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Evaluation of Food Safety Processes and Applications in Catering and Fast-Food Chains in Adana Post-COVID-19 Pandemic

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Abstract

This study aims to investigate the impact of the COVID-19 pandemic on food safety practices in the catering industry and fast-food chains in Adana, Turkey. Surveys were conducted with 103 participants representing various food-related businesses, ranging from restaurants to food production companies. The study examined company characteristics, including size, type of business, number of employees, and the status of food safety management systems (FSMS). Additionally, discussions with participants were held regarding food safety measures associated with COVID-19. The obtained results indicate that most businesses have implemented Hazard Analysis and Critical Control Points (HACCP) systems for food safety management. Most businesses recognized pandemics as potential emergencies within their FSMS; however, there were differences in personnel training and resource provision. Participants prioritized equipment/raw material hygiene and staff awareness. Overall, the study highlights the importance of proactive measures and continuous adaptation to ensure food safety resilience during crises such as the COVID-19 pandemic. The findings underscore the need for comprehensive training and adequate resources to maintain high standards of food safety and hygiene. Enhanced focus on hygiene practices, regular updates to safety protocols, and increased awareness among staff are essential components for mitigating risks and maintaining consumer trust in food safety.

Keywords: Food Safety Management, Pandemic, Restaurant Industry, COVID-19 Impact, Certified Food Systems

1.INTRODUCTION

The rapid spread of the coronavirus (COVID-19) from China to many other countries initiated a global pandemic, marked by its acute and highly contagious nature (Bao et al., 2020). This pandemic swiftly reached our country, introducing not only the threat of viral infection but also significant psychological stress on populations both locally and globally (Xiao, 2020; Duan and Zhu, 2020). The nation experienced unprecedented changes and restrictions, enforced through stringent measures by various governmental bodies such as the Ministry of Transport and Infrastructure, the Ministry of Health, the Ministry of National Education, and the Presidency of the Council of Higher Education, to curb the virus's spread (Gülçiçek Tolun and Bulut, 2021).

A critical aspect of preventing diseases is maintaining healthy and balanced nutrition, which requires the consumption of safe and reliable food products. To mitigate the pandemic's impact, Turkish authorities revised food safety and hygiene regulations, ensuring that practices such as selling bread in bags, handling open food products with gloves, and prohibiting the sale of unpackaged items became mandatory. The Ministry of Agriculture and Forestry intensified food safety inspections, highlighting the importance of hygiene in protecting against COVID-19, as with other diseases (Oğur et al., 2020).

The World Health Organization estimates that annually, 33 million healthy lives are lost due to the consumption of unhealthy food. Foodborne

illnesses typically arise from cross-contamination, poor storage, insecure food supplies, mishandling, poor personal hygiene, and improper cooking (WHO, 2022). During the COVID-19 pandemic, food safety became paramount, as the potential for contamination during food preparation, handling, serving, and transportation increased. The stability of SARS-CoV-2 at -20 °C for three weeks on various foods and its reduction through heating to 63 °C underscores the need for strict food safety protocols (Fischer, 2020; Anonymous, 2020).

Consequently, investigating the knowledge, attitudes, and practices (KAP) regarding food safety during the COVID-19 pandemic is crucial. Prior studies have shown improvements in KAP during public health crises (Hatabu et al., 2020; Mayurnikova et al., 2020; Luo et al., 2019; Ranaei et al., 2020; Omar, 2020). Ensuring safe food provision during this period poses significant challenges for food enterprises, especially fast-food restaurants, which must maintain high standards of hygiene and safety to protect consumer health. Research before the pandemic revealed deficiencies in food hygiene practices among food handlers, indicating the need for rigorous safety assessments during COVID-19 (Luo, 2020).

Food safety involves identifying, eliminating, and controlling hazards from production to consumption (Wang et al., 2019). Failures in food safety lead to global and national issues, including increased harmful substances in food due to improper handling, storage, and hygiene. The COVID-19 pandemic has necessitated a rapid and significant shift in food safety practices, influencing consumer behavior and reinforcing the importance of food safety measures.

Ensuring food safety is essential at every stage of food preparation, from raw material receipt to final consumption. Fast food restaurants and cafeterias, known for their quick service and affordability, must adhere to strict hygiene practices to ensure

the quality and safety of their offerings (Kashyap et al., 2004; Gupta et al., 2011). Implementing comprehensive food quality and safety monitoring programs can significantly enhance food safety and acceptability (Gangahar et al., 2000; Olaimat et al., 2020). Given the limited information on coronavirus survival on food and surfaces, further research is essential to understand the risks associated with food and packaging contamination (Giorgi et al., 2009; Olaimat et al., 2020). The pandemic has severely impacted the food supply chain and the labor force, with shortages exacerbating the situation. Many food industry workers faced isolation due to infection or quarantine, and the fear of contracting the virus further reduced the available workforce. The industry had to rely on less-skilled labor, complicating the implementation of COVID-19 safety measures and training (Byington et al., 2021).

This study aims to assess the quality, safety, and acceptability of foods in fast food restaurants in Adana, Turkey, during the COVID-19 pandemic. It seeks to evaluate the suitability of manufacturing sites, facilities, and the food safety knowledge and practices of food handlers. By examining these factors, the research will provide insights into how the catering industry and fast-food chains adapted their food safety practices in response to the pandemic, offering valuable lessons for future public health crises. This study is particularly significant as it represents the first investigation into the post-pandemic effects on food safety practices in restaurants and food handlers in Adana.

2. MATERIALS AND METHODS

2.1 Research design

In this proposal, we provide a quasi-experimental study that uses quantitative approaches to assess the impact of the COVID-19 epidemic on food safety protocols in Adana's fast-food and catering sectors. To find out whether the COVID-19 epidemic might have an effect on these

establishments' food safety procedures, a survey tool was created. The information gathered allowed for a thorough examination of the safety procedures followed by businesses during the pandemic, the identification of particular characteristics associated with COVID-19 and how they affected food safety, an evaluation of the emergency preparedness of businesses, and the detection of weak points in the food supply chain. There are three main sections to the study:

1. ****Business Details:**** Information on companies is gathered in this part, such as their size, type of activity, place of origin, and the state of their food management system.
2. ***Food Safety Declarations:*** Seven food safety declarations are the subject of the second section; three of these are related to general safety preparedness measures, and six of them particularly address COVID-19. Using a five-point Likert scale that goes from 1 ('strongly disagree') to 5 ('strongly agree'), respondents indicate how much they agree or disagree.
3. ****Prioritization of Pandemic Attributes:**** The evaluation of pandemic impact mitigation priorities for food corporations is the main focus of the third section. It examines nine COVID-19-related attributes and ranks them according to perceived influence using Best-Worst scale. The qualities are in line with the World Health Organization's (WHO, 2020) standards and the required courses described in the CAC 2003 guide on good hygiene practices. A semi-structured questionnaire was employed in this study to collect data.

2.2. Participants

Surveys were distributed to Adana's operational fast-food and catering chains. A minimum of one hundred respondents were targeted ($n \geq 100$) in order to guarantee a representative sample. In order to create a relaxed and comfortable environment where respondents feel free to share

their views and feelings, the opening questions were carefully constructed. This strategy, which is backed by Alvehus (2013), seeks to improve the respondents' responsiveness and validity, which will strengthen and enlighten the data collection process.

2.3. Variables

The study's goal is to compare evaluations of changes made to food safety procedures in the fast-food and catering industries in response to the COVID-19 pandemic's extensive effects. The food sector, company size, type of food service establishment, and FSMS status are examples of independent factors, and the survey responses are examples of dependent variables that are affected by the pandemic.

