



**TÜRKİYE CUMHURİYETİ
ADANA ALPARSLAN TÜRKER SCIENCE AND TECHNOLOGY
UNIVERSITY**

**SOCIAL SCIENCES INSTITUTE
FACULTY OF BUSINESS ADMINISTRATION**

**EVALUATION OF FOOD SAFETY PROCESSES BY NUMERICAL
METHODS IN CATERING AND FAST-FOOD CHAINS IN ADANA
AFTER THE COVID-19 PANDEMIC**

HATİCE ENGİN

**MASTER OF BUSINESS ADMINISTRATION
M.Sc.**



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ADANA, 2024

DECLARATION OF CONFORMITY

In this thesis study, which was prepared following the thesis writing rules of Adana Alparslan Türkeş Science and Technology University Institute of Graduate School, I declare that I provide all the information, documents, evaluations and results in accordance with scientific ethics and moral codes without resorting to any means or assistance that would be contrary to scientific ethics and traditions. I also declare that I refer to all of the articles I used in this study with appropriate references and accept all moral and legal consequences if a situation is found contrary to my statement regarding my work.

30/04/2024

[Signature]

Hatice ENGİN

ÖZET

ADANA'DA COVID-19 PANDEMİSİ SONRASI CATERING VE FAST-FOOD ZİNCİRLERİNDE GIDA GÜVENLİĞİ SÜREÇLERİNİN SAYISAL YÖNTEMLERLE DEĞERLENDİRİLMESİ

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Yüksek Lisans, İşletme Anabilim Dalı

Danışman: Doç. Dr. Selim GÜNDÜZ

Nisan, 2024 68 sayfa

Bu çalışmada, Adana, Türkiye'deki catering endüstrisi ve fast-food zincirlerinde COVID-19 pandemisinin gıda güvenliği uygulamalarına etkisini araştırmak amaçlanmıştır. Restoranlardan gıda üretim şirketlerine kadar çeşitli gıda ile ilgili işletmeleri temsil eden 103 katılımcı üzerinde anketler yapılmıştır. Çalışma, şirket karakteristiklerini, boyutu, iş türünü, çalışan sayısını ve gıda güvenliği yönetim sistemi (GGYS) durumunu incelemektedir. Ayrıca, katılımcılar ile COVID-19 ile ilişkilendirilen gıda güvenliği önlemlerini tartışılmıştır. Sonuçlar, çoğunluğun gıda güvenliği yönetimi için Tehlike Analizi ve Kritik Kontrol Noktaları (HACCP) sistemlerini uyguladığını göstermiştir. Çoğu işletmenin, GGYS içinde pandemileri potansiyel acil durumlar olarak tanıdığı; ancak, personel eğitimi ve kaynak temini konusunda farklılıkları bulunduğu belirlenmiştir. Katılımcılar, ekipman/ham madde hijyenini ve personel farkındalığını önceliklendirmiştir. Genel olarak, çalışma, COVID-19 pandemisi gibi krizler sırasında gıda güvenliği direncini sağlamak için proaktif önlemlerin ve sürekli adapte olmanın önemini vurgulamaktadır.

Anahtar Kelimeler: Gıda Güvenliği Yönetimi, Pandemi, Gıda Sektörü, COVID-19 Etkisi, Sertifikalı Gıda Sistemleri

ABSTRACT

EVALUATION OF FOOD SAFETY PROCESSES BY NUMERICAL METHODS IN CATERING AND FAST-FOOD CHAINS IN ADANA AFTER THE COVID-19 PANDEMIC

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April 2024, 68 pages

This study investigates the impact of the COVID-19 pandemic on food safety practices within the catering industry and fast-food chains in Adana, Turkey. Surveys were conducted among 103 participants representing various food-related businesses, ranging from restaurants to food manufacturing companies. The study examined company characteristics, including size, type of business, employee count, and food safety management system (FSMS) status. Additionally, participants ranked COVID-19 attributes associated with food safety measures. Results revealed a predominance of medium and large-sized establishments, with the majority implementing Hazard Analysis and Critical Control Points (HACCP) systems for food safety management. While most companies recognized pandemics as potential emergency situations within their FSMS, there were discrepancies in staff training and resource availability. Participants prioritized measures such as hygiene of utensils/raw materials and staff awareness. Overall, the study underscores the importance of proactive measures and continuous adaptation to ensure food safety resilience during crises like the COVID-19 pandemic.

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



Dedication

To my beloved family...

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1. INTRODUCTION

The coronavirus (COVID-19) rapidly spread from China to numerous other countries, resulting in an acute, highly contagious pandemic (Bao et al., 2020). This pandemic quickly reached our country, bringing not only the risk of fatal viral infection but also severe psychological stress to individuals both in China and globally (Xiao, 2020; Duan and Zhu, 2020). Our country experienced numerous unprecedented challenges due to the coronavirus. The pandemic imposed significant restrictions on daily life, and strict measures were implemented both provincially and nationally to curb the spread of the virus. These measures were communicated to the public by various governmental bodies, including the Ministry of Transport and Infrastructure, the Ministry of Health, the Ministry of National Education, and the Council of Higher Education. Additionally, national leaders urged citizens to voluntarily quarantine, remain at home as much as possible, and support these efforts during this period (Gülçiçek Tolun and Bulut, 2021).

While healthy and balanced nutrition and a strong immune system are two important factors in preventing diseases, consuming reliable food products is the most important factor in providing a healthy and balanced diet. In order to prevent the spread of the pandemic in Turkey, the rules required to ensure food safety and food hygiene were reviewed by state administrators and authorized authorities, and some rules that should also be followed under normal conditions (sell bread in bags, open food products are not touched without gloves, unpackaged products are not sold, food should not be contacted). Disinfection of places such as departments, counters, etc.) has become urgently applicable during the pandemic. The scope of food safety inspections carried out by the Ministry of Agriculture and Forestry has been expanded, and their frequency and number have been increased. In this context, providing and maintaining hygiene has been the most critical factor in protection from the new type of coronavirus disease, as in all diseases (Oğur et al., 2020).

The World Health Organization reports that unhealthy eating habits lead to the loss of 33 million healthy lives each year. Key factors causing foodborne diseases include cross-contamination, poor storage conditions, unsafe food sources, improper handling, inadequate personal hygiene, and incorrect cooking techniques (WHO, 2022). Preventive measures for COVID-19 involve handwashing, wearing masks, maintaining physical distance, and

quarantine. Additionally, various vaccines are in progress. The possibility of COVID-19 infections raises concerns for other sectors within the food industry. Throughout the pandemic, ensuring food safety became paramount, with potential contamination risks during preparation, storage, serving, and transportation. Unsafe practices by employees can elevate the risk of transmission. Research indicates that SARS-CoV-2 can remain stable at -20°C for three weeks on salmon fillets, poultry, and pork (Fischer, 2020). Moreover, cooking at 63°C for 4 minutes can significantly reduce SARS infection in food by 4 log CFU per gram (Anonymous, 2020).

As a result, there is an urgent need to research food safety knowledge, attitudes, and behaviors (KAP) during the COVID-19 pandemic. Numerous studies have indicated that KAP has improved during the public health crisis (Hatabu et al., 2020; Mayurnikova et al., 2020; Luo et al., 2019; Ranaei et al., 2020; Omar, 2020). Ensuring the provision of safe foods to consumers has been particularly challenging for many food businesses, especially fast food restaurants. These establishments offer a variety of fresh, quickly available, and often semi-nutritious items at low prices. However, the quality and safety of these foods, along with their effects on consumer health, are concerning. Before the pandemic, it was found that about 59% of food professionals in a Jordanian military hospital did not adhere to proper food hygiene practices (Luo, 2020). During COVID-19, no studies were conducted to objectively assess the quality, safety, and acceptability of the products offered at fast food restaurants in various well-known and traditional locations.

Food safety is vital for detecting, removing, and limiting the risks and hazards that exist from production to consumption (Wang et al., 2019). One of the most serious issues with food is a lack of food safety measures. This problem produces a variety of issues at both the global and national levels. Food not complying with the rules, problems in its storage, damage to the packaging, and not paying attention to the hygiene rules; all of these reasons cause an increase in harmful substances along with beneficial ones in foods, and as a result of inadequate food safety in the process from the first stage of production to the consumer's table, these foods become harmful to human health (Erkmen, 2010; Golian et al., 2018). Covid-19 has strengthened the food safety habits of food processors and consumers by causing changes in safe food practices, resulting in a rapid and massive change in consumer behavior.

Food safety is paramount throughout the food preparation process, starting from raw material receipt, pre-processing, preparation, storage, and finally food serving and distribution. Ensuring food safety during COVID-19 is crucial for public health. In recent years, food deliveries and dining out have become significant trends. Fast food restaurants and cafeterias offer a vast array of dishes that appeal with their freshness, delightful flavors, quick service, and affordability (Kashyap et al., 2004; Gupta et al., 2011). However, if proper preparation and hygiene practices are not followed, the quality and safety of these foods, as well as their impact on consumer health, could become concerning (WHO, 2002). Therefore, it is essential to adhere to all hygienic and sanitary procedures during food manufacturing and preparation (Davies et al., 1992). Implementing a food quality and safety monitoring program in foodservice establishments can significantly enhance food quality and safety (Gangahar et al., 2000; Olaimat et al., 2020). These improvements will be reflected in the acceptability of the cuisine offered in these establishments. There is limited information about the duration of coronavirus survival on various contact surfaces and in foods under specific conditions, highlighting the need for more research into the risk of COVID-19 transmission associated with food and food packaging. Studies are needed to explore the relationship between the consumption of SARS-CoV-infected food (Giorgi et al., 2009; Olaimat et al., 2020).

Food products typically comprise multi-element formulations, and the absence of even one component can disrupt production (Bhunnoo, 2019). During the COVID-19 pandemic, every segment of the food supply chain, including fresh vegetables, fruits, bakery products, perishables, and food grains, faced significant challenges (Ivanov and Dolgui, 2020). The food supply system has been one of the sectors most severely impacted by the pandemic (Galanakis, 2020). Despite stringent safety measures implemented throughout the food chain, the final stage—consumption—requires the most thorough safety assessments at the consumer level, as it poses the primary risk for infection (Euractiv, 2020). For instance, some US industries, such as meat processors, halted production entirely to mitigate risks during the pandemic (Reiley, 2020). A study that evaluated the 'most affected' and 'least affected' sectors within food systems due to the COVID-19 pandemic found that the retail industry was the hardest hit, while storage was identified as the least affected segment (Djekic et al., 2021).

In addition to the disruption in the food supply chain, the food industry faced widespread human resource shortages. COVID-19 caused labor shortages by separating personnel for prolonged durations due to infection or quarantine for suspected exposure. COVID-19 also

has an indirect impact on the labor supply. Early in the pandemic, several employees did not come to work because they were terrified of getting sick or because there was an outbreak at their workplace. The prospective pool of workers for the food business to hire was also limited since some people who had lost their jobs chose not to look for new opportunities. After all, the temporary federal and state COVID-19 jobless help programs provided benefits comparable to food-service salaries. The remaining food employees were subsequently assigned new responsibilities, which usually increased their regular duties and working hours. Production managers, for example, were responsible for processing equipment, and quality assurance managers had to establish and implement COVID-19 control plans and mitigation measures in addition to their food safety and quality programs. As the supply of competent workers decreased, the food industry was obliged to hire new personnel who were less trained but had prior food industry experience or training in food safety requirements. Training these new staff also posed issues in implementing COVID-19 mitigation strategies. For example, shadowing a skilled employee is a standard method of training new staff, but the required physical distance made close visual instruction problematic, and facial coverings hampered verbal communication in already noisy food production conditions. New employees with less food industry expertise were less likely to commit to long-term employment after training. These labor issues have fuelled the food industry's interest in automation and robots to reduce the risk of COVID-19 transmission and reliance on specialist labor (Byington et al., 2020).

