors: COVID-19; Food handling; Hygiene; Pandemics; Surveys and questionnaires.

RESUMO. Objetivo: a pesquisa teve como objetivo investigar as mudanças causadas pela pandemia da Covid-19 nos hábitos dos manipuladores de alimentos em restaurantes da cidade de Maringá, estado do Paraná, Brasil. **Métodos:** foi realizado um estudo transversal no período de 8 de novembro de 2021 a 6 de abril de 2022, com um quantitativo inicial de 832 restaurantes, selecionados aleatoriamente, sendo visitados 256, dos quais 50 aceitaram participar da pesquisa. O formulário de pesquisa era composto por 92 questões e estava dividido em seis seções. **Resultados:** cobrir a boca ao espirrar ou tossir, usar máscara e luvas ao manipular alimentos e higienizar embalagens de alimentos foram as práticas mais utilizadas ao longo da pandemia. **Conclusão:** os resultados permitem concluir que, embora as boas práticas de manipulação já estejam bem estabelecidas nos serviços de alimentação, houve uma intensificação nas práticas adotadas pelos manipuladores de alimentos durante a pandemia da Covid-19.

Descritores: COVID-19; Manipulação de alimentos; Higiene; Pandemias; Inquéritos e questionários.

RESUMEN. Objetivo: la investigación tuvo como objetivo investigar los cambios provocados por la pandemia de Covid-19 en los hábitos de los manipuladores de alimentos en restaurantes de la ciudad de Maringá, estado de Paraná, Brasil. **Métodos:** se realizó un estudio transversal del 8 de noviembre de 2021 al 6 de abril de 2022, con un número inicial de 832 restaurantes seleccionados aleatoriamente, de los cuales se visitaron 256, de los cuales 50 aceptaron participar en la encuesta. La encuesta constó de 92 preguntas y se dividió en seis secciones. **Resultados:** subirse la boca al estornudar o toser, usar mascarilla y guantes al manipular alimentos y desinfectar los envases de alimentos fueron las prácticas más utilizadas durante la pandemia. **Conclusión:** los resultados permiten concluir que, si bien las buenas prácticas de manipulación ya están bien establecidas en los servicios de alimentación, se observó una intensificación de las prácticas adoptadas por los manipuladores de alimentos durante la pandemia de Covid-19.

Descriptores: COVID-19; Manipulación de alimentos; Higiene; Pandemias; Encuestas y cuestionarios.

INTRODUCTION

Contaminated food and water can transmit disease⁽¹⁾ and is a major cause of human morbidity and mortality⁽²⁾. In this scenario, food handlers are a fundamental part of safe food production. Their behavior about personal hygiene and food preparation will largely determine the safety of the food they produce and, consequently, the occurrence or not of foodborne illnesses⁽³⁾.

Although there is no evidence of SARS-CoV-2 transmission through food consumption to date⁽⁴⁾, concerns about food hygiene have increased substantially since the beginning of the pandemic⁽⁵⁾. Studies have observed changes in food and handling habits before and during the Covid-19 pandemic⁽⁶⁻⁷⁾, allowing individuals to change some of their behaviors regarding food safety during this period⁽⁸⁾.

Jung *et al.*⁽⁶⁾ assessed the influence of the Covid-19 pandemic on hygiene practices for food safety of 1,200 individuals in South Korea and concluded that Covid-19 made people more aware of maintaining good hygiene practices. In addition to washing hands and maintaining social distancing, individuals began to take individual portions and use personal plates, thus reducing the spread of the virus through the community food culture in South Korea.

These findings support the results of Faour-Klingbeil *et al.*⁽⁷⁾, who, to understand the changes in food buying and handling, choices, and hygiene practices during the pandemic, surveyed 1,074 participants in three Arab countries: Lebanon, Jordan, and Tunisia. Compared to pre-pandemic times, they observed a substantial increase in behaviors related to hygiene and disinfection practices (22.0% - 32.2%), with an 11.2% increase in handwashing practices before food preparation. Moreover, there was an increase in the number of participants using cleaning agents to wash fresh fruits and vegetables (e.g., soap and chlorine bleach).