2.4. Instrumentation and materials

To collect information on changes made to food safety procedures following the effects of COVID-19, a survey has been developed. The survey was purposefully designed to take less than five minutes to complete, and all of the questions used clear and concise wording to encourage participation. Five questions on typical data for fast-food and catering chains are included in the survey's first part.

2.5. Procedures

To ensure that each sample subject submitted an answer just once, the survey was given out separately to food establishments in Adana. The objective was to collect at least 103 respondents ($n \geq 100$) in order to guarantee a representative sample. Qualitative analyses were carried out on the assembled data from the sample following the completion of the final data collection.

3. RESULTS AND DISCUSSION

The global COVID-19 pandemic has drastically impacted numerous sectors, including the foodservice industry, presenting unprecedented challenges and disruptions. In light of this crisis, it is crucial to assess how food establishments, particularly restaurants and fast-food chains, have adapted their food safety practices to safeguard public health and ensure operational continuity. Despite the critical nature of food safety, especially during a public health crisis, there is a lack of research in this area, specifically in Adana, Turkey. This study aims to address this gap by exploring the effects of the COVID-19 pandemic on food safety practices in restaurants and fast-food chains in Adana, Turkey. The research focuses on understanding the challenges these establishments faced during the pandemic and the modifications made to their food safety management systems. By examining the experiences and responses of various food establishments, this study aims to provide valuable insights into the impact of the pandemic on food safety within the catering industry.

To meet these goals, a detailed survey was conducted among 103 food establishments, including restaurants, fast-food chains, and food service companies in Adana, Turkey. The survey gathered information on various factors, such as the size and type of businesses, the number of employees, and the status of their food safety management systems. Participants were also asked about their experiences and the challenges they encountered with food safety practices during the pandemic.

By analyzing the survey responses, this study aims to highlight the resilience of the catering industry in Adana, Turkey, during the COVID-19 pandemic and identify opportunities to enhance food safety standards in the post-pandemic era. By understanding the factors that influence food safety practices and assessing the effectiveness of current management systems, this research

intends to contribute to the development of strategies and interventions to ensure public health and safety in the foodservice sector.

3.1 Company characteristics

This study investigates the diverse foodservice industry in Adana, Turkey, focusing on key company characteristics that impact food safety management practices. The ability of food businesses to succeed and remain resilient during the global COVID-19 pandemic depends not only on its operational flexibility but also on their commitment to strong food safety protocols. To thoroughly evaluate the industry's dynamics, we examine various aspects of the participating companies, including their size, the main focus within the food sector, workforce composition, as well as the implementation of food safety management systems. Through this analysis, we aim to uncover detailed insights into how businesses of different sizes and specialties address food safety challenges and contribute to the overall goal of ensuring public health and consumer trust in food products.

3.2 Name of the company

The surveyed companies were diverse, encompassing a wide range of food-related businesses such as restaurants, fast-food chains, catering services, and food manufacturing companies. Although specific names are not mentioned, this variety highlights the broad scope of the study and includes multiple sectors within the foodservice industry. Participants ranged from well-known restaurant chains to local catering services and food manufacturing enterprises, reflecting the multifaceted nature of the Adana food sector. This extensive representation underscores the wide-reaching nature of our study and aligns with previous research on regional food business landscapes (Kurtsal et al., 2020). Literature indicates that such diversity within the industry signifies a robust and dynamic

marketplace, with numerous players driving culinary innovation and economic growth (Ghosh et al., 2017). By including a wide range of company types and sizes in our study, we aim to capture a comprehensive understanding of food safety management practices across the Adana foodservice sector.

3.3. Distribution of Companies by Size and Employee Count

The classification of companies into small, medium, and large categories provides valuable insights into the diversity and distribution within the food industry. Small companies, often with limited resources and a localized presence, play a key role in catering to niche markets and unique consumer demands. These businesses tend to prioritize agility and flexibility to adapt to changing market conditions and consumer preferences.

Medium-sized companies occupy an intermediate position, generally having moderate resources and a more established market presence compared to smaller firms. They can leverage some economies of scale, optimizing production processes and enhancing efficiency while maintaining adaptability to market dynamics.

Large companies sit at the top of the food industry hierarchy, with extensive resources, infrastructure, and market reach. Their operations often include large-scale production facilities, sophisticated supply chains, and significant brand recognition. Although they benefit from economies of scale and market dominance, they face challenges in maintaining quality control and complying with food safety regulations across their extensive operations.

Figure 1 illustrates the distribution of company sizes, showing the percentage breakdown of small, medium, and large companies among the surveyed establishments. The majority are medium-sized companies, making up 45.63% of the total (Figure 1). This indicates that medium-sized

establishments dominate the sample, which may affect their food safety practices due to their scale of operations. Small companies follow at 39.81%, with large companies contributing the smallest share at 14.56%.

The distribution of companies across these size categories provides valuable insights into the food industry's composition in the Adana region. Examining the prevalence of small, medium, and large companies helps researchers understand the competitive landscape and identify opportunities for targeted interventions to improve food safety practices and regulatory compliance across the sector.

The predominance of medium-sized companies in the sample, nearly half of the total, indicates a significant presence of establishments with moderate resources and operational capabilities. These companies bridge the gap between smaller, specialized businesses and larger, more established enterprises. Their balanced size allows them to leverage economies of scale while maintaining agility and responsiveness to market trends.

In contrast, the smaller proportion of large companies, making up only a minority of the sample, suggests a less pronounced presence of major industry players with extensive resources and market influence. While these companies may significantly impact certain segments of the food market, their lower representation in the sample may reflect a more decentralized industry landscape with a diverse array of competitors.

Overall, the distribution of companies across size categories highlights the multifaceted nature of the food industry in the Adana region, encompassing a range of businesses from small-scale enterprises to large conglomerates. Understanding the composition and dynamics of these companies is crucial for developing targeted strategies to enhance food safety practices, promote regulatory

compliance, and foster sustainable growth in the sector.