Food safety legislation affecting staff and consumer actions during COVID-19 have had a significant impact on restaurant owners and employees. As a result, the primary goal of this study was to evaluate the quality, safety, and acceptability of the foods, as well as the suitability and availability of manufacturing sites, physical facilities, drinking water, waste management systems, processing conditions, food safety knowledge, and hygienic practices of food handlers at these fast food restaurants in Jordan's various universities during COVID-19. The goals were to compile a baseline profile of food handlers, food materials, hygiene practices, surface sanitation, food safety knowledge, and safety processes utilized in food manufacture, packing, and distribution.

COVID-19 does not transmit through food and cannot survive or multiply within food. However, handling food without proper sanitation can lead to infection, similar to contact with any surface touched by a person carrying the coronavirus. Moreover, heating food at 60°C for at least 30 minutes effectively eradicates viruses like SARS. Research by Baier et al. (2020) discovered coronavirus in saliva, suggesting that food handlers can transmit the virus through activities like coughing, speaking, or sneezing, creating an infectious aerosol. This aerosol can mix with the air breathed by nearby individuals, such as customers and restaurant staff.

Direct contact with an infected person's bodily fluids or indirect contact with surfaces contaminated by coughing or sneezing particles can spread the virus. Hence, strict hygiene practices, including handwashing and mask-wearing, are crucial for raw materials and food handlers. Regular health monitoring and identification of sick individuals, especially asymptomatic carriers, are essential to prevent virus spread.

Mismanagement can lead to COVID-19 outbreaks. Proper training of food handlers is necessary to enhance food safety and minimize risks. Continuous practical training can reduce the risk of consuming contaminated foods. Learning from the COVID-19 quarantine experience is essential for proposing strategies to ensure food safety during potential future quarantines.

Although coronaviruses cannot reproduce in food, they can replicate in cells, posing a risk, especially in raw foods like meat, fish, shrimp, and eggs. Research is needed to manage these risks and discover safer food packaging materials to prevent cross-contamination.

Hecht et al. (2019) identified ten factors contributing to organizational-level resilience in food supply chains, including emergency planning, staff training, and infrastructure. All major stakeholders, including industry, politicians, governments, and consumers, must actively participate in transitioning towards a more resilient future for food security.

Given the lack of research in Adana, Turkey, and limited monitoring programs on health and food safety in restaurants, this thesis aims to explore how the catering industry and fast-food

chains in Adana survived the COVID-19 pandemic and the changes forced upon their food safety practices. This study will be the first to investigate the post-effects of the pandemic on restaurants and food handlers in the region.



2. LITERATURE REVIEW

Pandemics include large-scale infectious disease outbreaks that greatly increase morbidity and mortality over a wide geographical area of the world and can ultimately cause very significant economic, social and political disruptions. The available evidence shows that the probability of a pandemic will increase in the last century due to increased global travel and integration, urbanization, erroneous changes in land use and very poor exploitation of the natural environment. Therefore, very urgent and important measures should be taken. The international community should quickly make progress towards preparing for the effects of pandemics and reducing their impact (Jones et al., 2015; Madhav et al., 2015) .

COVID-19, which we have recently experienced, is a highly contagious pandemic that has no analogues in the past 100 years of human history and affects the whole world. This virus has caused a disruption that has led to economic shuttering and commercial activity on an almost unique scale. The first COVID-19 case was identified in Wuhan, China, in December 2019, and since then, COVID-19 has spread exponentially around the world and turned into an epidemic affecting the whole world ((Bao et al., 2020). On March 11, 2020, the World Health Organization (WHO) announced COVID-19 as a global pandemic in a short time in the world due to its rapid and widespread transmission, as well as the high number of deaths and effective infection and mortality rates compared to other coronavirus outbreaks (Abdou, & Shehata, 2021; Shamim et al., 2021).

The spread of COVID through food can happen in three ways: viruses in food environments, including contaminated ones food, infected food handlers and contaminated food they are contact materials (Abolmaaty et al., 2022). Regarding food safety, the World Health Organization (WHO) has made important recommendations on following good hygiene practices during food processing and preparation, such as washing hands, cooking meat by meat, and not having cooked and uncooked foods side by side to avoid potential cross-contamination.

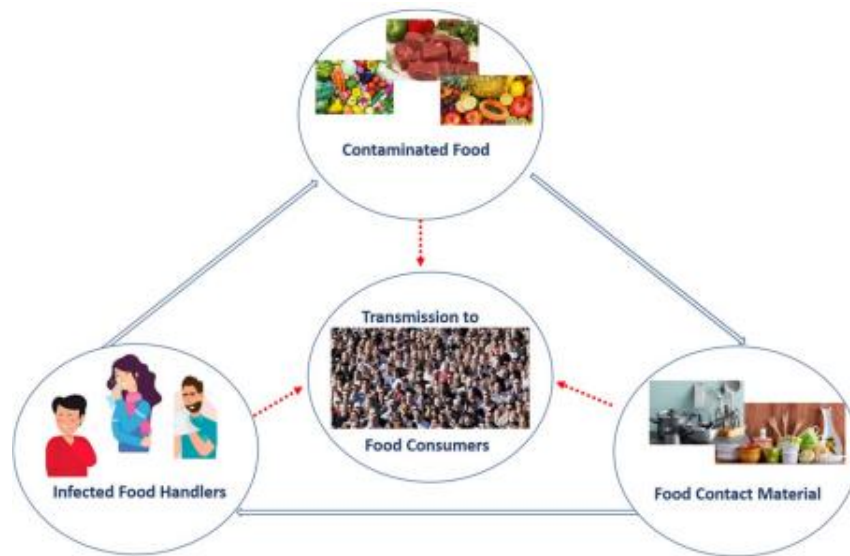


Figure 2.1 The potential transmission pathway of coronaviruses via food products to consumers (From Abolmaaty et al., 2022)

The COVID-19 pandemic has negatively affected all aspects of daily life and this has changed daily food intake, food consumption, consumers' eating behaviors and food safety perceptions. (Wilder-Smith and Freedman, 2020). Recent scientific studies have shown that disruptions in food supply chains, restrictions on food exports / imports, restrictions on food Sundays, limited accessibility to supermarkets due to high inflation in food prices also negatively affect attitudes and behaviors related to food purchase and consumption. (Béné, 2020; Erokhin and Gao, 2020). These adverse situations have collectively affected food buying and eating behaviors, and food safety measures have been receiving much more attention recently due to the increased concern about contracting COVID-19. In fact, food safety is a phenomenon that needs to be paid great attention at every period in order to protect the public health of consumers. Regarding the food supply, many countries have reported delays in the harvest of agricultural products due to self-isolation of employees, curfews or lockdowns. However, the disruptions in the food supply chain with the pandemic and accessibility to food Sundays unfortunately increased the waste of perishable foods such as fruits and vegetables during that period. In order to prevent food shortages that may occur if international food suppliers limit the export of goods, local food production has been encouraged to prevent hunger in many countries in order to ensure sustainable access to food during the pandemic (Al-Tarah et al., 2021).

The COVID-19 pandemic has caused significant disruptions in food and all other industries (WHO, 2020). The pandemic has had a very negative impact on the restaurant industry worldwide globally, forcing a significant number of restaurants to close. This restaurant industry is an important sector consisting of about 1 million employees in the world who are dealing with unprecedented problems (Haider et al., 2020). The best way to adapt to this unprecedented COVID crisis is to take elements of the creative economy. Cloud kitchens have emerged as an innovative approach for the restaurant industry in this case. Cloud kitchen is a commercial kitchen area in your food business that provides the facilities and services needed for food delivery and takeaway. In other words, a cloud kitchen or ghost kitchen is a kitchen model, a type of restaurant in which the production and preparation of dishes are carried out, consisting only of a kitchen, but customers are not served in a physical environment (such as a cafe, restaurant), that is, it does not have a customer hospitality area (Mathur et al., 2023; Sarbhai & Khare, 2023). In a study, the technology-oriented cloud kitchen was examined and included the intention to become a food processor among the students who are the main pillars of the world. As a result of the study, it has been shown that people are more likely to become foodpreneurs and intend to adopt the technology-oriented cloud kitchen business model, as it tends to attract more customers due to its cost effectiveness, low investment and suitability for pandemic situations (Nagadeepa et al. 2023).

Mayurnikova et al. (2020) studied the food safety practices in catering during the coronavirus COVID-19 pandemic. They reported that the three transmission ways the coronavirus can contaminate at food service enterprises: These are (1) aerial transmission by droplets and aerosols during the principal and secondary technological production processes, (2) person-to-person transmission from clients to staff or from employee to employee via direct or indirect contact, and (3) transmission via contaminated surfaces, e.g. packaging materials, furniture, equipment, etc. The researchers emphasized that these reported recommendations are based more on the possibility of public health risks associated with person-to-person transmission than on food safety.

The COVID-19 disease caused by SARS-CoV-2 poses a major risk to public health. There is no information that the SARS-CoV-2 virus is transmitted through food and food packaging, but the possibility that infected people may have contact with food and food packaging should

be considered, and personal hygiene should be ensured for this purpose. From the consumption of foods first, attention should be paid to routine food safety practices and they should be applied. Although there is no evidence that this virus is transmitted by consuming food although there is no scientific data to date, food manufacturers and consumers need to comply with hygiene rules more than ever and turn hygiene rules into a routine process in their daily lives. Thus, concerns about the transmission of this virus through food and therefore, it is thought that discussions can be prevented (Akkemik and Guner, 2020).

The biggest factor in preventing the spread of the COVID-19 pandemic through humans is the provision of social distance, reducing the number of employees in some sectors, stopping production, and employees in sectors whose conditions are favorable have started working from home. In statements made during the early stages of the pandemic (WHO, 2020; EFSA, 2020), it was reported that there is no evidence that COVID-19 is transmitted through food and food packaging. However, in the following months, it was suggested that the potential food-borne transmission of SARS-CoV-2 could be caused by the consumption of foods from infected animals or cross-contaminated foods (Blondin-Brosseau et al., 2020; Matson et al., 2020; Oakenfull and Wilson, 2020). In a review article, food-related factors that may trigger the spread of COVID-19 infection, hygiene and sanitation measures specific to the pandemic in the fight against a new type of coronavirus, effective food safety practices and current studies providing information about the role of food enterprises and food workers in the pandemic process related to these issues were discussed. In summary, the researchers reported that it is not considered possible for personnel working in food establishments to transmit COVID-19 to food or food-related materials if they practice good hygiene practices correctly. In addition, if the necessary care is taken to COVID-19-specific hygiene and sanitation practices during the pandemic, food sector employees will have fulfilled their role in preventing the spread of the pandemic and combating the pandemic (Ogur, 2021).

The COVID-19 pandemic has greatly deeply affected the food and beverage sectors. Understanding how this large-scale pandemic affects the sector is important for creating solutions. This study did not examine the perceptions of Turkish cooks about the potential effects of the food and beverage industry pandemic during the epidemic, focusing on their post-epidemic expectations. For this purpose, interviews have been arranged with a total of 18

chefs. The study examined the perceptions of Turkish chefs in two main directions: during COVID-19 (employee perceptions, changing consumer needs and general views on the sector) and after COVID-19 (innovation practices, hygiene and sanitation, robotics applications). This research has contributed to the limited literature on the food and beverage industry COVID-19 pandemic. As a result of the study, practical recommendations for the food and beverage industry were also presented (Alrawadieh and Cifci, 2021).