Faced with this scenario of changes in behavior regarding food hygiene during the Covid-19 pandemic, it is worth noting that food services suffered major financial impacts during the pandemic⁽⁹⁾ and are still facing major challenges today. These services, for the most part, remained open throughout the Covid-19 pandemic and had to organize themselves to maintain high hygiene standards and safe food production, while taking care of the personal protection of their employees and customers⁽¹⁰⁾. So far, a small number of studies have specifically assessed changes in food handlers' hygiene habits in food services. The study aimed to assess the changes in food handlers' practices and habits in food services belonging to the municipality of Maringá, state of Paraná, Brazil, before and during the Covid-19 pandemic.

METHODS

Study design

This is a cross-sectional survey, designed to collect information about knowledge, personal hygiene habits, and food preparation among food handlers before and after the Covid-19 pandemic, in restaurants in Maringá, northwestern Paraná. The 2010 national census conducted by the Brazilian Institute of Geography and Statistics (IBGE) reported that Maringá had a total population of 357,077. According to IBGE, Maringá has gross domestic product (GDP) per capita of R\$45,582.78 (about US\$8,287.77) (2019) and Municipal Human Development Index (MHDI) of 0.808 (2010)⁽¹¹⁾.

Sample size and source population were prepared using a list of food establishments registered with Maringá's Municipal Health Department. These establishments were grouped according to region/neighborhood, then coded to easily differentiate them during visits at the time of data collection. The technique used for selection was proportional stratified sampling, in which the region/neighborhood constituted the strata, and 256 out of 832 restaurants were selected at random for visitation.

The establishments were visited, and after accepting to participate in the research, the interviewer/researcher presented the objectives of the study and the form to be applied to a local food handler who was available at the time. During the visit, he complied with preventive measures, such as using a protective mask, 70% alcohol in his hands, and a disposable cap to enter the restaurant's kitchen.

To minimize non-response rate, if an eligible study participant was not available at the restaurant, a second visit was made according to local availability. If again it was not available, that establishment was considered non-responding. Restaurants where their owners/managers were not present to authorize the survey during the data collection period were also considered non-respondent and excluded.

Ethical considerations

The Research Ethics Committee of the State University of Maringá (UEM) approved this study (CAAE nº 43234621.7.0000.0104 and Opinion nº 4.594.020). At the beginning of the research, all participants received the information deemed necessary, and those who agreed to participate in the research provided their consent to privacy and information management policies.

Form validity

A survey form on food knowledge and practices before and during the Covid-19 pandemic was carefully constructed to mitigate the chance that respondents did not understand the expected answers to the questions. To ensure response quality, the instrument was reviewed by two specialists, one specializes in Covid-19 (PSBM) and the other in statistics (ABTM), to improve its clarity, format, and content. Subsequently, a pre-test was applied to 13 individuals who did not participate in the research definitively.

Search

The survey form was applied from November 8, 2021 to April 6, 2022. At the beginning of form application, Brazil reached a total of 21,891,439 cases of Covid-19, with 120,880,423 people who received all doses prescribed by the initial vaccination protocol and 609,836 deaths⁽¹²⁾.

In total, the form consisted of 92 questions and was divided into 6 sections, namely: sociodemographic profile; personal hygiene before and during the Covid-19 pandemic; food preparation before and during the Covid-19 pandemic; food delivery care before and during the Covid-19 pandemic; knowledge about the new coronavirus; and practices against Covid-19 in the workplace.

Section 1 of the form used eight questions to explore basic and demographic characteristics: gender, age, education level, higher education, individual monthly income, job tenure in food industry, and participation in a course on good handling practices (GHP).