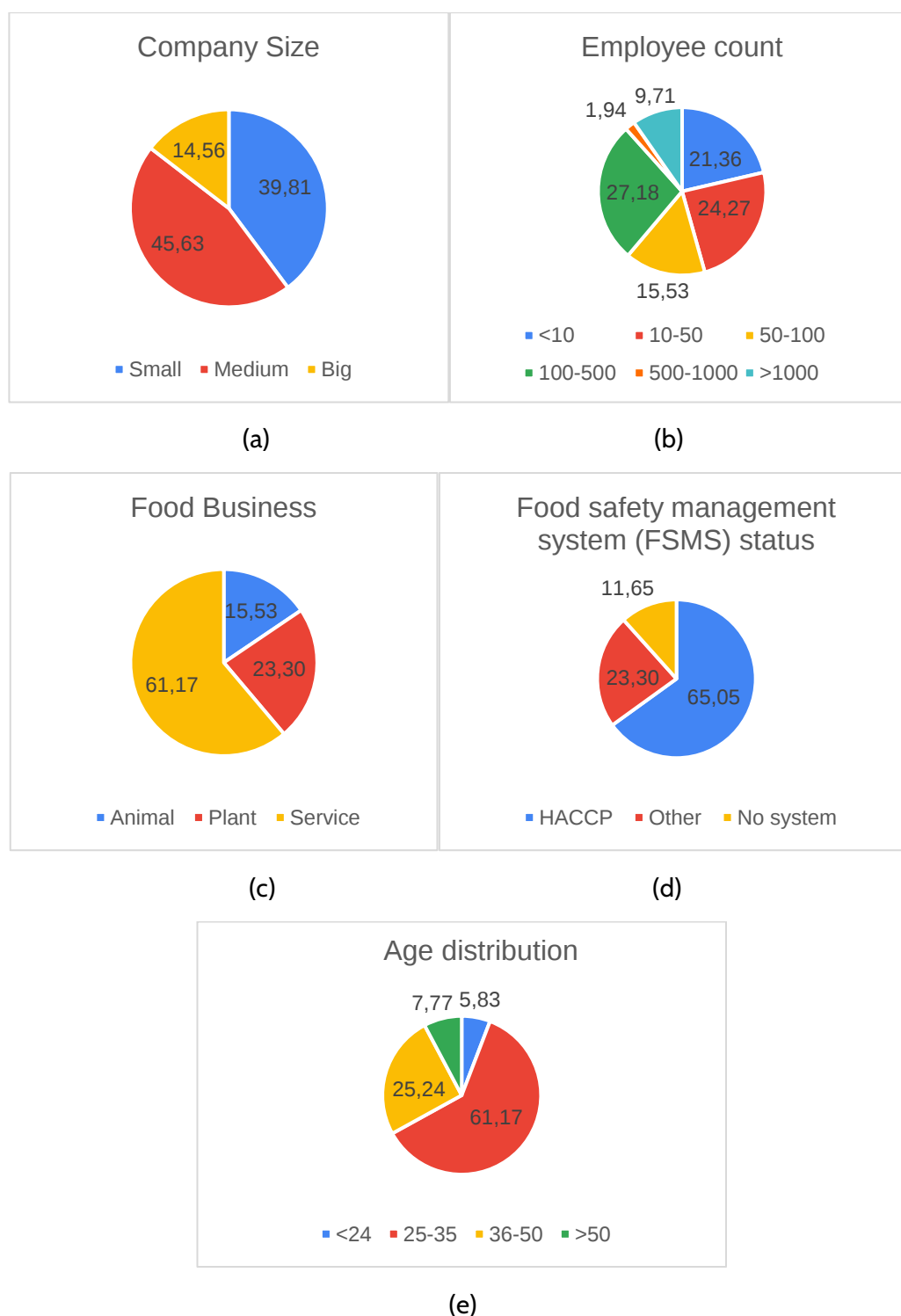


Figure 1. (a) Company size distribution of the sample. (b) Employee count distribution of the sample. (c) Type of food businesses. (d) Food safety management system (FSMS) status of the sample. (e) Age distribution of the respondents

The employee count is a crucial metric for understanding the workforce size and human resource capacity of the companies surveyed,

providing valuable insights into their operational dynamics. By categorizing companies based on the number of employees, ranging from fewer than 10

to over 1,000, we obtain a detailed understanding of employment scale and labor intensity within the foodservice industry.

The data on employee count reveals a varied distribution, indicating diverse staffing levels across the surveyed establishments. Notably, a significant proportion of companies have between 10 and 500 employees, with 24.27% in the '10-50' category and 27.18% in the '100-500' category (Figure 1). This distribution highlights the presence of both smaller-scale enterprises and mid-sized establishments within the sample, each contributing to the overall landscape of the foodservice sector.

Moreover, the distribution underscores the prevalence of companies with moderate staffing levels, reflecting the varied workforce compositions and operational capacities observed across the surveyed businesses. This diversity in employee count emphasizes the multifaceted nature of the foodservice industry, where establishments of different sizes and workforce capacities coexist to meet the diverse demands of consumers and stakeholders.

3.4. Types of food businesses

The primary emphasis and operational specialization of the assessed enterprises are determined by the food business category, which provides important information about their primary activities in the foodservice industry. This category includes a range of businesses, such as those based on animals that process meat or dairy products, businesses based on plants that farm or process food, and establishments that are service-oriented including eateries, caterers, and food stores.

The distribution of businesses among various food-related categories demonstrates the diversity of the foodservice industry and the range of functions that its players play. Interestingly, the 'Service'

category includes a sizable majority of the surveyed companies—61.17%—(Figure 1). A broad variety of foodservice firms, including restaurants, caterers, and other enterprises whose main concentration is on food preparation and service, fall under this category.

Furthermore, the incorporation of enterprises classified as 'Animal' or 'Plant' highlights the variety of operational specializations present in the sample. The aforementioned enterprises, which are involved in various operations such as meat processing, dairy production, agricultural farming, or food processing, add to the diverse character of the foodservice sector and fulfill certain functions within the food supply chain.

The overall distribution of businesses across various food business categories draws attention to the variety of operational priorities and activities found in the establishments surveyed; this reflects the dynamic nature of the foodservice industry and the range of roles that participants play in satisfying customers' gastronomic needs and preferences.

3.5. Food safety management system (FSMS) status

The FSMS status is a critical indicator of the food safety practices and management systems adopted by the surveyed companies, providing valuable insights into their commitment to food safety and regulatory compliance. This classification includes the presence or absence of formal food safety management systems, such as Hazard Analysis and Critical Control Points (HACCP), ISO 22000, ISO 9001, British Retail Consortium (BRC) standards, or the lack of a structured system. Understanding the FSMS status offers essential information about the diligence and adherence to food safety protocols among the surveyed companies.

Most companies (65.05%) reported implementing HACCP systems for food safety management

(Figure 1). HACCP is a systematic preventive approach to food safety that identifies, evaluates, and controls hazards throughout the food production process, from raw material acquisition to consumption. The widespread adoption of HACCP indicates a proactive approach to mitigating food safety risks and ensuring regulatory compliance, highlighting a commitment to delivering safe and high-quality food products.

HACCP, developed by the Codex Alimentarius Commission, serves as a fundamental framework for managing food safety within enterprises. It proactively identifies critical control points (CCPs) along the food production chain and establishes central business policies for monitoring and maintaining food safety (Codex Alimentarius Commission, 1996). Ensuring the production of safe and healthy food is a paramount objective for companies involved in the food production chain. Recognizing the importance of food safety, international trade and the global food industry have developed scientifically grounded risk analyses and interventions to mitigate public health risks. The European Union (EU) mandates the adoption of HACCP to uphold food hygiene standards, ensuring the production, distribution, and export of safe food (EU, 2004). Article 5 of the European Commission (EC) Regulation No. 853/2004 requires all food processing, production, and distribution companies to implement the seven principles of the food safety management system (Alford and Page, 2015; FAO/WHO, 1997; Ropkins and Beck, 2000).

The literature review highlights the positive results of implementing food safety management systems while also identifying challenges during adoption. These difficulties often arise from resource constraints, reduced purchasing power, inadequate information and knowledge, system complexity, and insufficient technical staff training (Bata et al., 2006; Fielding et al., 2011; Macheka et al., 2013; Milios et al., 2012). Studies in Italy and Spain show that small and medium-sized

enterprises (SMEs) face financing hurdles, both from banks and the EU, and internal efforts to fund growth through retained profits (Donati, 2017; Romero-Martinez et al., 2010). Additionally, SMEs encounter barriers in implementing systems like HACCP, including costs and enterprise size (Holt and Henson, 2000; Taylor and Kane, 2005; Yapp and Fairman, 2006).

In this study, 11.65% of companies reported having no formal food safety management system, indicating a potential gap in food safety practices and regulatory compliance. Establishments without formal FSMS may benefit from implementing standards like ISO 22000, ISO 9001, or BRC, which provide comprehensive frameworks for food safety management and quality assurance.

In order to guarantee food safety across the supply chain, ISO 22000 defines requirements for a food safety management system that include hazard analysis, risk assessment, and control methods. The ISO 9001 standard places a strong emphasis on quality management systems, customer satisfaction, and ongoing product and service delivery improvement. BRC standards offer recommendations for food safety, quality, and operational requirements, especially for manufacturers and retailers.