This study is the first global assessment to focus on the impacts of COVID-19 on food security and nutrition status, particularly in low- and middle-income countries. The assessment covers 62 countries in total and is based on analysis of 337 different documents published in English, French, Spanish and Portuguese. This review has confirmed the magnitude and seriousness of an unprecedented crisis that has spread across the world. The analysis found that the most affected part of food security is accessibility, and there is solid evidence to suggest that both financial and physical access to food is being disrupted. In contrast, there is no clear evidence that food availability is affected. Overall, the evidence suggests that food systems have resisted and adapted to the disruption of the pandemic, but this resilience has come at great costs, with many system actors having to cope with serious disruptions to their operations. These actors (uneducated women/men, the poor, unskilled workers) then lost a large part of their investments and assets at the beginning of the pandemic, even happened to those who went bankrupt (Hirvonen et al. 2020a,b). However, since many of these actors are already “invisible” to the national statistical systems of their respective countries, their economic ‘disappearance’ has been officially difficult to document or measure, although they are probably the most severely affected group in the food system. On the other hand, markets and supermarkets made billions of dollars in profit in 2020, especially from heavy food sales (Béné, et al., 2021).

The COVID-19 pandemic and the implementation of quarantines have become a challenge for the restaurant business and the industry as a whole at that time. Restaurants do not have a balanced exit strategy from this negative situation, and harsh government actions, such as indefinite closures, have undermined their viability. As a result, the restaurant business has been severely negatively affected by the pandemic all over the world. The recovery of this condition will be long and painfully slow. Restaurant owners are learning new business

models and trying to adapt to new ways of doing business in order to get rid of the negative financial impact of the COVID-19 pandemic. Digitally innovative technologies and digital marketing are causing restaurants to realize a digital transformation. More and more restaurants are registering on the platforms of online delivery firms, improving their websites, improving pages on social networks. In this way, restaurants are trying to overcome these financial difficulties (Matsenko et al., 2021).

In a study, the impact of the COVID-19 pandemic on the food sector and its relationship with financial performance were investigated in detail. The quarterly data of a total of 19 companies in the food and beverage sector traded on Borsa Istanbul before Covid-19 (2016-2019) and COVID-19 period (2020) were analyzed by panel data analysis method. It has been determined that the COVID-19 pandemic had a positive impact on the market value of companies in the food sector. During the Covid-19 period, the market value is positively related to "Market Value/Book Value", "Current Assets/Assets and "Inflation", a significant relationship with "Income" has not been determined. As a result of the study, a negative significant relationship was found between the "Debt Ratio" and market value (Kılınç and Çalış, 2021).

Kee et al. (2021) studied to determine how Covid-19 affected the fast food sector in Malaysia. This study data was collected in detail through primary and secondary data, and surveys using the online Google form for this purpose were taken as primary data to learn more about the subject being studied. In total, about 100 customers (37 men and 63 women, and ages between 18 and 24 (90%)) participated in the survey. According to the results obtained from this study, it has been shown that the fast food sector continues its activities in the pandemic and adopts digitalization technologies. Digital technologies have had a significant impact on fast food restaurant strategies during the global pandemic, and these companies have achieved rapid digital transformation. On the other hand, Digitalization has created new different possibilities for fast food restaurants to maintain their business. Mobile devices have provided significant convenience to both businesses and customers with digital infrastructures such as Wi-Fi networks and online pay systems. After all, the intensive implementation of this digitalization has helped fast food restaurants to operate more customer-oriented.

The pandemic conditions we are facing have also made stress more universal among food chain staff. New solutions should be implemented urgently to protect customers and employees. The few technologies that already exist should be implemented with extreme urgency. Since most of the societies were caught unprepared for the COVID-19 pandemic, it has also been very difficult for the food distribution sector, which had to quickly adapt to completely new working conditions and business models. The lack of microbiological experience in companies, municipalities, social systems and welfare services, and even in the health sector, was the most concrete result at the beginning of the current crisis. Since SARS-CoV-2 viruses spread rapidly all over the world at that time, an additional requirement for food services. Although the restaurants were at least partially closed, extra care had to be taken in the preparation of meals both at work and at home. There is a need for rapid and effective training of professionals to cope with pandemics, as well as greater cooperation with authorities and health professionals. In addition, hygiene maintenance operations during food chains need to be constantly re-evaluated in detail according to the pandemic (Sauramäki et al., 2021).

Pakistan's second largest industry is restaurants. The total employment rate of this sector is 16% and it serves about 180 million people. Due to differences in the demographics of the population, mostly all family members now work, as in western countries, and they prefer to eat out instead of cooking at home. Especially the younger generation also likes to eat more in restaurants. Zeb et al. (2021) investigated the effect of teCOVID-19 on restaurants and small stalls of street food vendors in Pakistan and to propose an effective way forward. A total of 30 different interviews were conducted in the study through conference calls. The findings have shown that the main problems faced by restaurants are a sharp decline in sales, significant layoffs, insufficient economic activity and lack of necessary assistance from the government. The researchers stated that this study will be useful for restaurants and street food vendors to help them during this difficult stage and offer them a way forward.

The restaurant business is a dynamic and constantly growing sector from year to year. Therefore, food safety has been a top priority for these organizations, especially during the COVID-19 pandemic. The aim of this study was to determine the effect of educational intervention on the health and food safety knowledge, attitude and self-reported practices of

restaurant food handlers during the COVID-19 pandemic. In this research, a semi-experimental study was designed to assess the impact of an educational intervention on the health and food safety knowledge, attitude and self-reported practices of restaurant food handlers during the COVID-19 pandemic. According to the current research results on the impact of implementing an educational intervention on health and food safety during the COVID-19 pandemic, it has been revealed that the average level of knowledge of food handlers before and after training is at an adequate level, their attitude levels have changed to positive, and their practices have changed from acceptable to desirable (Mohammadi-Nasrabadi et al., 2021).

The increase in COVID-19 cases has negatively affected almost every business sector in Jakarta, including the fast-food restaurant industry, which has experienced a major decline in income. Consumers are choosing fast food restaurants to go to more sensitively in order to avoid the risk of COVID-19 transmission, and at the same time they are demanding high-quality food at affordable prices. This study investigated the relationship between crisis management, consumer health and safety protocols and consumer intention to eat again during the COVID-19 pandemic. The test method used was a purposeful sample using PLS-SEM. There were 238 participants who had dinner experience at least twice in fast food restaurants of the international brand franchise category in regional shopping malls in Jakarta during the COVID-19 pandemic. According to the results of this study, it has been determined that crisis management and health protocols have a positive effect on consumer safety, but crisis management causes a negative effect. As a result of the research, it is believed that it can benefit entrepreneurs in the food and beverage sector, especially fast food restaurants, with the right strategies in the implementation of crisis management and health protocols in order to protect consumer safety while eating during a pandemic similar to COVID-19 (Fernandhytia et al., 2022).

The outbreak of the new coronavirus (COVID-19) in the world has led to sequential fluctuations in public health concern. Restaurant owners and employees have caused significant changes from safety regulations to protect the health of both employees and consumers. In this study, it was investigated to investigate the knowledge, attitudes and practices of restaurant owners and employees in the context of COVID-19 and the impact of

COVID-19 measures on the implementation of food safety measures in food service organizations in Jordan. A cross-sectional survey was applied to 605 participants from 91 restaurants and catering establishments in Jordan in the study. The questionnaire used in the study was taken during a face-to-face interview or via online platforms. A significant part of the participants (77%) were men and under the age of 35 (79%), 42% had a high level of education (undergraduate or postgraduate education) and 46% had 1-5 years of work experience. As a result of the study, it was reported that more training should be provided for both employees and employers to ensure the effective implementation of the necessary regulations to prevent the spread of COVID-19 and foodborne pathogens, good hygienic practices that improve food safety and reduce diseases (Olaimat et al., 2022).

In this research, the food industry discusses the importance of analyzing disruptions in supply chains and a model has been proposed to develop optimal resource allocations to reduce the effects of such disruptions. In the study, a simulation model was made that replicates the operations of a small restaurant's supply chain to explore alternatives that would improve service and delivery times. The most important performance metrics have been researched to determine the best practices that will strengthen the restaurant's service and ensure that they have a flexible supply chain that can handle any situation, such as the COVID-19 pandemic. The most appropriate resource allocation has been proposed depending on the minimum service time and the use of each server. In addition, the study analyzed the time loss for stock loss, stock replenishment, and finally, regardless of the scenarios when one or more potential suppliers are out. The resulting model can be used as a Decision-Making System that allows the customer to generate new ideas and make innovative decisions by comparing scenarios (Saha, 2022).

Tosun et al. (2022) investigated the fish restaurants located in Sarıyer-Istanbul, which were reopened with normalization after the first wave, in terms of food safety and compliance with the Covid-19 directive. As a result of the study, it was determined that 83.3% of the participants had very good knowledge scores on "Occupational Hygiene", 69.84% on "Product Hygiene" and 91.67% on "Personnel Hygiene" in the assessment measuring the participants' food safety and hygiene knowledge levels. It has been observed that fish restaurants have been very careful during the Covid-19 pandemic, especially in customer

reception, cleaning the tables by arranging them according to social distance rules. It has been determined that both the customer and the staff take hand care by being sensitive about the necessary cleaning, the supply of antiseptic materials and the use of protective equipment by the staff in order to ensure hand hygiene. As a result, it is thought that this study will guide future studies on food safety and hygiene in food enterprises in cases that may be of concern to human health within the scope of Covid-19 measures.

Due to the unprecedented pandemic in recent history, it has caused significant changes and disruptions in accommodation operations and customer experiences. This has contributed to customer rudeness and lack of courtesy towards restaurant employees, which is a critical issue for the well-being of the hospitality workforce and the community. This study aims to address this neglected but mandatory issue and empirically examine the impact of uncivilized behavior of customers on employees. The study findings provide evidence of the negative impact of customer disharmony on employee stress and negative emotions, which in turn affects interpersonal conflicts between coworkers and turnover intention. As a result of the study, it has been shown that social motivation of employees and supervisor support both function as critical boundary conditions. Specifically, when employees are socially motivated enough and provided with adequate supervision support, it leads to a decrease in the negative impact of customer Decencies on employees' emotional reactions (i.e. stress and negative emotions) and negative behavioral (i.e. stress spread among employees and conflicts and turnover intention) consequences (Kim et al., 2023).

In order to prevent the spread of COVID-19 disease, it is necessary to prevent contact between a sick individual and a healthy individual. For this reason, social distance rules should be followed in enterprises, and informative posters should be hung about social distance for personnel. The World Health Organization Decrees that the distance between employees should be at least 1 meter. In order to maintain social distance in enterprises: Enterprises should work with as few personnel as possible, avoid close contact, and prevent personnel from being in crowded groups. Only the driver should open the door of vehicles bringing products to the enterprise, and drivers should not leave the vehicle. Transport vehicles should be disinfected periodically, and vehicle drivers should also pay attention to personal hygiene, the use of disinfectants and protective equipment (Varol, 2023).

The COVID-19 pandemic has negatively affected people's daily routines, including travel behaviors, social interactions, and work-related activities.. However, the potential effects of COVID-19 on the use of campus places in higher education, such as libraries, dining areas, sports facilities and other destinations, are still unknown. This study, conducted at the three well known universities in Texas (Texas A & M University, University of Texas at Austin, and Texas Tech University), compares changes in campus destination visits before and after the COVID-19 pandemic. The results of the study showed that COVID-19 had a significant impact on the reduction of visits to various campus locations. Visits to places for eating, eating, drinking, sports, recreation and sightseeing with people living within 1 km of the campus have also decreased significantly. This finding has reduced the dependence of those who live near the campus, i.e. mostly university students, on campus destinations, especially for eating and drinking purposes. In particular, the 'Food, food and drink' and 'Sports, recreation and sightseeing' categories have decreased significantly in use for users who live within a walkable distance of the campus, the majority of whom are students (Song et al., 2023).