Sections 2, 3, and 4 of the form consisted of 62 statements that assessed personal hygiene, food preparation, and food delivery care before and after the Covid-19 pandemic. Respondents indicated their agreement with the statements using a 5-point Likert scale ranging from “always”, “most of the time”, “sometimes”, “never” to “not applicable”.

Section 5 of the form assessed food handlers' knowledge about the new coronavirus. There were seven questions, each with three possible answers: “agree”, “disagree” and “do not know”.

Session 6 contained questions about changes in interviewees' practices in their work environment, both about the environment in which there is contact with food, as well as the environment in which people are in contact and whether they acted in the way they responded before the pandemic.

Statistical analysis

To assess food handlers' behavior globally, two scores were established for each food handler, with score 1 relating to personal hygiene practices and food preparation care before the pandemic and score 2 during the pandemic. To define the scores, a value was assigned to each response option. Regarding personal hygiene, there were five responses (always, most of the time, sometimes, never, and not applicable). These responses were scored from 0 to 5, with lower scores indicating appropriate personal hygiene behavior. The question related to using accessories or adornments during food preparation was an exception, in which a higher score indicated adequate personal hygiene behavior. Thus, it was possible to assess the personal hygiene score before and during the pandemic and observe that, when the score value decreased during the pandemic, it was because personal hygiene care was intensified.

For the food preparation care item, the same way of defining the score was used, varying only the final values, since for this section of the form there were four answers (always, most of the time, sometimes, and never) that were scored from 0 to 4.

Statistical analyzes were performed using Microsoft Excel and R statistical environment. Tables and graphs were constructed and the sign test was used to test whether there were statistically significant differences between personal hygiene before and during the Covid-19 pandemic as well as food preparation and food delivery care before and during the pandemic. The significance level adopted was 5%.

RESULT

The 832 restaurants in the municipality of Maringá were grouped according to the region/neighborhood where they were located, and 256 were randomly selected for visitation.

Of the 256 restaurants visited, 50 agreed to participate in the study and provided a food handler to answer the proposed form; 57 declined to participate in the study; 42 did not receive the researcher (because there were no people in the establishment or the owner/manager was not present to authorize the research); 36 establishments were closed; and 71 no longer corresponded to a restaurant, i.e., currently, there is another branch of commerce (Figure 1).

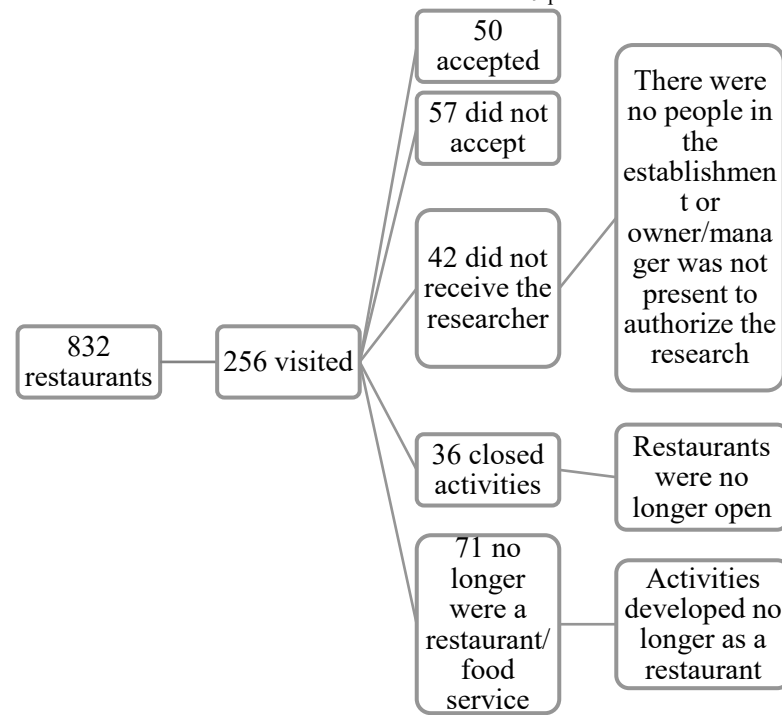


Figure 1. Flowchart of participating restaurants. N = 50, Maringá/PR, Brasil, 2022.