The distribution of FSMS status among the companies surveyed indicates a range of dedication to food safety and regulatory adherence. This underscores the need for better procedures to be implemented and increased consumer confidence in food products.

3.6. Age and professional background of the sample

The sample that completed the survey is mainly made up of people working in the field of food engineering, according to the replies given. Of the respondents, a sizable portion (66.99%) identified as food engineers. This suggests that the

respondents to the poll have specific knowledge and experience in the food business, especially in the areas of food manufacturing, quality control, and R&D. The sample is also diverse, with respondents holding a range of jobs in the food industry, including manager of research and development, production specialist, manager of a quality unit, laboratory specialist, and engineer or winemaker for wine production, among others. The multidisciplinary aspect of the food industry, which includes not only food manufacturing and engineering but also management, quality assurance, research, and customer service, is reflected in this diversity.

Respondents in professions like managers, administrators, and IT specialists, for example, are essential in managing resources, supervising operations, putting food safety procedures into place, and guaranteeing regulatory compliance. Additionally, the sample is made richer by include individuals from non-food-related professions like administrators, IT specialists, and veterinarians. These professionals offer viewpoints from related businesses that may have a small but important impact on food safety and management procedures. Veterinarians, for instance, can provide insights into elements of animal health and welfare, while IT specialists can provide knowledge of data management systems and technological integration for the purpose of monitoring food safety.

Furthermore, examining the age distribution of the respondents reveals significant insights into generational perspectives on food safety and management. The majority of respondents are aged 25-35 (61.17%), followed by those aged 36-50 (25.24%) (Figure 1). This indicates that the sample is mainly comprised of individuals in the early to mid-career stages. A smaller percentage of participants are under 24 (5.83%) and over 50 (7.77%). The dominance of the 25-35 age group suggests that many respondents are at the beginning of their careers, likely contributing fresh

ideas and innovative approaches to food industry challenges. Meanwhile, the presence of respondents aged 36 and above indicates the inclusion of experienced professionals who can offer insights into long-term trends, industry developments, and best practices.

The mix of professional backgrounds and age groups in the sample broadens and deepens the insights derived from the survey. By capturing views from individuals at different career stages and sectors, the study gains a holistic understanding of the intricacies and nuances involved in food safety management within the foodservice industry.

3.7. The evaluation of FSMS of the companies

Businesses that have a legitimate and approved food safety management system show that they are dedicated to guaranteeing the quality and safety of their goods. Stakeholders such as customers and regulatory agencies are reassured by certification that the business follows established food safety guidelines and standards. Companies that take proactive steps to reduce risks and guarantee prompt and efficient reactions to accidents impacting food safety are indicated by the existence of defined protocols for emergency preparedness and response. These texts include guidelines for dealing with a range of crises, such as the COVID-19 pandemic.

Companies who recognize pandemics as potential emergencies in their food safety management system are showing that they are risk-aware and forward-thinking. This understanding helps businesses create customized reaction plans and efficiently distribute resources in the event of a pandemic.

Ensuring that staff members have the information and abilities to handle food safety issues during a pandemic is achieved by providing training on pandemic response to food safety teams. Appropriate training improves readiness and makes

it possible to take prompt, appropriate action to protect public health.

The COVID-19 pandemic has highlighted the need for extra staff training on food safety, highlighting the dynamic nature of the difficulties related to food safety posed by newly developing infectious illnesses. To handle changing hazards and best practices, businesses need to update and modify their training procedures.

Preventing the transmission of diseases, particularly SARS-CoV-2, during and after the COVID-19 pandemic requires the implementation of more stringent personal hygiene measures, such as handwashing and physical distance. These steps help to preserve a clean atmosphere and safeguard both workers and customers.

Purchasing extra personal protective equipment (PPE) shows a dedication to worker safety and infection control. Examples of PPE include masks, gloves, and protective clothes. Sufficient personal protective equipment (PPE) is necessary to reduce the risk of transmission and safeguard the health and safety of frontline employees in food-related companies.

We asked the sample that completed the survey about their company's FSMS status while keeping all of this information in mind. A detailed discussion of each topic and its corresponding response is provided below. In general, the answers to these queries shed light on the proactive steps businesses made to improve food safety procedures and reduce hazards during the COVID-19 epidemic. Through the implementation of emergency planning, personnel training, and hygiene practices, organizations may remain responsive to changing circumstances and maintain their public health and food safety commitments.

Q1. Our company has a valid and certified food safety management system (FSMS):

In order to guarantee the overall integrity of food safety in the businesses examined, a strong foundation of a valid and verified FSMS is essential. The participants' opinions of their company's FSMS were revealed by the responses. A significant proportion of respondents indicated varied degrees of doubt or uncertainty, despite the majority expressing confidence in the validity and certification of their FSMS (Figure 2). An positive sign for Turkey's food business is the broad consensus (78.1%) among respondents who strongly agree or agree that such a system should exist. This demonstrates a proactive dedication to upholding accepted norms and procedures and highlights how important it is for companies to maintain high standards of food safety.

In addition to fulfilling legal obligations, a successful FSMS serves as a systematic framework for risk reduction, continuous improvement, and emergency response—all of which are extremely important in unforeseen circumstances like the global COVID-19 pandemic.

This shows a proactive dedication to following set guidelines and procedures, highlighting the importance that companies have on upholding high standards of food safety. The efficacy of training programs, previous occurrences, and the clarity of communication regarding food safety procedures may all have an impact on these kinds of reactions.

To guarantee adherence to food safety laws and standards, the FSMS must be certified. It shows that the business has put strong processes in place to recognize, stop, and lessen risks to food safety. A certified food safety management system (FSMS) reduces the risks of foodborne illness and regulatory non-compliance, boosts brand reputation, and inspires confidence in stakeholders. It is essential that food safety management is continuously improved, regardless of the opinions expressed by respondents. To handle new risks,

take lessons from audits or events, and keep abreast of changing regulatory requirements, businesses should review and update their procedures on a regular basis. A culture of food safety and continual improvement requires open communication, staff involvement, and on-going training.

Establishing trust with stakeholders requires open and honest communication regarding the FSMS certification status, audit findings, and remedial measures implemented. Businesses should address any issues or misunderstandings regarding

food safety, ask for input to pinpoint areas that need improvement, and aggressively convey their commitment to food safety. In summary, even though most respondents said they were confident in their company's FSMS, continual assessment, openness, and development are still required. Establishing a culture that prioritizes responsibility, openness, and continuous development can help organizations better manage food safety concerns, adhere to regulatory requirements, and uphold consumer confidence in their offerings.

Our company has a valid and certified food safety management system (FSMS).

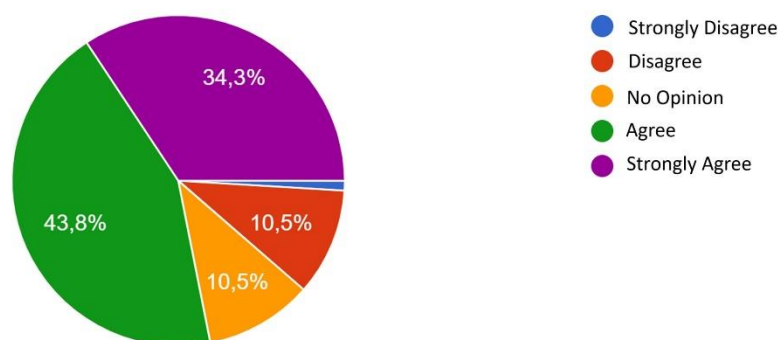


Figure 2. The existence of FSMS

Q2. Within our FSMS, we have documents associated with emergency preparedness and response/incidents affecting food safety:

The survey responses reflect participants' views on the presence of emergency preparedness and response documentation within their company's food safety management system (FSMS).