In a study conducted in Jordan based on literature and interviews (Zan, 2023), it was determined that the fast food industry has shown remarkable flexibility and adaptability in the face of the COVID-19 pandemic. In the face of the difficulties created by disruptions in supply chains, changes in consumers, behavioral and operational constraints have been emphasized to mobilize enterprises. Some businesses have not only survived this period and have also grown their business. Moreover, the COVID-19 pandemic has clearly accelerated the adoption of digital technologies in the fast food industry. While the world is slowly recovering from the COVID-19 pandemic, the fast food industry in Jordan has been reported to be recovering. As a result, it has been reported that food enterprises that have successfully adapted to the challenges of the pandemic are likely to emerge much stronger and more resilient.

Chen et al. (2024) investigated to the relationship between foodborne illnesses and food safety practices followed by food handlers of various food service facilities. December March 1, 2022, to December 30, 2022, a cross-sectional survey was conducted in Wuhu City of Anhui Province of China in the study. The data were collected through face-to-face interviews and

the selected food handlers answered a questionnaire they compiled themselves. Out of a total of 1072 food handlers in the study, 88 (8.2%) reported experiencing foodborne illness symptoms within the last 4 weeks. The following food safety practices have been found to be associated with self-reported foodborne illnesses: (1) rarely using 3-compartment sinks to clean different types of raw food items separately ($p < 0.05$ or = 2.312); (2) rarely removing uneaten portions of seafood outside a specific food room is processed ($p < 0.001$ or = 3.916); (3) rarely quickly cooling pre-prepared cold dishes for later consumption ($p < 0.001$ or = 4.048); (4) store perishable food usually at 8-60 ° C indoors after cooking and before eating ($p < 0.05$ or = 2.068); (5) rarely reheat cooked perishable food stored at 8-60 ° C for more than 2 hours before eating ($p < 0.05$ or = 1.934); and (6) store raw and cooked food usually in the same container ($p < 0.001$ or = 3.818). At the end of the study, it was emphasized that improper food use in food service facilities can unfortunately cause foodborne illnesses.

The fact that a large number of people are involved in large-scale cooking increases the danger of food contamination due to intentional or unintentional misuse. Unwanted food contamination during large-scale production poses a significant danger to the consumer and this has significant financial implications for the nation. This study was intended to investigate the food safety information and practices of a corporate food manufacturer in Bangladesh, taking into account the growing concern surrounding this issue and the current lack of knowledge about foodborne illnesses related to institutions. In the study, multiple linear regression analysis was performed to determine the factors related to food safety information and applications. The majority of the participants in the study were women (71.3%) and their ages ranged from 26 to 35 (average age 34.53 ± 9.06). According to the results of this study, it has strengthened the idea that corporate food processors will benefit from increased exposure to food safety interventions, active participation in training sessions, and strict adherence to food hygiene regulations in food processing knowledge and practices (Siddiky et al., 2024).

Food safety is an important issue that includes all possible measures, strategies and resources to ensure that food remains safe in the production, processing and distribution processes before reaching consumers. It has always been a main concern for consumers, and frequent food safety incidents pose a important threat to people's health and the risks show an

increasing trend year by year, with the years 2006, 2012-2015 and 2019 having higher risk rankings in the world. A lack of food security creates a large amount of economic and health problems all over the world. First of all, the hygiene of the kitchen and the food processor is one of the most important factors to ensure food safety. In recent years, although globalization has many benefits, it has emerged as a new challenge for food security. Climate change has also become a modern challenge for food security, as rising temperatures and changing ecosystems have created a favorable environment for new types of microorganisms. In addition, decontamination of additives and lack of awareness about expiration dates and labels are among some other factors that affect food safety. In order to cope with all these problems and difficulties, it is the most basic factor to ensure that food safety measures are taken at every stage from production to consumption. It is impossible to ensure food safety and hygiene without sanitation. Sanitation is a definition that refers to health efforts aimed at improving and providing better health to people by maintaining public health conditions and cleanliness, including personal hygiene. According to the World Health Organization, 785 million people do not have access to clean water for drinking, and 2 billion people use it as drinking water from sources contaminated with feces (Sharif et al., 2024; Yu et al., 2024).

3. MATERIALS AND METHODS

3.1. Research Design

In this proposal, we outline a quasi-experimental study aimed at evaluating the repercussions of the Covid-19 pandemic on food safety procedures in Adana's catering and fast-food chains using quantitative methodologies. A survey instrument was devised to investigate the potential impact of the Covid-19 pandemic on food safety practices within these establishments. The collected responses facilitated an in-depth analysis of companies' safety protocols during the pandemic, the identification of specific attributes linked to Covid-19 and their impact on food safety, an assessment of companies' emergency preparedness, and the identification of vulnerabilities in the food supply chain. The study encompasses three key sections:

1. ****Company Information:**** This section gathers data related to companies, including their country of origin, size, type of activity, and the status of their food management system.
2. ****Food Safety Statements:**** The second section focuses on seven food safety statements, with three pertaining to general safety preparedness plans and six specifically addressing Covid-19. Respondents rate their level of agreement using a five-point Likert scale ranging from 1 ('strongly disagree') to 5 ('strongly agree').
3. ****Pandemic Attribute Prioritization:**** The third section concentrates on assessing priorities for mitigating pandemic effects in food companies. It explores nine attributes associated with Covid-19, utilizing Best-Worst scaling to rank them based on their perceived influence. The attributes align with recommendations from the World Health Organization (WHO, 2020) and prerequisite programs outlined in good hygiene practices (CAC, 2003). In this study, a semi-structured questionnaire was used as a data collection.

3.2. Participants

Surveys were disseminated among operational catering and fast-food chains in Adana. To ensure a representative sample, a minimum of one hundred respondents was targeted ($n \geq$

100). The initial questions were strategically crafted to establish a comfortable and relaxed atmosphere, fostering an environment where respondents feel at ease to openly express their thoughts and feelings. This approach, supported by Alvehus (2013), aims to enhance the validity and responsiveness of the respondents, contributing to a more robust and insightful data collection process.

3.3. Variables

The objective of the study is to contrast assessments of alterations in the food safety processes within the catering and fast-food sector following the widespread impact of the global COVID-19 pandemic. Independent variables encompass the country type, company size, food sector, and FSMS status, while the survey responses serve as dependent variables influenced by the pandemic.

3.4. Instrumentation and Materials

A survey has been devised to gather data on alterations in the food safety processes post the impacts of COVID-19. Deliberately crafted to be completed in less than five minutes, the survey aims to facilitate participation, employing simple and unambiguous language in its questions. The initial section of the survey encompasses five questions related to characteristic information for catering and fast-food chains.

3.5. Procedures

The survey was individually distributed to food companies in Adana, ensuring that each sample subject provided responses only once. To ensure a representative sample, the goal was to gather a minimum of 100 respondents ($n \geq 100$). After completing the final data collection, both quantitative and qualitative analyses were conducted on the compiled data from the sample.

3.6. Data Evaluation

The ordinal data obtained from the Likert scale was treated as non-parametric, and appropriate statistical tests were applied. For categorizing the observed statements, a two-step cluster analysis was utilized, considering country type, company size, food sector, and FSMS

status as categorical variables. The one-way ANOVA test was employed to identify any statistically significant differences among the clusters.

4. RESULTS AND DISCUSSIONS

The global COVID-19 pandemic has significantly impacted various sectors, including the foodservice industry, with unprecedented challenges and disruptions. In response to this crisis, it has become imperative to examine how food establishments, particularly restaurants and fast-food chains, have adapted their food safety practices to ensure public health and safety while maintaining operational continuity. Despite the critical importance of food safety, especially during a public health crisis, limited research has been conducted in this area, particularly in Adana, Turkey.

This study aims to fill this gap by investigating the post-effects of the COVID-19 pandemic on food safety practices in restaurants and fast-food chains in Adana, Turkey. Specifically, the study seeks to gain insights into the challenges faced by these establishments during the pandemic and the changes implemented in their food safety management systems. By examining the experiences and responses of a diverse range of food establishments, this research aims to provide valuable knowledge and understanding of the implications of the pandemic on food safety in the catering industry.

To achieve these objectives, a comprehensive survey was conducted among 103 food establishments, including restaurants, fast-food chains, and food service companies, operating in Adana, Turkey. The survey collected data on various aspects, including the size and type of businesses, employee count, and the status of food safety management systems. Additionally, participants were asked about their experiences and challenges related to food safety practices during the pandemic.

Through the analysis of survey responses, this study aims to shed light on the resilience of the catering industry in Adana, Turkey, amidst the COVID-19 pandemic and identify opportunities for enhancing food safety standards in the post-pandemic era. By understanding the factors influencing food safety practices and the effectiveness of existing management systems, this research seeks to contribute to the development of strategies and interventions aimed at ensuring public health and safety in the foodservice sector.

4.1. Company characteristics

In this study, we delve into the diverse landscape of the foodservice industry in Adana, Turkey, aiming to elucidate key company characteristics that influence food safety management practices. The success and resilience of food businesses amidst the challenges posed by the global COVID-19 pandemic hinge not only on their operational adaptability but also on their adherence to robust food safety protocols. To comprehensively assess the industry's dynamics, we scrutinize various dimensions of participating companies, including their size, primary focus within the food sector, workforce composition, and the adoption of food safety management systems. Through this exploration, we seek to uncover nuanced insights into how companies of different scales and specialties navigate food safety challenges and contribute to the broader goal of ensuring public health and consumer confidence in food products.

4.1.1. Name of the company

The names of the companies surveyed were diverse and represented a wide range of food-related businesses, including restaurants, fast-food chains, catering services, and food manufacturing companies. While specific names are not mentioned here, the variety of participants reflects the broad scope of the study and the inclusion of various sectors within the foodservice industry. The surveyed companies encompassed a diverse array of establishments within the foodservice industry, ranging from renowned restaurant chains to local catering services and food manufacturing enterprises. This diversity underscores the multifaceted nature of the Adana food sector and highlights the broad scope of our study. While specific company names are not disclosed, the extensive representation of various sectors within the foodservice industry aligns with findings from prior research on regional food business landscapes (Kurtsal et al., 2020). Literature suggests that such diversity within the industry is indicative of a robust and dynamic marketplace, characterized by a multitude

of players contributing to culinary innovation and economic growth (Ghosh et al., 2017). By incorporating 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.

4.1.2. Distribution of Companies by Size and Employee Count:

The classification of companies into small, medium, and big categories offers valuable insights into the diversity and distribution of businesses within the food industry landscape. Small companies, often characterized by limited resources and a localized presence, play a significant role in catering to niche markets and fulfilling unique consumer demands. These establishments may prioritize agility and flexibility in their operations to adapt to changing market conditions and consumer preferences.

On the other hand, medium-sized companies occupy a middle ground, typically possessing moderate resources and a more established market presence compared to their smaller counterparts. They may benefit from economies of scale to some extent, allowing them to optimize production processes and enhance efficiency while still maintaining a level of adaptability to market dynamics.

In contrast, big companies represent the apex of the food industry hierarchy, boasting extensive resources, infrastructure, and market reach. Their operations are often characterized by large-scale production facilities, sophisticated supply chain networks, and significant brand recognition. While big companies may enjoy advantages in terms of economies of scale and market dominance, they also face challenges related to maintaining quality control and ensuring compliance with food safety regulations across their vast operations.