Fifty food handlers were interviewed, of which 70% were female. About age, a non-homogeneous distribution was observed, that is, 48% of food handlers were in the age group between 40 and 69 years. About education, the highest percentage (42%) was observed for complete secondary education. Of the total number of food handlers who answered that they attended or are studying higher education, the most frequent courses were administration (26.67%) and gastronomy (20%).

About monthly income, it was observed that 58% of handlers had a monthly income of 1 to less than 2 minimum wages. About job tenure in food industry, the highest frequency was for 20 years or more (34%), followed by less than 5 years (26%).

Respondents were also asked about taking a course on GHP and, among the 50 participants, most (41; 82%) responded that they had already attended his type of course.

Of the total respondents, 50% said that the pandemic has greatly changed their personal hygiene habits, followed by 24% who responded that the pandemic has completely changed their personal hygiene habits.

Food handlers' behavior during the Covid-19 pandemic

Considering handlers' behavior regarding all personal hygiene practices and food preparation care, it was possible to observe a significant difference before and during the pandemic ($p < 0.0001$).

Regarding personal hygiene, 45 (90%) obtained lower scores, and regarding food preparation, 19 (38%) scored low scores, which denotes an improvement or intensification in food handlers' behavior.

Personal hygiene practices before and during the Covid-19 pandemic

To specifically assess each food handler's attitude, we assessed the frequency with which they performed each of the questioned practices before and during the Covid-19 pandemic. Thus, it was found that "washing hands after handling garbage" (96% before versus 96% after) and "using accessories or adornments while preparing food" (58% before versus 58% after) have not gone through changes. Already, some practices were intensified during the pandemic: "washing hands before preparing food" (92% before versus 100% during); "washing hands after using the bathroom" (98% before versus 100% during); "taking off apron when going to the bathroom" (84% before versus 90% during); "wearing a cap or hair tied back when handling food" (92% before versus 96% during).

On the other hand, some practices had a statistical difference during the pandemic, namely: "covering mouth when sneezing and coughing" (56% before versus 92% during); "wearing apron and clean clothes when preparing food" (84% before versus 94% during); "wearing a mask when handling food" (12% before versus 94% during); and "wearing gloves during food preparation" (30% before versus 54% during), with $p < 0.05$.

Food preparation practices before and during the Covid-19 pandemic

When assessing food preparation habits in isolation, it can be seen that attitudes towards GHP did not change significantly during the Covid-19 pandemic, with the frequency of some habits remaining the same before and throughout the pandemic ($p > 0.05$) (Table 1).

Table 1. Percentage of responses related to food preparation before and during the Covid-19 pandemic. N = 50, Maringá/PR, Brasil, 2022.