A majority (78.1%) either agreed or strongly agreed that their FSMS includes such documents. This indicates that many companies have integrated protocols and procedures to address food safety incidents, including contamination events, natural disasters, or public health crises. The widespread acknowledgment by respondents highlights a

comprehensive approach to managing risks in the food industry. In this complex environment, where unexpected events can have far-reaching consequences, having well-structured documentation is essential. These documents serve not only as formalities but as practical roadmaps, guiding businesses to respond swiftly and effectively, in accordance with best practices in food safety.

It is significant, therefore, that just 8.74 percent of respondents disagreed or strongly disagreed with this statement, suggesting that there may be a gap in the FSMS's emergency preparedness paperwork or execution. This emphasizes how crucial it is to continuously assess and improve the FSMS in

order to guarantee thorough coverage of all facets of food safety management, including readiness and reaction for emergencies.

The inclusion of emergency response documents in the FSMS demonstrates a dedication to flexibility and resilience when faced with unforeseen circumstances. This is especially important in light of the global epidemic, when it has been essential to be able to react quickly to unanticipated obstacles. It demonstrates an innovative approach to risk management, putting these businesses in a position to protect not just their ongoing operations but also—and maybe

more importantly—the health and safety of their patrons.

Overall, the consensus among responders highlights the importance of having strong standards in place to protect food safety during unanticipated incidents and recommends a proactive approach to handling emergency scenarios. To improve readiness and reduce the impact of calamities on public health and food safety, emergency response protocols must be reviewed, updated, and tested on a regular basis.

Within the FSMS, there are documents associated with emergency preparedness and response/incidents affecting food safety.

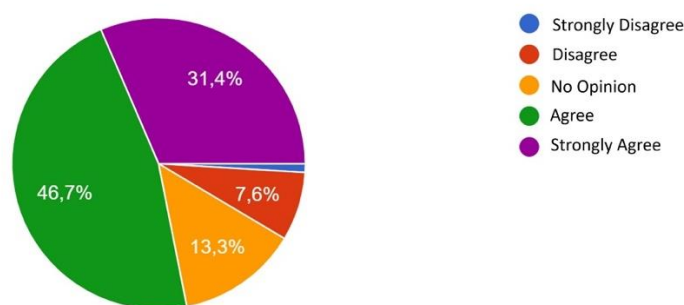


Figure 3. The distribution of results given to the related question

Q3. Pandemic was identified as one of the potential emergency situations/incidents within our FSMS:

Pandemic recognition as a major component of food safety management signifies a fundamental change in the way the industry approaches risk assessment and mitigation. The COVID-19 pandemic has brought attention to the connection between public health and global food systems, acting as a wake-up call. In order to successfully traverse unanticipated emergencies, there has been an increasing emphasis on incorporating resilience and adaptation into food safety management procedures.

The answers to this question offer important information about how ready food establishments

are for pandemics as a possible danger to food safety. According to Figure 4., the majority of participants (77.1%) agreed or strongly agreed that pandemics were one of the probable emergency circumstances identified by their food safety management systems (FSMS). This result is consistent with the literature's increasing understanding of the necessity of including pandemic preparation into food safety management procedures (Shahidi, 2020). According to research, pandemics—like the COVID-19 crisis—can have a big effect on the food business by upsetting supply networks, limiting the availability of workers, and creating new problems with safety and hygiene (Zhang et al., 2021). Therefore, preventive steps are crucial for improving resilience and response skills in the case of such crises, including the inclusion of pandemics

in FSMS. The fact that just 7.77% of respondents objected or strongly disagreed with the inclusion of pandemics in their FSMS is noteworthy, nevertheless. This research highlights possible awareness or readiness gaps in certain food establishments, which could make them more susceptible to the difficulties presented by pandemics. In order to effectively handle new threats, companies must acknowledge the dynamic nature of risks and update their FSMS on a regular basis. In order for FSMS to effectively respond to dynamic and unpredictable issues, including pandemics, literature highlights the

significance of flexibility and adaptation (Settembre-Blundo et al., 2021).

Going forward, expanding our knowledge of pandemic preparedness in the context of food safety management will require further study and cooperation between industry players, government agencies, and academic institutions. Through the utilization of interdisciplinary research findings and the integration of industry best practices from many fields, the food industry can enhance its ability to predict, alleviate, and adjust to the difficulties presented by pandemics and other public health catastrophes.

Pandemic was identified as one of potential emergency situations/incidents within the FSMS.

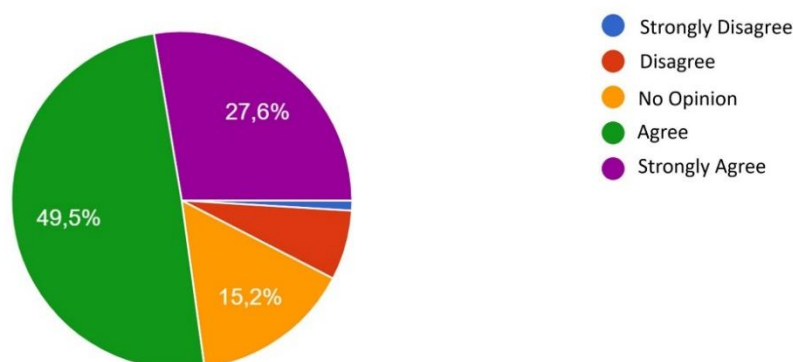


Figure 4. The distribution of results given to the related question

Q4. Food safety team in our company was trained on how to react in case of a pandemic:

The survey responses indicate the level of preparedness and training provided to food safety teams in surveyed companies regarding pandemic response. A significant majority (86.7%) agreed or strongly agreed that their food safety teams had received training on how to respond to pandemics (Figure 5). This finding is consistent with previous research emphasizing the role of training and education in improving food safety readiness during public health crises (Harrison et al., 2013; Charalambous et al., 2015).

The majority of participants responded well to the training programs, which emphasizes the importance of proactive preparation efforts in maintaining the efficacy and resilience of food safety teams. According to research, proper training can enhance hazard management, crisis response, and risk assessment skills in food companies, which lowers the chance of foodborne illness outbreaks during emergencies (FAO, 2020; DeWaal, 2007).

It is significant, therefore, that a small portion of respondents (13.59%) did not state whether or not their food safety teams had been trained specifically for pandemics. This emphasizes how

crucial it is for businesses to have open lines of communication and to be transparent about their training programs in order to guarantee that all staff members are sufficiently equipped to handle emergency situations.

In summary, the survey underscores the critical role of training and capacity-building efforts in

bolstering food safety systems against public health crises. Sustained investment in training and education is essential for improving the food industry's capacity to effectively adapt and respond to changing threats to public health and safety.

Food safety team in the company was trained how to react in case of pandemic.