In Figure 4.1., the distribution of company sizes is illustrated, showing the percentage breakdown of small, medium, and big-sized companies among the surveyed establishments. The majority of the companies surveyed fall under the "Medium" category, comprising 45.63% of the total (Figure 4.1.). This suggests that larger establishments dominate the sample, which may have implications for their food safety practices due to their scale of

operations. Small sized companies (39,81%) followed the medium-size ones and big sized companies had the smaller contribution (14,56%).

The distribution of companies across these size categories in the surveyed sample provides valuable insights into the overall composition of the food industry in the Adana region. By examining the prevalence of small, medium, and big companies, researchers can better understand the dynamics shaping the competitive landscape and identify opportunities for targeted interventions to enhance food safety practices and regulatory compliance across the sector.

Additionally, the predominance of medium-sized companies in the surveyed sample, comprising nearly half of the total, suggests a significant presence of establishments with moderate resources and operational capabilities. These companies may serve as crucial players in the local food economy, bridging the gap between smaller, specialized businesses and larger, more established enterprises. Their relatively balanced size allows them to leverage economies of scale while maintaining a degree of agility and responsiveness to market trends.

Conversely, the smaller contribution of big-sized companies, comprising only a minority of the sample, indicates a less pronounced presence of major industry players with extensive resources and market influence. While these companies may exert significant sway over certain segments of the food market, their lower representation in the surveyed sample may reflect a more decentralized industry landscape characterized by a diverse array of competitors.

Overall, the distribution of companies across size categories underscores the multifaceted nature of the food industry in the Adana region, encompassing a spectrum of businesses ranging from small-scale enterprises to large-scale conglomerates. Understanding the composition and dynamics of these companies is essential for formulating targeted strategies to enhance food safety practices, promote regulatory compliance, and foster sustainable growth across the sector.

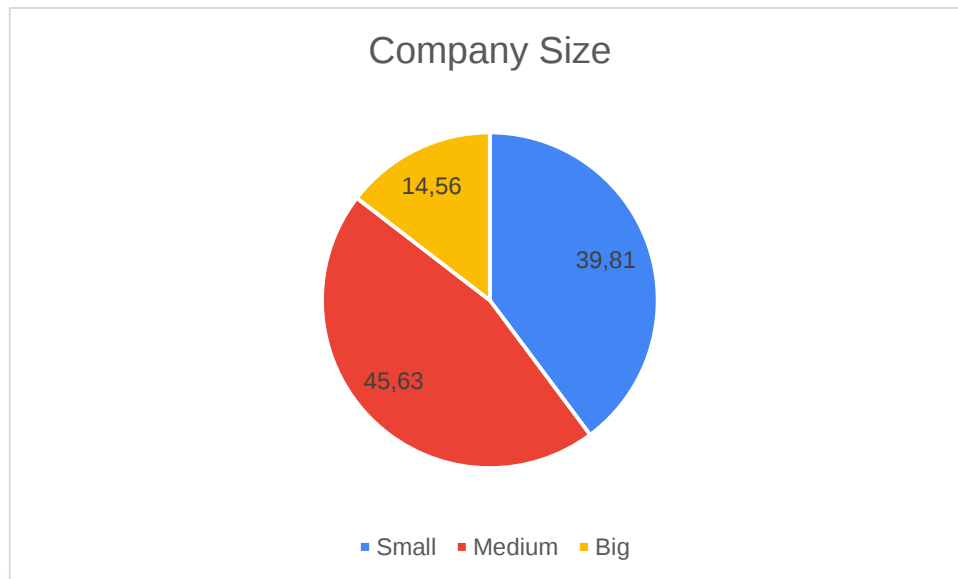


Figure 4.1 Company size distribution of the sample

The employee count serves as a crucial metric for understanding the workforce size and human resource capacity of the companies surveyed, offering valuable insights into their operational dynamics. By categorizing companies based on the number of employees, ranging from less than 10 to over 1000, we gain a nuanced understanding of the scale of employment and the labor intensity within the foodservice industry.

The data on employee count reveals a varied distribution, indicative of the diverse staffing levels across the surveyed establishments. Notably, a substantial proportion of companies fall within the range of 10 to 500 employees, with 24.27% classified under the '10-50' category and 27.18% falling within the '100-500' category (Figure 4.2.). This distribution underscores the presence of both smaller-scale enterprises and mid-sized establishments within the sample, each contributing to the overall landscape of the foodservice sector.

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

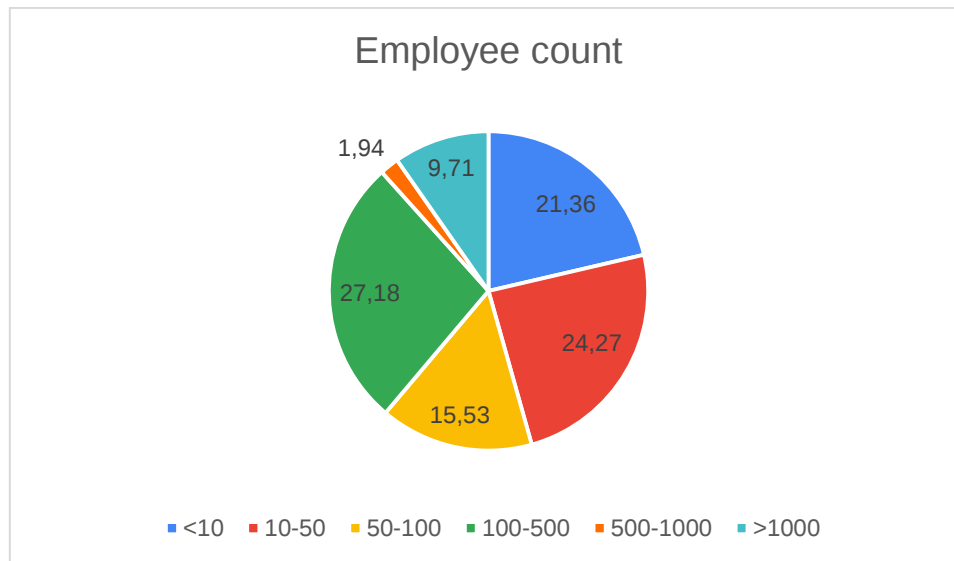


Figure 4.2 Employee count distribution of the sample

4.1.3. Types of food businesses

The food business category serves as a crucial determinant of the primary focus and operational specialization of the surveyed companies, offering valuable insights into their core activities within the foodservice industry. This classification encompasses a spectrum of enterprises, including animal-based businesses involved in meat processing or dairy products, plant-based businesses engaged in agricultural farming or food processing, and service-oriented establishments encompassing restaurants, catering services, and food retail.

The distribution of companies across different food business categories reflects the diverse landscape of the foodservice sector and the varied roles played by participants within the industry. Notably, a significant majority of the surveyed companies fall under the 'Service' category, comprising 61.17% of the total (Figure 4.3.). This classification encompasses a wide array of foodservice establishments, including restaurants, catering services, and other service-oriented businesses primarily focused on food preparation and service.

Additionally, the presence of companies categorized as 'Animal' or 'Plant' further underscores the diversity of operational specializations within the sample. These enterprises, involved in activities such as meat processing, dairy production, agricultural farming, or food processing,

contribute to the multifaceted nature of the foodservice industry, each playing a distinct role in the overall food supply chain.

Overall, the distribution of companies across different food business categories highlights the varied operational focuses and activities observed within the surveyed establishments, reflecting the dynamic nature of the foodservice sector and the diverse roles played by participants in meeting the culinary needs and preferences of consumers.

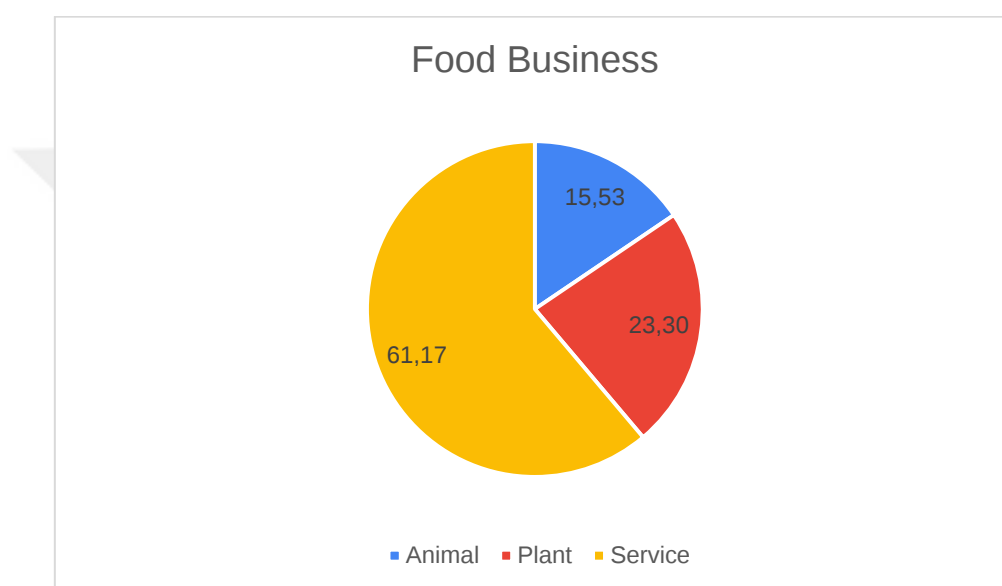


Figure 4.3 Type of food businesses

4.1.4. Food safety management system (FSMS) status

The FSMS status serves as a critical indicator of the food safety practices and management systems adopted by the surveyed companies, offering valuable insights into their commitment to ensuring food safety and regulatory compliance. This classification encompasses the presence or absence of formal food safety management systems, including the implementation of Hazard Analysis and Critical Control Points (HACCP), other recognized standards such as ISO 22000 and ISO 9001, British Retail Consortium (BRC) standards, or the absence of a structured system altogether. Understanding the FSMS status provides essential information about the level of diligence and adherence to food safety protocols among the surveyed companies.

The majority of companies (65.05%) reported the implementation of Hazard Analysis and Critical Control Points (HACCP) systems for food safety management (Figure 4.4.). 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 compliance with regulatory standards, underscoring a commitment to delivering safe and high-quality food products to consumers.

The Hazard Analysis and Critical Control Point (HACCP) system, developed by the Codex Alimentarius Commission, serves as a fundamental framework for managing food safety within enterprises. This system operates proactively by identifying critical control points (CCPs) along the food production chain and establishing central business policies to ensure food safety monitoring and maintenance (Codex Alimentarius Commission, 1996). Ensuring the production of safe and healthy food stands as a paramount objective for companies involved in the food production chain, both directly and indirectly. Recognizing the imperative nature of food safety protection, international trade and the global food industry have spearheaded the development of scientifically grounded risk analysis and interventions aimed at mitigating public health risks (HACCP). The European Union (EU) has mandated the adoption of the HACCP system through guidelines to uphold food hygiene standards, thus ensuring the production, distribution, and export of safe food and safeguarding public health (EU, 2004). Article 5 of the European Commission (EC) Regulation No. 853/2004, effective from January 1, 2006, mandates all companies engaged in food processing, production, and distribution to implement the seven essential principles of the food safety management system (Alford and Page, 2015; FAO/WHO, 1997; Ropkins and Beck, 2000).