Questions	BEFORE				DURING			
	Always (%)	Most of the time (%)	Sometimes (%)	Never (%)	Always (%)	Most of the time (%)	Sometimes (%)	Never (%)
Cleaning countertops before preparing food	98	NA ^a	2	NA ^a	100	NA ^a	NA ^a	NA ^a
Using the same knife to cut raw meat and vegetables	20	2	2	76	20	NA ^a	2	78
Cleaning knives used for raw food with soap and water before using them for other types of food	92	NA ^a	8	NA ^a	98	2	NA ^a	NA ^a
Using different chopping boards for raw meat, poultry, bread, fish, and fresh vegetables and fruits	92	NA ^a	6	2	98	NA ^a	2	NA ^a
Talking, singing, and whistling while preparing food	26	10	40	24	20	10	46	24
Tasting the food during its preparation	70	6	16	8	64	8	18	10
Handling money during food preparation	NA ^a	2	8	90	2	2	6	90
Using a cell phone while preparing food	8	2	20	70	10	NA ^a	20	70
Keeping raw foods separate from cooked and ready-to-eat foods	96	NA ^a	NA ^a	4	96	NA ^a	NA ^a	4
Properly cleaning the food storage area before storing new products	84	6	10	NA ^a	90	4	6	NA ^a
Checking the refrigerator temperature before storing food	60	2	18	20	60	2	16	22
Storing cooked food in the refrigerator separately with a label	76	NA ^a	10	14	74	4	6	16
Leaving leftovers at room temperature for a few hours and then freeze them	10	2	18	70	12	2	18	70
Defrosting frozen fish, meat, and poultry using running water	10	NA ^a	10	80	8	NA ^a	12	80
Using an appropriate thermometer to check food temperature	18	8	10	64	22	4	8	66
Inspecting raw materials before using them in food products	94	NA ^a	4	2	98	NA ^a	2	NA ^a
Checking food expiration date	96	NA ^a	4	NA ^a	96	2	2	NA ^a
Sanitizing food packaging	54	2	12	32	76	4	8	12

^aNA = não se aplica.

Food delivery care before and during the Covid-19

About food delivery care, only 56% of establishments used this type of service. It was observed that, before the pandemic, 26% of establishments always checked the temperature of food

before delivery and 32% started to do this during the pandemic. Regarding always using the isothermal box to deliver food, the percentage changed from 48% to 60% during the pandemic. As for always cleaning and sanitizing food packaging before delivery, there was a change from 28% to 40% during the pandemic. However, there was no significant difference between food delivery care before and during the Covid-19 pandemic.

Knowledge about the new coronavirus

According to results obtained regarding handlers' knowledge about Covid-19, we observed good knowledge related to the disease's clinical picture, as 100% of food handlers agreed with the statement concerning the main clinical symptoms of Covid-19. Furthermore, 94% agreed that generally older adults, obese individuals and people who have comorbidities are more likely to have severe cases of Covid-19.

Regarding knowledge about SARS-CoV-2 transmission, of the total number of participants, 98% agree that the new coronavirus is transmitted through the air, through respiratory droplets of infected individuals; 88% disagree that only people with a fever can transmit the virus. On virus transmission, 48% of handlers stated that eating food contaminated by the new coronavirus can be a route of Covid-19 transmission.

About disease prevention, 96% believe that using a mask can prevent virus transmission, but 4% of respondents disagree with this preventive measure. Food handlers were unanimous (100%) in agreeing that, to prevent infection with the new coronavirus, individuals should avoid crowds. Furthermore, 96% responded that they "agree" with the statement that isolating people infected with Covid-19 is a way to reduce the spread of the virus.

About the virus being able to be eliminated through feces, 56% of interviewees disagreed with this statement.

Practices against Covid-19 in the workplace

When asked about how they wash their hands before preparing food during the pandemic, 56% answered that they washed it with soap and water, while 42% said they washed it with soap and water and then apply 70% alcohol on their hands. In addition to this, 34% responded that they did not act in the same way before the pandemic.

Participants were also asked about the way they use most to wash fruits and vegetables during the pandemic, and 62% stated they wash these items and leave them immersed in a bleach solution, while 96% stated they already had this behavior before the pandemic.

About the way they used most to clean the kitchen sink, countertop and table, 36% of respondents cleaned with soap and water and then wiped with 70% alcohol, followed by 30% who cleaned with soap and water, and 96% of participants said they acted that way even before the pandemic.

A notable change was observed in terms of sanitizing food packaging arriving from the supermarket during the pandemic, as 64% said they cleaned it with 70% alcohol, of which 56% did not sanitize food packaging before the pandemic.

The public studied was also approached about having already contracted the new coronavirus and going to work, resulting that 30% had Covid-19 and did not work those days and 58% did not have Covid-19.