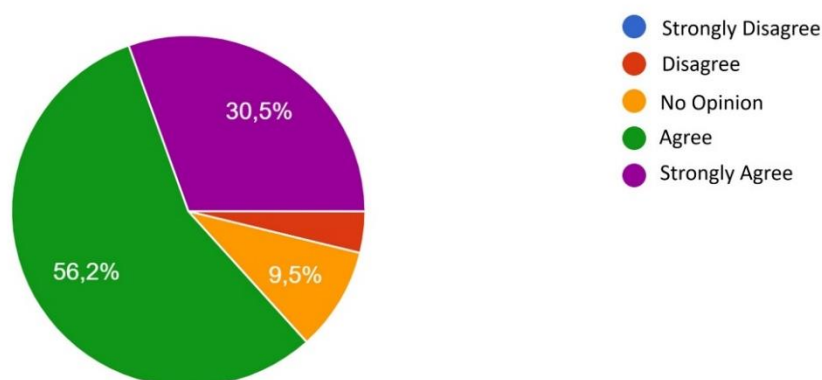


Figure 5. The distribution of results given to the related question

Q5. When the pandemic of COVID-19 was announced, we had to additionally train our staff about food safety:

In light of the COVID-19 epidemic, the answers to this question shed light on the proactive steps businesses have made to improve employee education on food safety. When the COVID-19 pandemic was revealed, the majority of participants (85.44%) either agreed or strongly agreed that their organizations had given staff members additional training about food safety (Figure 2). This preemptive strategy is in line with industry experts' and public health authorities' recommendations, which highlight the significance of upholding food safety regulations in times of public health emergency (WHO, 2020).

The affirmative reaction to further training programs highlights the companies' dedication to

placing a high priority on food safety despite the obstacles presented by the pandemic. According to research, by raising food handlers' understanding of appropriate hygiene procedures and infection control measures, focused training programs can help reduce the likelihood of foodborne illness outbreaks (FAO, 2020; FDA, 2020).

It is noteworthy, although, that a minor portion of participants (14.56%) either disagreed or did not provide a comment when asked if their organizations offered extra training on food safety in reaction to the epidemic. This draws attention to potential shortcomings in some establishments' understanding of or execution of training programs, which may call for more care and intervention.

Overall, the results point to most businesses taking a proactive approach to mitigating the COVID-19 pandemic's effects on food safety by

implementing staff training programs. Maintaining the resiliency and efficacy of food safety protocols

in the face of changing public health issues requires sustained investment in training and education.

When Covid-19 pandemic was announced, the company had to additionally train the staff about food safety.

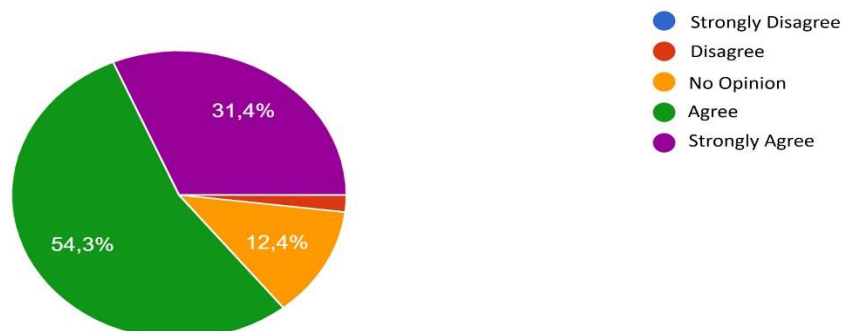


Figure 6. The distribution of results given to the related question

Q6. During and after the pandemic of COVID-19, we implemented more restrictive personal hygiene procedures (hand washing, physical distance, ...): The answers to this question show how much food establishments improved personal hygiene practices both during and after the COVID-19 outbreak. A significant proportion of participants (94.17%) expressed agreement or strong agreement that their organizations implemented more stringent personal hygiene protocols, like regular hand washing and physical distancing, during the pandemic (Figure 7.). This result is consistent with international attempts to slow the virus's spread by enforcing strict cleanliness regulations in a variety of contexts, including foodservice places (Ma et al., 2021). The proactive use of such procedures demonstrates a dedication to minimizing the danger of viral transmission within food operations and protecting the health of both customers and employees. It also highlights how flexible the food industry is in the face of public health emergencies and how eager they are to put safety first in order to win over customers.

Improving personal cleanliness practices is essential for reducing the risk of contracting other foodborne illnesses as well as for stopping the

COVID-19 virus from spreading. According to studies, following good sanitation and hand hygiene procedures can greatly lower the spread of infections in foodservice environments (Green et al., 2007). Food facilities can maintain high levels of cleanliness and guarantee the safety of the products they serve by incorporating these steps into regular operations. Even after the pandemic's immediate threat has passed, businesses must continue to be vigilant and follow these guidelines since ongoing hygiene measures are crucial to managing food safety over the long term.

Overall, the respondents' strong agreement to enact more stringent personal hygiene policies highlights the proactive steps made by food outlets to address new public health issues. These businesses show that they are committed to safeguarding the health and safety of both customers and employees in the face of emerging health risks by placing a high priority on cleanliness and hygiene. Sustaining customer trust and confidence in the post-pandemic era will need persistent attention to detail and adherence to recommended standards for cleanliness and sanitation.

During and after the pandemic of Covid-19 we implemented more restrictive personal hygiene procedures (hand washing, physical distance, ...).

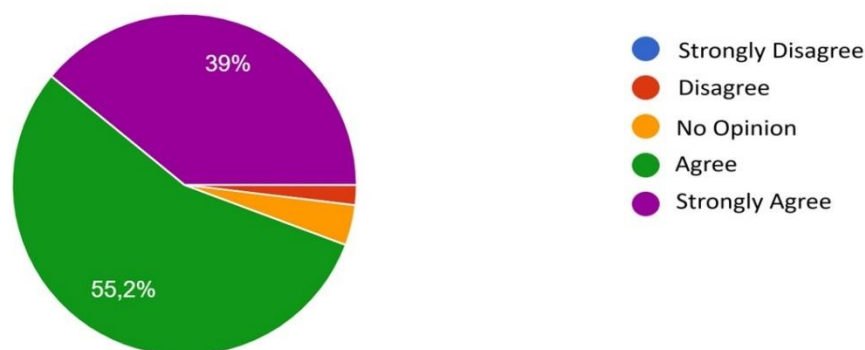


Figure 7. The distribution of results given to the related question

Q7. During the pandemic of COVID-19, we had to purchase additional personal protective equipment (masks, gloves, protective clothing):

During the COVID-19 pandemic, food enterprises demonstrated a thorough commitment to risk management and staff safety by procuring additional personal protective equipment (PPE) proactively. The majority of respondents (90.29%) agreed or strongly agreed that their companies purchased additional personal safety equipment (PPE) in response to the pandemic, including masks, gloves, and protective clothes (Figure 8). Research has emphasized the significance of personal protective equipment (PPE) in reducing the spread of respiratory viruses, such as SARS-CoV-2, in a variety of contexts, such as public areas, workplaces, and healthcare institutions (Howard et al., 2021; MacIntyre et al., 2020). Food outlets show their dedication to maintaining strict hygiene standards and reducing the danger of virus transmission among staff and patrons by making the purchase of masks, gloves, and protective apparel a top priority.

Furthermore, putting improved PPE measures into practice is in line with global regulatory bodies and public health authorities' recommendations. PPE is crucial in stopping the spread of COVID-19 in work environments, according to guidelines released by

organizations like the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) (CDC, 2020; WHO, 2020). These recommendations emphasize the use of face masks in particular as a preventative strategy against respiratory droplet transmission and as a means of safeguarding people in situations involving close contact.

In addition, the provision of sufficient personal protective equipment (PPE) indicates a proactive approach to observing occupational health and safety laws. It is legally required of employers to give their workers a safe workplace, including PPE as needed (Occupational Safety and Health Administration, 2021). Food outlets show their dedication to meeting regulatory requirements and putting employee well-being first by investing in PPE and making sure it is available to all employees.

Purchasing extra PPE is a calculated strategic investment in resilience and business continuity. Food establishments can prevent operations problems like temporary closures or workforce shortages due to illness or quarantine measures by reducing the likelihood of COVID-19 outbreaks among their employees. This proactive strategy not only preserves the health and safety of workers but also the long-term survival and reputation of the company.