The literature review underscores the positive outcomes resulting from the implementation of food safety management systems while shedding light on the challenges encountered during their adoption. These difficulties are often attributed to various factors, including resource constraints, diminished 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). Notably, studies conducted in Italy and Spain revealed that small and medium-sized enterprises (SMEs) encounter hurdles related to

financing, both from banking institutions and the EU, as well as internal efforts to fund growth through retained profits (Donati, 2017; Romero-Martinez et al., 2010). Furthermore, the barriers and limitations faced by SMEs in implementing systems like HACCP, including implementation costs and enterprise size, have been extensively explored in the literature (Holt and Henson, 2000; Taylor and Kane, 2005; Yapp and Fairman, 2006).

Thus, a notable proportion of companies (11.65%) reported having no formal food safety management system in place in this study. This signifies a potential gap in food safety practices and regulatory compliance within these establishments, highlighting the need for enhanced measures to ensure the safety and integrity of food products. Establishments without formal FSMS may benefit from implementing internationally recognized standards such as ISO 22000, ISO 9001, or BRC, which provide comprehensive frameworks for food safety management and quality assurance.

ISO 22000 is an international standard that specifies requirements for a food safety management system, incorporating principles of hazard analysis, risk assessment, and control measures to ensure the safety of food products throughout the supply chain. ISO 9001, on the other hand, focuses on quality management systems, emphasizing customer satisfaction and continual improvement in product and service delivery. BRC standards are widely recognized in the food industry, providing guidelines for food safety, quality, and operational criteria, particularly for retailers and manufacturers.

Overall, the distribution of FSMS status among the surveyed companies reflects varying levels of commitment to food safety and regulatory compliance, highlighting opportunities for improvement and the adoption of best practices to enhance consumer confidence and trust in the safety of food products.

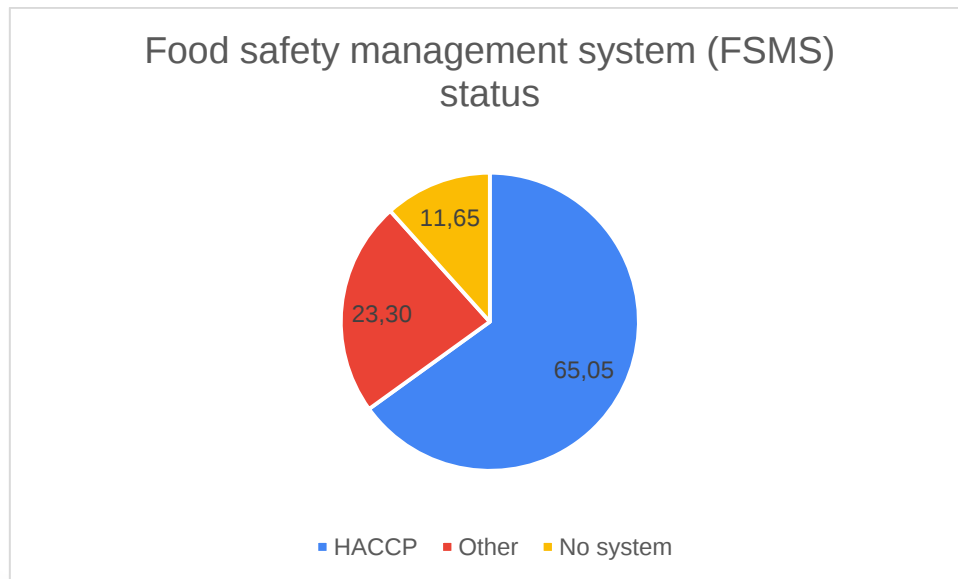


Figure 4.4 Food safety management system (FSMS) status of the sample

4.2. Age and professional background of the sample

Based on the responses provided, the sample that took the survey comprises individuals primarily from the food engineering field, with a significant number of respondents identifying themselves as food engineers (66.99%). This indicates that the survey participants possess specialized knowledge and expertise in the food industry, particularly in areas related to food production, quality assurance, and research and development. Additionally, there is diversity within the sample, with respondents holding various positions within the food sector, including roles such as R&D manager, production specialist, quality unit manager, laboratory specialist, and wine production engineer/winemaker, among others. This diversity reflects the multidisciplinary nature of the food sector, which encompasses not only food production and engineering but also management, quality control, research, and customer service. For instance, respondents holding positions such as managers, administrators, and IT professionals play crucial roles in overseeing operations, implementing food safety protocols, managing resources, and ensuring compliance with regulations.

Moreover, the inclusion of professionals from non-food-related fields, such as veterinarians, IT specialists, and administrators, adds richness to the sample by providing perspectives from adjacent industries that may have indirect but significant impacts on food safety and management practices. For example, veterinarians may contribute insights into animal health

and welfare aspects, while IT specialists may offer expertise in data management systems and technology integration for food safety monitoring.

Additionally, the age distribution within the sample provides valuable insights into the generational perspectives on food safety and management. In terms of age distribution, the majority of respondents fall within the 25-35 age range (61.17%), followed by those in the 36-50 age group (25.24%) (Figure 4.5.). This indicates that the sample predominantly consists of individuals in the early to mid-career stages, with a smaller proportion of respondents aged below 24 (5.83%) and over 50 (7.77%). The majority of respondents falling within the 25-35 age range suggest a significant representation of individuals in the early stages of their careers, likely with fresh perspectives and innovative approaches to addressing challenges in the food industry. Conversely, the presence of respondents aged 36 and above brings in seasoned professionals with years of experience and expertise, potentially offering insights into historical trends, industry evolution, and best practices.

Overall, the diversity of professional backgrounds and age demographics in the sample enriches the breadth and depth of insights gathered from the survey. By capturing perspectives from individuals across different sectors and career stages, the study gains a comprehensive understanding of the complexities and nuances of food safety management practices in the context of the foodservice industry.

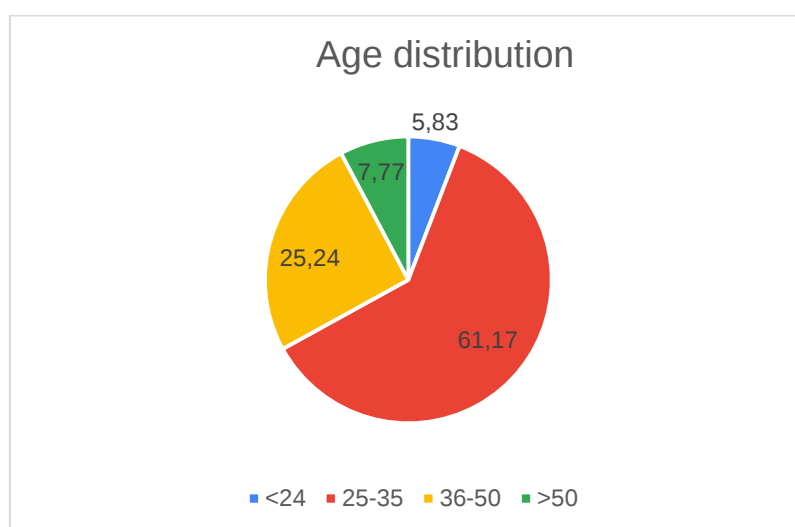


Figure 4.5 Age distribution of the respondents

4.3. The evaluation of FSMS of the companies

Companies with a valid and certified food safety management system demonstrate a commitment to ensuring the safety and quality of their products. Certification provides assurance to stakeholders, including consumers and regulatory authorities, that the company complies with established food safety standards and protocols.

The presence of documented procedures for emergency preparedness and response indicates proactive measures taken by companies to mitigate risks and ensure swift and effective responses to incidents affecting food safety. These documents outline protocols for addressing various emergencies, including pandemics like COVID-19.

Identifying pandemics as potential emergency situations within the food safety management system reflects forward-thinking and risk-awareness on the part of companies. This recognition enables companies to develop tailored response strategies and allocate resources effectively during pandemics.

Training food safety teams on pandemic response ensures that personnel are equipped with the knowledge and skills to address food safety concerns amidst a pandemic. Proper training enhances preparedness and enables timely and appropriate actions to safeguard public health. The need for additional staff training on food safety during the COVID-19 pandemic underscores the dynamic nature of food safety challenges presented by emerging infectious diseases. Companies must adapt and update their training protocols to address evolving risks and best practices.

Implementing more restrictive personal hygiene procedures, such as handwashing and physical distancing, during and after the COVID-19 pandemic is crucial for preventing the spread of pathogens, including SARS-CoV-2. These measures contribute to maintaining a hygienic environment and protecting both employees and consumers.

Acquiring additional personal protective equipment (PPE), such as masks, gloves, and protective clothing, demonstrates a commitment to employee safety and infection control.

Adequate PPE supplies are essential for mitigating transmission risks and ensuring the well-being of frontline workers in food-related establishments.

With all these information in mind, we have asked the sample who took the survey about their company's FSMS status. All of the questions and given answers are discussed in detail as below. Overall, the responses to these questions provide insights into the proactive measures taken by companies to enhance food safety practices and mitigate risks during the COVID-19 pandemic. By addressing key aspects of emergency preparedness, staff training, and hygiene protocols, companies can adapt to evolving challenges and uphold their commitment to food safety and public health.

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

The robust foundation of a valid and certified FSMS is fundamental to ensuring the overall integrity of food safety in the surveyed establishments. The responses provided insight into the participants' perceptions of their company's FSMS. While the majority expressed confidence in the validity and certification of their FSMS, a notable proportion indicated varying degrees of skepticism or uncertainty (Figure 4.6.). The overwhelming consensus (78.1%) among respondents who strongly agree or agree with the presence of such a system is an encouraging sign for the food industry in Turkey. This indicates a proactive commitment to adhering to established standards and practices, emphasizing the significance that businesses place on maintaining high levels of food safety. An effective FSMS not only meets regulatory requirements but also acts as a structured framework for continuous improvement, risk mitigation, and emergency response, especially crucial in unpredictable scenarios like the global COVID-19 pandemic.

This indicates a proactive commitment to adhering to established standards and practices, emphasizing the significance that businesses place on maintaining high levels of food safety. Such responses may be influenced by factors such as past incidents, clarity of communication regarding food safety protocols, and the effectiveness of training programs.

Certification of the FSMS is essential for ensuring compliance with food safety standards and regulations. It signifies that the company has implemented robust procedures to identify, prevent, and mitigate food safety hazards. Certified FSMS instills confidence in stakeholders,

enhances brand reputation, and mitigates risks associated with foodborne illnesses and regulatory non-compliance.

Regardless of respondents' perceptions, continuous improvement in food safety management is imperative. Companies should regularly review and update their procedures to address emerging risks, incorporate lessons learned from incidents or audits, and stay updated on evolving regulatory requirements. Open dialogue, employee engagement, and ongoing training are essential for fostering a culture of food safety and continuous improvement.

Transparent communication about the FSMS certification status, audit results, and corrective actions taken is crucial for building trust among stakeholders. Companies should proactively communicate their commitment to food safety, address concerns or misconceptions, and solicit feedback to identify areas for improvement.

In conclusion, while the majority of respondents expressed confidence in their company's FSMS, there is a need for ongoing evaluation, transparency, and continuous improvement. By fostering a culture of accountability, transparency, and continuous improvement, companies can enhance their ability to mitigate food safety risks, comply with regulations, and maintain consumer trust in their products.

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

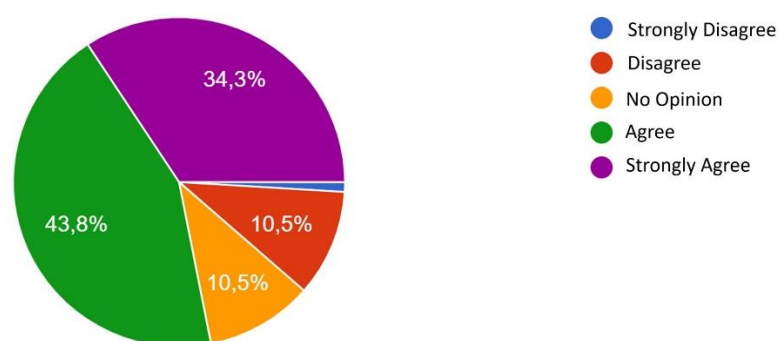


Figure 4.6 The existence of FSMS

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

The responses to this question reveal the participants' perceptions regarding the presence of documents associated with emergency preparedness and response within their company's food safety management system (FSMS).