Moreover, food handlers were asked about changes in the restaurant where they work. In view of this, 62% implemented physical spacing between other employees and 40% stated that there were changes in work shifts to reduce the number of workers together. Finally, most (76%) respondents did not participate in any food handling training or qualification for guidance on preventive measures against Covid-19.

DISCUSSION

During the Covid-19 pandemic, emphasis was placed on integration of preventive measures to monitor and contain the spread of SARS-CoV-2⁽²⁾, which resulted in changes in several habits. In this regard, this study analyzed the changes in food handlers' personal hygiene and food preparation practices in the city of Maringá, Paraná, Brazil, before and during the Covid-19 pandemic.

The population of food handlers assessed by this study was similar to other studies, such as that of Limon⁽¹³⁾, which obtained 72% of female handlers. The age group between 18 and 69 years old figured prominently, similar to the findings of Andualem et al.⁽¹⁴⁾, where the age of study participants ranged from 18 to 65 years. This age group corresponds to the economically active population in Brazil, which varies between 15 and 65 years, with the age group of 15 and 18 years being characterized by young apprentices⁽¹⁵⁾.

Changes in the overall behavior of food handlers assessed in this study about personal hygiene and food preparation were also observed in studies with food handlers from Philippines and the Ethiopia⁽¹³⁻¹⁴⁾. During the pandemic, changes were also observed in food care habits of other populations, as reported in a study by Thomas and Feng⁽¹⁶⁾, who found an increase in hand hygiene practices, washing products with water, and using food thermometer during the Covid-19 pandemic by American consumers. Likewise, another study assessed the impact of Covid-19 on the relationship of 312 Brazilians with food and observed that 71.47% of them frequently clean food packaging

obtained from commercial establishments and 72.44% and 64.11% are taking more care of hygienic conditions of surfaces they handle and places where they store their food, respectively⁽⁹⁾. Likewise, Finger et al.⁽¹⁷⁾ interviewed 3,000 Brazilians and most of them started to wash their hands more frequently, avoiding touching their faces, public places, properly handling food, and cleaning surfaces.

Despite the observed changes, it is worth noting that 26% of handlers assessed stated that the pandemic had little effect on their personal hygiene habits, which may indicate resistance to changing habits and attitudes or denial of the Covid-19 pandemic⁽³⁾. On the other hand, we can assume that, in part, the little behavior change reported may be due to the studied population being already used to intensive personal hygiene and food care practices, since most (82%) handlers had attended a GHP training course. Data that corroborates this observation is that significant differences in behavior were related to personal hygiene about Covid-19, since practices related to food care did not show a statistically significant difference.

About personal hygiene practices, the results indicated that GHP, such as washing hands after handling garbage, washing hands before preparing food, washing hands after using the bathroom, and wearing a cap or hair tied during handling food, were practiced since before the pandemic and were already well established among food handlers. Similar results were found in a study by Andualem et al.⁽¹⁴⁾, where about a third of food handlers had good infection prevention practices, stating that 91% of respondents reported that they washed their hands regularly and 91% used personal protective equipment (PPE).

It was also observed that the frequency of certain personal hygiene practices increased significantly after the pandemic, namely: covering mouth when sneezing and coughing, wearing a mask when handling food, and using gloves during food preparation. The findings are corroborated by Andualem et al.⁽¹⁴⁾, which sought to assess Covid-19 infection prevention practices among food handlers in restaurants in Ethiopia, where 97% of food handlers reported that, when sneezing, they covered their nose and mouth with their elbow, and masks were used by 87.8% of handlers. On the other hand, the same did not occur in Limon's work⁽¹³⁾, which, according to self-reported practices by Filipino food handlers during the pandemic, 46.6% did not cover their mouths when sneezing and coughing, with most participants (98.4%) not wearing gloves and 99% not wearing a face mask when handling food. It is worth noting that, according to the guide proposed by the Food and Agriculture Organization of the United Nations (FAO) and World Health Organization (WHO)⁽¹⁰⁾ for food companies, food handlers should have good respiratory hygiene. Hand hygiene and respiratory etiquette were practices that most were widespread during the pandemic.