To summarise, food outlets' preemptive acquisition of supplementary personal protective equipment (PPE) during the COVID-19 pandemic is indicative of a comprehensive approach that encompasses risk management, public health compliance, and

business continuity. These businesses show their dedication to safeguarding staff members, clients, and the general public from the dangers of infectious diseases by adhering to set policies, rules, and best practices.

During the pandemic of Covid-19 we had to purchase additional personal protective equipment (masks, gloves, protective clothing).

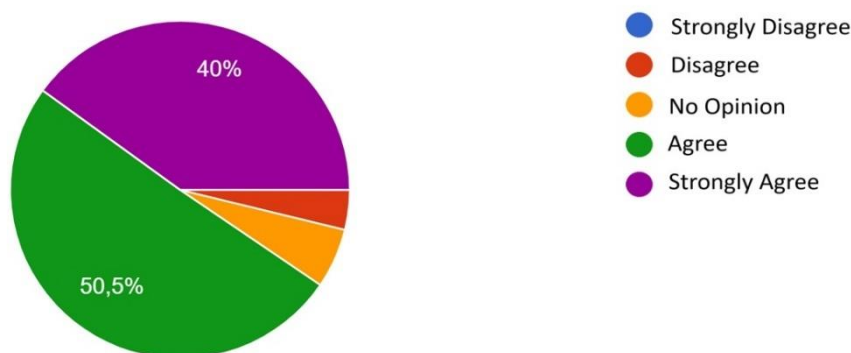


Figure 8. The distribution of results given to the related question

3.8. Evaluating the COVID-19 attributed associated to food safety

Following the COVID-19 pandemic, food establishments around the world are finding it more and more important to ensure food safety (Rizou et al., 2020). Securing the health and welfare of workers and customers has depended heavily on the implementation of strict protocols to reduce the possibility of virus spread (Olaimat et al., 2022). In order to enhance comprehension of the perceived efficacy of different COVID-19 mitigation tactics in food facilities, this conversation delves into the ranking of crucial characteristics associated with food safety protocols.

Food businesses have been entrusted with putting policies in place to lower the risk of virus transmission while preserving operational continuity in the face of changing public health standards and recommendations (WHO, 2020). Numerous interventions have been implemented to reduce the transmission of COVID-19 in foodservice settings, ranging from strict cleanliness

protocols to staff training initiatives (CDC, 2020). Determining the relative efficacy of these actions can help with policy creation and decision-making that aims to raise food safety standards (Sobolik et al., 2022).

Participants were asked to rank nine COVID-19 features related to food safety on a scale of 1 to 9, where 1 represented the most effective measure and 9 the least effective, using a survey-based methodology. The characteristics covered a variety of behaviors, such as physical distancing techniques, PPE use, staff training, and hygiene procedures. Through the collection of responses from a wide range of respondents who work in different areas of the food industry, this study aims to clarify important goals and beliefs about COVID-19 mitigation options.

The ranking of COVID-19 characteristics linked to food safety offers important information on how different strategies are thought to work in reducing the risk of virus transmission in food outlets. The traits were ranked as shown in the Figure 9. and are described below.

3.9. Hygiene of the utensils/raw materials:

37 participants ranked the cleanliness of raw materials and utensils as the most important factor, highlighting the fundamental role that sanitation plays in guaranteeing food safety. Upholding strict hygiene standards is demonstrated by the emphasis on cleanliness at every stage of food handling, from obtaining raw materials to preparing and serving meals. Good sanitation techniques prevent the spread of foodborne pathogens, which protects the public's health in addition to lowering the danger of contamination. Food businesses can gain customers' trust and show their steadfast commitment to providing healthy and safe food by emphasizing the cleanliness of their equipment and raw materials. Additionally, spending money on thorough cleanliness guidelines and routine monitoring practices strengthens the company's dedication to quality and promotes an accountable culture among employees. Therefore, paying close attention to cleanliness procedures is essential to food safety management as it guarantees regulatory compliance and enhances the health of both clients and staff.

3.10. Staff awareness:

Staff awareness, which came in second place out of 28 participants, emphasizes how important knowledgeable staff members are to maintaining strict hygiene guidelines and infection control procedures. Implementing food safety measures successfully requires a skilled workforce, particularly in the middle of a global health emergency such as the COVID-19 pandemic. Establishing a culture of responsibility and awareness helps firms make sure employees have the information and abilities needed to reduce risks and keep a safe workplace. Investing in education and training programs not only increases worker competency but also fosters a sense of accountability and dedication to maintaining food safety standards at all organizational levels.

Furthermore, staff awareness and compliance can be further strengthened through proactive communication and ongoing reinforcement of hygiene practices, protecting the public's health as well as the well-being of employees.

3.11. Frequent hand washing:

22 participants cited frequent hand washing as a crucial intervention, highlighting the ongoing significance of fundamental hygiene habits in the fight against infectious illnesses. Regular hand washing is an essential component of infection prevention in all settings, including food outlets, due to its demonstrated efficiency in lowering the spread of viruses and other infections. Businesses can greatly reduce the danger of contamination and guarantee the security of both employees and clients by encouraging a culture of frequent hand washing among staff members. It is crucial that people follow the straightforward yet effective habit of regularly washing their hands with soap and water as a first line of defense against the spread of infectious pathogens (Ijaz et al., 2021). In addition, integrating hand hygiene guidelines into standard operating procedures and offering sufficient resources and facilities for hand washing helps strengthen the significance of hand hygiene and promote uniform adherence from employees.

3.12. Health protocols from WHO/government:

The importance of following health guidelines provided by reliable organizations like the World Health Organization (WHO) and governmental authorities is emphasized by the participants. The attribute's score emphasizes how widely accepted evidence-based guidelines are as essential tools for guiding policy implementation and decision-making in the context of the COVID-19 pandemic (WHO, 2020). Food establishments can ensure that their infection prevention and control practices are in line with internationally recognized standards by following guidelines from credible sources, such as the World Health Organization and

national health agencies. In addition to improving public health outcomes, this strategic approach builds public trust and confidence in the organization's dedication to safety (CDC, 2020). Additionally, companies can reduce the risks of infectious disease transmission and protect the health of their workforce and customers by incorporating health guidelines into their operating frameworks (FDA, 2020). Therefore, the acceptance of health protocols from reliable sources emphasizes how crucial evidence-based tactics are for overcoming the difficulties presented by public health emergencies.

3.13. Temperature checking of workers:

Workers' temperature screening stands out as a key measure, as ranked sixth by participants. Temperature checks are a first line of defense in identifying those who may be exhibiting COVID-19 symptoms, such as fever, as noted by 31 responders (CDC, 2020). Organizations can quickly identify and separate workers who may be at risk of spreading the virus in the workplace by keeping a frequent eye on their temperature (CDC, 2021). Temperature checks are helpful in identifying people who are feverish, but it's important to recognize that they are not always effective in finding asymptomatic cases, which account for a sizable fraction of COVID-19 infections (CDC, 2020). Therefore, to fully reduce the risk of COVID-19 transmission in the workplace, temperature screening should be used in conjunction with other tactics, such as symptom monitoring and attention to hygiene regulations, even if it is a valuable tool in the toolbox of infection prevention measures.

3.14. Sufficient stock of gloves, masks, sanitizers, and cleaning chemicals:

Keeping a sufficient supply of cleaning supplies and personal protective equipment (PPE) on hand is essential for upholding hygienic practices and safeguarding employees and clients in the wake of

the COVID-19 outbreak. The availability of an adequate supply of gloves, masks, sanitizers, and cleaning supplies is acknowledged as a crucial step in reducing the danger of transmission, with 29 participants placing it as their sixth top priority (CDC, 2020). Frontline workers can lower their risk of infection exposure by using appropriate personal protective equipment (PPE) to comply with infection prevention and control guidelines, such as donning gloves and face masks (CDC, 2020). Similar to this, having access to sanitizers and cleaning supplies makes it easier to regularly disinfect surfaces and equipment, which promotes a safer atmosphere for both staff and customers (CDC, 2020).