A majority of respondents (78.1%) either agreed or strongly agreed that their FSMS includes documents related to emergency preparedness and response. This suggests that many companies have incorporated protocols and procedures to address incidents affecting food safety, including emergencies such as contamination events, natural disasters, or public health crises. The acknowledgment by a significant majority of respondents that their FSMS incorporates documents related to emergency preparedness and response signifies a comprehensive approach to risk management (Figure 4.7.). In the complex landscape of the food industry, where unforeseen incidents can have far-reaching consequences, having structured documentation becomes paramount. These documents are not merely a formality but serve as a roadmap for businesses to navigate crises, ensuring that responses are swift, well-coordinated, and aligned with best practices in food safety.

However, it is noteworthy that a small percentage of respondents (8.74%) disagreed or strongly disagreed with this statement, indicating a potential gap in the implementation or documentation of emergency preparedness measures within their FSMS. This highlights the importance of regular evaluation and enhancement of FSMS to ensure comprehensive coverage of all aspects of food safety management, including emergency preparedness and response.

Having emergency response documentation within the FSMS underscores a commitment to adaptability and resilience in the face of unpredictable events. This is particularly relevant in the context of the global pandemic, where the ability to respond effectively to unforeseen challenges has been crucial. It showcases a forward-thinking approach to risk management, positioning these establishments to safeguard not only their operational continuity but, more importantly, the health and safety of their consumers.

Overall, the majority agreement among respondents suggests a proactive approach to addressing emergency situations and underscores the significance of having robust protocols in place to safeguard food safety during unforeseen events. Continuous review, updating, and testing of emergency response procedures are essential to enhance preparedness and minimize the impact of emergencies on food safety and public health.

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

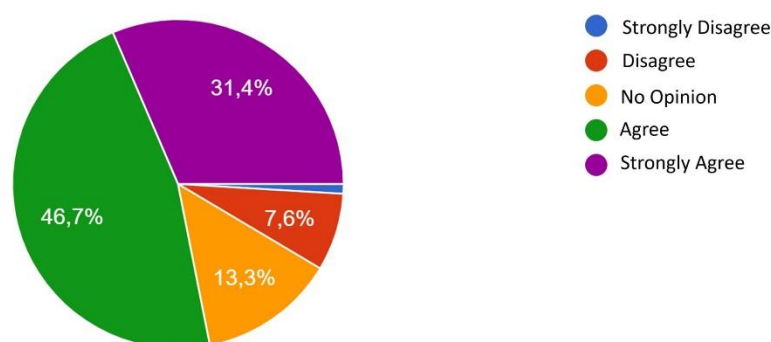


Figure 4.7 The distribution of results given to the related question

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

The acknowledgment of pandemics as a significant aspect of food safety management reflects a critical shift in the industry's approach to risk assessment and mitigation. The COVID-19 pandemic has served as a wake-up call, highlighting the interconnectedness of global food systems and public health. As a result, there has been a growing emphasis on building resilience and adaptability into food safety management practices to effectively navigate unforeseen crises.

The responses to this question provide valuable insights into the level of preparedness within food establishments regarding pandemics as a potential threat to food safety. The majority of participants (77.1%) agreed or strongly agreed that their food safety management systems (FSMS) recognized pandemics as one of the potential emergency situations (Figure 4.8.). This

finding aligns with the growing recognition in the literature of the need to integrate pandemic preparedness into food safety management practices (Shahidi, 2020). Research suggests that pandemics, such as the COVID-19 crisis, can significantly impact the food industry by disrupting supply chains, affecting workforce availability, and introducing new hygiene and safety challenges (Zhang et al., 2021). As a result, proactive measures, including the inclusion of pandemics in FSMS, are essential for enhancing resilience and response capabilities in the face of such crises.

However, it is notable that a small percentage of respondents (7.77%) disagreed or strongly disagreed with the inclusion of pandemics in their FSMS. This finding underscores potential gaps in awareness or preparedness among some food establishments, which may leave them vulnerable to the challenges posed by pandemics. It is essential for organizations to recognize the evolving nature of risks and to continuously update their FSMS to address emerging threats adequately. Literature emphasizes the importance of flexibility and adaptability in FSMS to respond effectively to dynamic and unpredictable challenges, such as pandemics (Settembre-Blundo et al., 2021).

Moving forward, ongoing research and collaboration between industry stakeholders, regulatory agencies, and academic institutions are crucial for advancing our understanding of pandemic preparedness within the context of food safety management. By leveraging insights from interdisciplinary studies and adopting best practices from diverse sectors, the food industry can strengthen its capacity to anticipate, mitigate, and adapt to the challenges posed by pandemics and other public health emergencies.

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

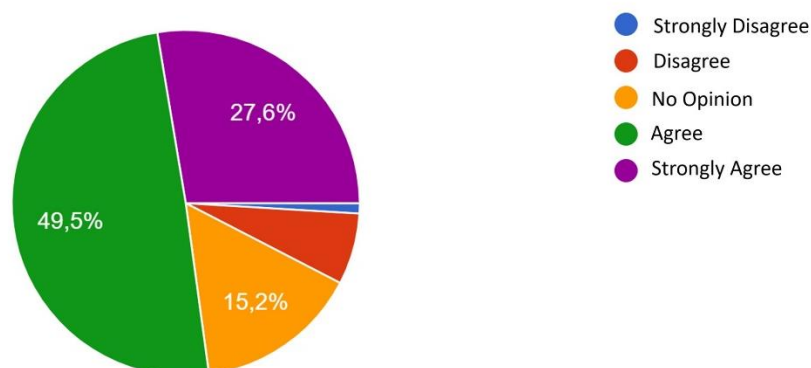


Figure 4.8 The distribution of results given to the related question

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

The responses to this question reflect the level of preparedness and training provided to food safety teams within the surveyed companies regarding pandemic response. A majority of participants (86.7%) either agreed or strongly agreed that their food safety teams had received training on how to react in case of a pandemic (Figure 4.9.). This aligns with findings from previous studies highlighting the importance of training and education in enhancing food safety preparedness during public health crises (Harrison et al., 2013; Charalambous et al., 2015).

The positive response to training initiatives among the majority of participants underscores the value of proactive preparedness efforts in ensuring the resilience and effectiveness of food safety teams. Research suggests that adequate training can improve risk assessment, hazard management, and crisis response capabilities within food establishments, thereby reducing the likelihood of foodborne illness outbreaks during emergencies (FAO, 2020; DeWaal, 2007).

However, it is noteworthy that a small percentage of respondents (13.59%) expressed no opinion on whether their food safety teams had received pandemic-specific training. This underscores the importance of clear communication and transparency regarding training initiatives within organizations to ensure that all employees are adequately prepared to respond to emergencies.

Overall, the findings from this survey highlight the importance of ongoing training and capacity-building initiatives in enhancing the resilience of food safety systems in the face of public health crises. Continued investment in training and education is essential for strengthening the food industry's ability to adapt and respond to evolving threats to public health and safety.

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

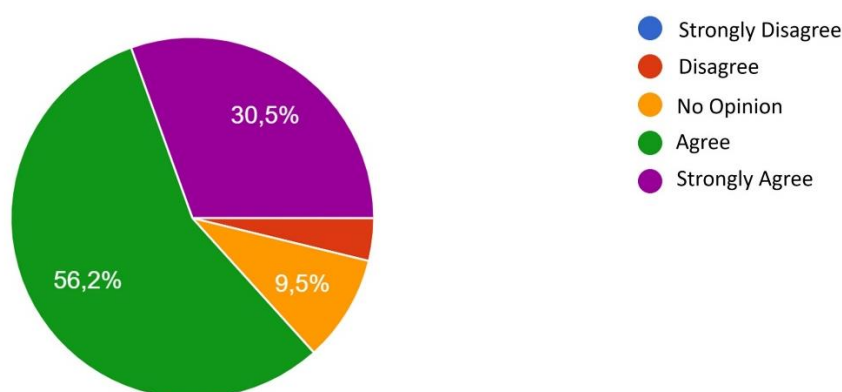


Figure 4.9 The distribution of results given to the related question

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

The responses to this question provide insights into the proactive measures taken by companies to enhance staff training on food safety in response to the COVID-19 pandemic. A majority of participants (85.44%) either agreed or strongly agreed that their companies conducted additional training for staff about food safety when the COVID-19 pandemic was announced (Figure 4.10). This proactive approach aligns with recommendations from public health authorities and industry experts, emphasizing the importance of reinforcing food safety protocols during public health emergencies (WHO, 2020).

The positive response to additional training initiatives underscores the commitment of companies to prioritize food safety amid the challenges posed by the pandemic. Research suggests that targeted training programs can help mitigate the risk of foodborne illness outbreaks by promoting awareness of proper hygiene practices and infection control measures among food handlers (FAO, 2020; FDA, 2020).

However, it is worth noting that a small percentage of respondents (14.56%) either disagreed or expressed no opinion on whether their companies provided additional food safety training in response to the pandemic. This highlights potential gaps in awareness or implementation of training initiatives within some establishments, which may necessitate further attention and intervention.

Overall, the findings suggest a proactive response from the majority of companies in addressing the food safety implications of the COVID-19 pandemic through staff training initiatives. Continued investment in training and education is crucial for ensuring the resilience and effectiveness of food safety measures in the face of evolving public health challenges.

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

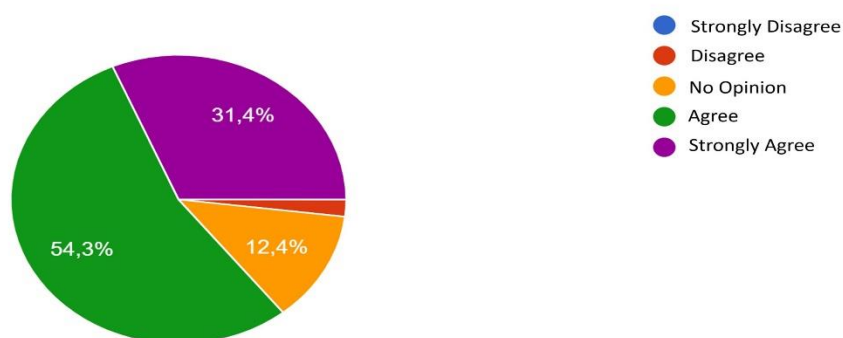


Figure 4.10 The distribution of results given to the related question

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

The responses to this question indicate the extent to which food establishments implemented enhanced personal hygiene protocols during and following the COVID-19 pandemic. A majority of respondents (94.17%) agreed or strongly agreed that their companies enforced stricter personal hygiene measures, such as frequent hand washing and maintaining physical distance, amid the pandemic (Figure 4.11.). This finding aligns with global efforts to mitigate the spread of the virus by implementing stringent hygiene practices in various settings, including foodservice establishments (Ma et al., 2021). The proactive adoption of such measures reflects a commitment to safeguarding both employee and customer health and

reducing the risk of virus transmission within food facilities. Moreover, it underscores the adaptability of food businesses in response to public health crises and their willingness to prioritize safety measures to ensure consumer confidence.