“Sanitizing food packaging” frequency increased considerably after the Covid-19 pandemic (54% before versus 76% after). Although SARS-CoV-2 is a respiratory virus, since the pandemic started, there has been much concern about food surfaces acting as fomites. Some studies have highlighted the importance of properly cleaning and sanitizing food contact surfaces during preparation⁽¹⁸⁾. Data from another study shows that this practice is unnecessary, due to low risk of transmission of the virus by this route⁽¹⁹⁾. Souza et al.⁽⁵⁾ reported that recommendations to reinforce personal hygiene measures and application of food safety practices to eliminate or reduce the risk of contamination of food surfaces and packaging by SARS-CoV-2 will reduce the likelihood of pathogens from contaminating food and consequently prevent foodborne infections.

A study carried out by Ray et al.⁽²⁰⁾ found a 26% reduction in the incidence of foodborne diseases in 2020, the largest annual variation in incidence during 25 years of surveillance. This seems to point to changes in daily living and hygiene behaviors, including increased hand washing, which likely altered exposures to foodborne pathogens.

Food handlers' knowledge regarding Covid-19 allows highlighting that 48% of respondents said that SARS-CoV-2 can be transmitted through food and 38% of handlers did not know whether the virus could be eliminated through feces. During the entire pandemic, the presence of SARS-CoV-2 in feces and its possible transmission by this vehicle was discussed, and it was found that although this virus or viral particles can be found in feces of people with Covid-19, there is no documented evidence that the virus can resist passage through the human gastrointestinal tract and therefore be able to transmit disease through food⁽⁵⁾.

In general, the interviewed food handlers successfully answered the knowledge questions regarding infection prevention. The vast majority believe that using a mask can prevent virus transmission, agree that to prevent infection with the new coronavirus, individuals should avoid crowds and support that isolation of people infected by Covid-19 is a way to reduce the spread of the virus. Our results are in agreement with those of Andualem et al.⁽¹⁴⁾, where 79.8% of food handlers had good knowledge about preventing infections; 92.8% knew the importance of social distancing; 75.6% agreed that it was an important way to reduce coronavirus transmission; and 92.5% used PPE at work. It is worth noting that, although most respondents (76%) did not undergo specific training regarding Covid-19, they had knowledge about the virus and this fact may have benefited from information conveyed by the media, internet, and social media. About specific training for Covid-19 prevention, the population of this study showed a great difference among food handlers in Ethiopia, where the vast majority (90.3%) received training in preventing infection by Covid-19⁽¹⁴⁾. Possible reasons for this discrepancy may include differences in the study period, sociocultural practices, health policy, and strategies to prevent Covid-19 in the study locations.

About practices against Covid-19 in the work environment, the interviewed food handlers reported that food services in general were restructured to adapt to the measures to combat Covid-19. A survey carried out in 16 countries involving 825 food companies found that companies implemented more restrictive hygiene procedures during the pandemic, purchased more PPE, and food safety staff was trained. Employee awareness and hygiene are two important attributes that have contributed to the fight against Covid-19⁽²¹⁾.

It is worth considering that this study, as it is a self-report, has limitations such as social desirability bias and not being able to reliably identify the changes caused by the Covid-19 pandemic. Additionally, our sample size does not allow the results to be generalized to the entire Brazilian population, since the study was carried out with only part of the food establishments in Maringá.

CONCLUSION

Considering that the Covid-19 pandemic has impacted the general population, causing changes in personal hygiene habits, as well as in relationship of individuals with food, its handling, and practices to ensure safe food, this study revealed that the same happened with food handlers during the pandemic. Food handlers also showed increased GHP and good knowledge on Covid-19.

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