3.15. Physical distance between workers:

One of the most important things that can be done to minimize respiratory droplet distribution and lower the danger of COVID-19 transmission in the workplace is to keep workers physically apart. The importance of physical separation in minimizing close-contact interactions among employees is highlighted by the fact that 25 participants ranked it as their seventh most important concern (CDC, 2020). Workplaces can aid in preventing the spread of respiratory droplets by following advised distance rules, such as keeping a minimum of six feet between people, especially in situations when it is difficult to wear masks consistently (CDC, 2020). This action is in line with more general social distancing guidelines that are intended to stop the spread of infectious diseases in public and occupational settings (CDC, 2020).

3.16. Use of masks and gloves:

Using masks and gloves is the eighth most important personal protective equipment (PPE) that participants prioritized, indicating that PPE is important in lowering the risk of contamination during food handling. In foodservice settings, masks and gloves serve as vital barriers that prevent respiratory droplets and direct contact with

potentially contaminated surfaces, hence reducing the transmission of COVID-19. (CDC, 2021). For optimal protection against respiratory droplets emitted during speaking, coughing, or sneezing, mask use must be done properly, which includes covering the mouth and nose firmly (CDC, 2021). To avoid cross-contamination between various food items and surfaces, gloves should also be worn when handling ready-to-eat foods and should be changed frequently (FDA, 2020). Food companies can improve food safety procedures and reduce the chance of virus transmission among staff and patrons by following advised PPE protocols.

3.17. Prevent/limit visits to the food:

Considering the possible effects on consumer satisfaction and business operations, 38

participants thought that restricting or prohibiting visits to restaurants would be the least beneficial course of action. Restricting access can lessen the risk of contracting the virus, but it may also make it more difficult for restaurants to retain patronage and generate income (Ahmed et al., 2020). Maintaining the sustainability of foodservice operations during the COVID-19 pandemic requires striking a balance between public health concerns and commercial viability (Brouwer et al., 2020). While offering clients convenient and safe dining experiences, alternative techniques including online ordering, delivery services, and outdoor dining options can help reduce hazards (Brouwer et al., 2020; Reimann et al., 2020).

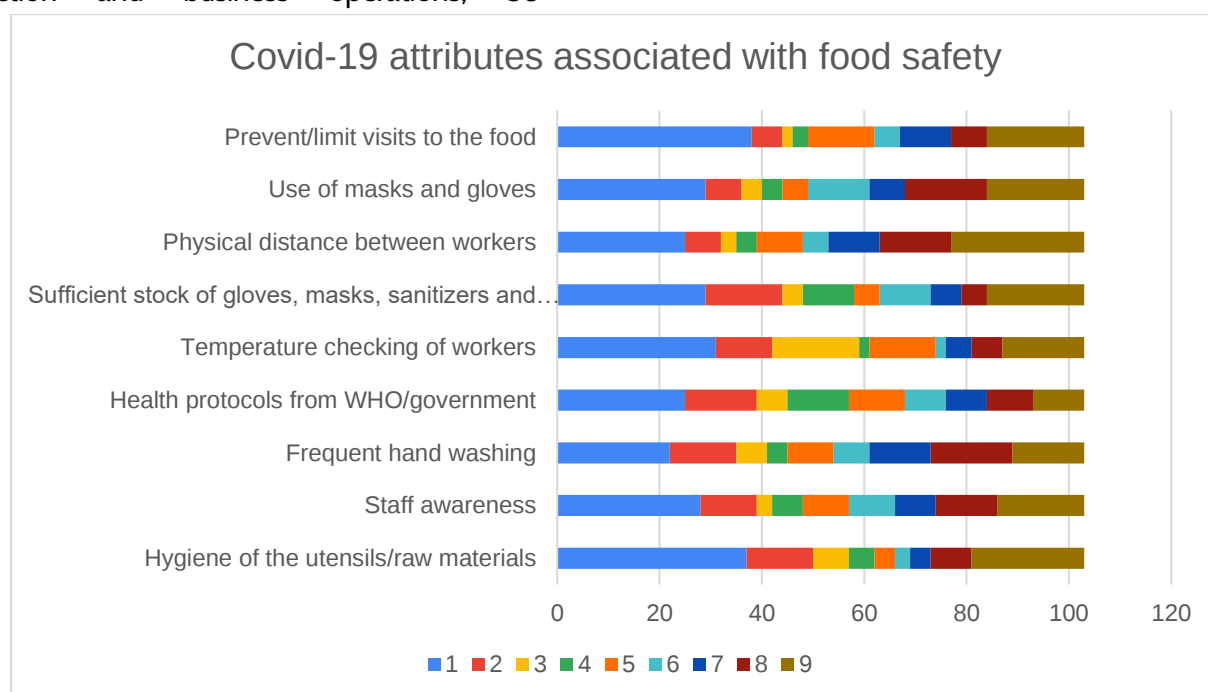


Figure 9. Ranking of the attributes

All things considered, the rankings show a diverse strategy for mitigating COVID-19, including hygienic measures, employee education, following health guidelines, and the availability of personal protective equipment (PPE). Food establishments can improve safety standards and aid in controlling

the transmission of viruses on their property by giving priority to these procedures.

3. CONCLUSION

The purpose of this study was to learn more about how fast food restaurants and the catering sector in Adana, Turkey, handled the COVID-19 pandemic's

issues and modified their food safety procedures accordingly. A number of significant conclusions were drawn from surveys that were completed by 103 participants, who represented a wide variety of food-related enterprises, such as restaurants, food production firms, and catering services.

First off, most participants said they had a food safety management system (FSMS) in place that was legitimate and certified, and a sizable percentage of them had HACCP (hazard analysis and critical control point) systems in place. This suggests that the surveyed companies are taking a proactive stance to guarantee food safety and regulatory compliance.

Moreover, the poll indicated that a significant proportion of respondents acknowledged pandemics, like COVID-19, as possible emergency scenarios in their FSMS. This emphasizes how crucial it is to incorporate pandemic preparedness into food safety management procedures, in line with advice from reputable organizations like the World Health Organization (WHO).

Many businesses adopted extra hygienic measures in reaction to the pandemic, such as frequent hand washing, the use of personal protective equipment (PPE), and physical separation procedures. The aforementioned procedures are indicative of a deliberate endeavor to reduce the spread of COVID-19 in food enterprises and provide equal importance to the well-being of staff and patrons.

Nevertheless, difficulties and potential areas of development were also noted. A few attendees raised concerns over the upkeep of proper sanitation procedures and staff management, emphasizing the necessity of more frequent inspections and compliance with official directives. Furthermore, issues such as employee discomfort due to close contact at work highlighted the importance of addressing both psychological and physical safety concerns.

Overall, the study's findings offer insightful information about how fast food restaurants and the catering sector in Adana, Turkey are adjusting their food safety procedures in response to the COVID-19 epidemic. Policymakers and businesses can better inform strategies for increasing resilience and response capacities in future public health emergencies by understanding the experiences and viewpoints of industry players.

Ethical Approval

None.

Declaration of Conflicting Interests

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Author Contribution

Concept: HE, SG

Design: SG

Data collecting: HE

Statistical analysis: HE, SG

Literature review: HE

Writing: HE, SG

Critical review: SG

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