The implementation of enhanced personal hygiene procedures is crucial not only for preventing the spread of COVID-19 but also for mitigating the risk of other foodborne illnesses. Studies have shown that proper hand hygiene and sanitation practices can significantly reduce the transmission of pathogens in foodservice settings (Green et al., 2007). By integrating these measures into routine operations, food establishments can uphold high standards of cleanliness and ensure the safety of the products they serve. However, it is essential for companies to maintain vigilance and adherence to these protocols even after the immediate threat of the pandemic subsides, as sustained hygiene practices are integral to long-term food safety management.

Overall, the high level of agreement among respondents regarding the implementation of stricter personal hygiene procedures underscores the proactive measures taken by food establishments to address emerging public health challenges. By prioritizing hygiene and sanitation, these companies demonstrate their commitment to ensuring the safety and well-being of both employees and customers in the face of evolving health threats. Continued vigilance and adherence to best practices in hygiene and sanitation will be essential for maintaining consumer trust and confidence in the post-pandemic era.

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

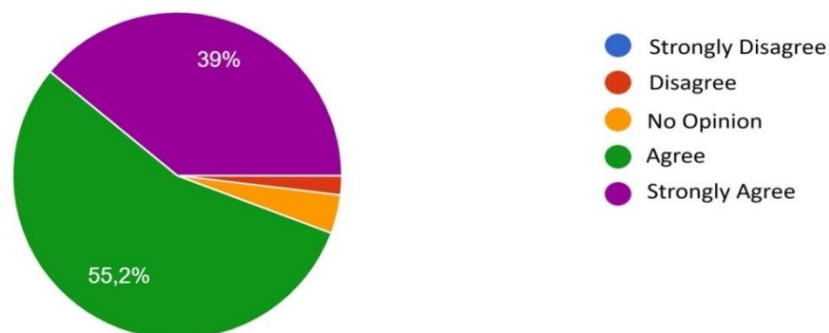


Figure 4.11 The distribution of results given to the related question

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

The proactive procurement of additional personal protective equipment (PPE) during the COVID-19 pandemic reflects a comprehensive approach to risk management and employee safety within food establishments. A significant majority of respondents (90.29%) agreed or strongly agreed that their companies acquired extra PPE, such as masks, gloves, and protective clothing, in response to the pandemic (Figure 4.12.). Studies have underscored the importance of PPE in mitigating the transmission of respiratory viruses, including SARS-CoV-2, in various settings, including healthcare facilities, workplaces, and public spaces (Howard et al., 2021; MacIntyre et al., 2020). By prioritizing the acquisition of masks, gloves, and protective clothing, food establishments demonstrate their commitment to upholding stringent hygiene standards and minimizing the risk of virus transmission among employees and customers.

Moreover, the implementation of enhanced PPE protocols aligns with recommendations from public health authorities and regulatory agencies worldwide. Organizations such as the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) have issued guidelines emphasizing the importance of PPE in preventing the spread of COVID-19 in occupational settings (CDC, 2020; WHO, 2020). These guidelines highlight the role of face masks, in particular, as a key measure for reducing respiratory droplet transmission and protecting individuals in close-contact settings.

Furthermore, the provision of adequate PPE reflects a proactive approach to compliance with occupational health and safety regulations. Employers have a legal responsibility to provide a safe working environment for their employees, including appropriate PPE where necessary (Occupational Safety and Health Administration, 2021). By investing in PPE and ensuring its availability to all staff members, food establishments demonstrate their commitment to fulfilling regulatory requirements and prioritizing employee well-being.

The acquisition of additional PPE also serves as a strategic investment in business continuity and resilience. By minimizing the risk of COVID-19 outbreaks among employees, food establishments can avoid disruptions to operations, such as temporary closures or staffing

shortages due to illness or quarantine measures. This proactive approach not only protects the health and safety of employees but also safeguards the reputation and viability of the business in the long term.

In summary, the proactive procurement of additional PPE by food establishments during the COVID-19 pandemic reflects a multifaceted strategy encompassing public health compliance, risk management, and business continuity. By aligning with established guidelines, regulations, and best practices, these companies demonstrate their commitment to protecting employees, customers, and the broader community from the risks associated with infectious diseases.

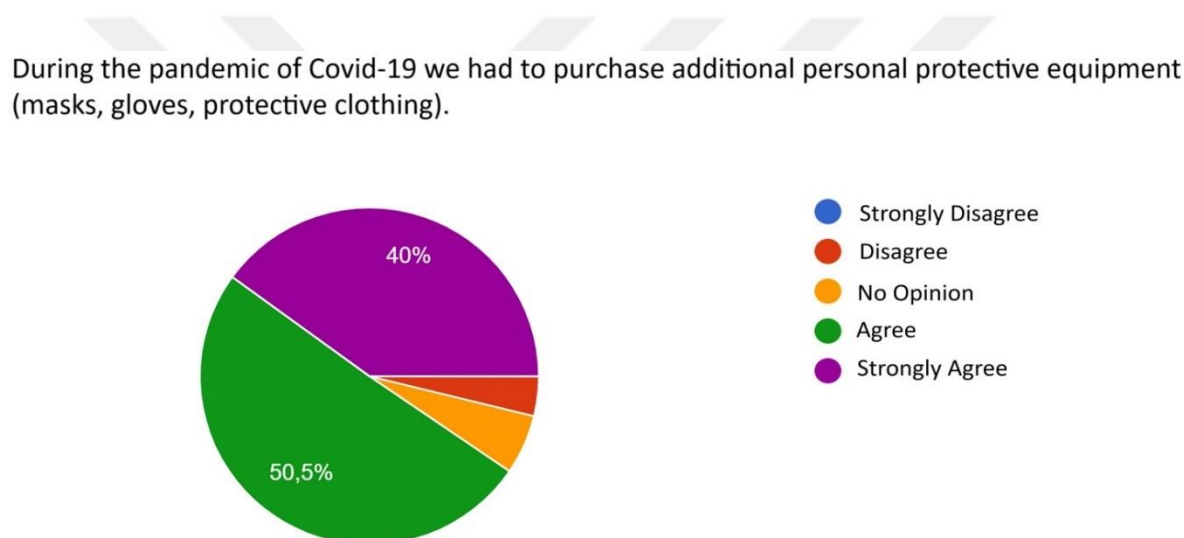


Figure 4.12 The distribution of results given to the related question

4.4. Evaluating the Covid-19 attributed associated to food safety

In the wake of the COVID-19 pandemic, ensuring food safety has become an increasingly pressing concern for food establishments worldwide (Rizou et al., 2020). The adoption of stringent measures to mitigate the risk of virus transmission has been paramount in safeguarding the health and well-being of both employees and consumers (Olaimat et al., 2022). To better understand the perceived effectiveness of various COVID-19 mitigation strategies within food establishments, this discussion explores the ranking of key attributes related to food safety practices.

Amidst evolving public health guidelines and recommendations, food establishments have been tasked with implementing measures to reduce the risk of virus transmission while maintaining operational continuity (WHO, 2020). From stringent hygiene protocols to staff training initiatives, a multitude of strategies have been deployed to mitigate the spread of COVID-19 within foodservice settings (CDC, 2020). Understanding the relative effectiveness of these measures can inform decision-making and policy development aimed at enhancing food safety standards (Sobolik et al., 2022).

Through a survey-based approach, participants were asked to rank nine COVID-19 attributes associated with food safety on a scale of 1 to 9, with 1 indicating the most effective and 9 indicating the least effective measure. The attributes encompassed a range of practices, including hygiene protocols, staff training, PPE usage, and physical distancing measures. By soliciting insights from a diverse pool of respondents representing various sectors within the food industry, this study seeks to elucidate key priorities and perceptions regarding COVID-19 mitigation strategies.

The ranking of COVID-19 attributes associated with food safety provides valuable insights into the perceived effectiveness of various measures in mitigating the risk of virus transmission within food establishments. The ranking of the attributes was given in Figure 4.13 and discussed as below.

Hygiene of the utensils/raw materials:

Hygiene of utensils and raw materials, identified by 37 participants as the paramount measure, underscores the foundational role of sanitation in ensuring food safety. The emphasis on maintaining cleanliness at every stage of food handling, from sourcing raw materials to preparing and serving meals, reflects a commitment to upholding stringent hygiene standards. Effective sanitation practices not only mitigate the risk of contamination but also safeguard public health by reducing the transmission of foodborne pathogens. By prioritizing the cleanliness of utensils and raw materials, food establishments can instill confidence in consumers and demonstrate their unwavering dedication to delivering safe and wholesome products. Moreover, investing in robust sanitation protocols and regular monitoring procedures reinforces the organization's commitment to quality and fosters a

culture of accountability among staff members. As such, meticulous attention to hygiene practices serves as a cornerstone of food safety management, ensuring compliance with regulatory requirements and promoting the well-being of both customers and employees.

Staff awareness:

Staff awareness, ranking second with 28 participants, underscores the pivotal role of well-informed employees in upholding stringent hygiene standards and infection control measures. A knowledgeable workforce is crucial for the successful implementation of food safety protocols, especially amidst a global health crisis like the COVID-19 pandemic. By fostering a culture of awareness and responsibility, organizations can ensure that staff members are equipped with the necessary knowledge and skills to mitigate risks and maintain a safe working environment. Investing in training and education initiatives not only enhances employee competence but also cultivates a sense of ownership and commitment to upholding food safety standards across all levels of the organization. Additionally, proactive communication and continuous reinforcement of hygiene practices can further strengthen staff awareness and compliance, thereby safeguarding both employee well-being and public health.

Frequent hand washing:

Frequent hand washing, highlighted by 22 participants as a critical measure, underscores the enduring importance of basic hygiene practices in combating infectious diseases. With its proven effectiveness in reducing the transmission of viruses and pathogens, regular hand washing stands as a fundamental pillar of infection prevention in all settings, including food establishments. By promoting a culture of frequent hand hygiene among employees, organizations can significantly mitigate the risk of contamination and ensure the safety of both staff and customers. The simple yet powerful act of washing hands with soap and water serves as a frontline defense against the spread of infectious agents, making it imperative for individuals to adhere to this practice diligently (Ijaz et al., 2021). Moreover, incorporating hand hygiene protocols into standard operating procedures and providing adequate facilities and resources for hand washing can further reinforce its importance and encourage consistent compliance among staff members.

Health protocols from WHO/government:

Participants underscore the significance of adhering to health protocols outlined by reputable entities such as the World Health Organization (WHO) and governmental agencies. The ranking of this attribute highlights the widespread recognition of evidence-based guidelines as crucial resources for informing decision-making and policy implementation in the context of the COVID-19 pandemic (WHO, 2020). By relying on recommendations from authoritative sources, such as the WHO and national health authorities, food establishments can align their practices with globally recognized standards for infection prevention and control. This strategic approach not only enhances public health outcomes but also fosters public trust and confidence in the organization's commitment to prioritizing safety (CDC, 2020). Furthermore, by integrating health protocols into their operational frameworks, businesses can effectively mitigate risks associated with the transmission of infectious diseases, thereby safeguarding the well-being of both employees and consumers (FDA, 2020). Thus, the acknowledgment of health protocols from reputable sources underscores the importance of evidence-based strategies in navigating the challenges posed by public health emergencies.

Temperature checking of workers:

Temperature screening of workers emerges as a significant measure, ranking fifth in participants' assessments. With 31 respondents recognizing its importance, temperature checks serve as a frontline defense mechanism in identifying individuals who may exhibit symptoms of COVID-19, such as fever (CDC, 2020). By monitoring employees' temperatures regularly, organizations can swiftly identify and isolate individuals who may pose a risk of spreading the virus within the workplace environment (CDC, 2021). However, while temperature checks play a valuable role in identifying febrile individuals, it's essential to acknowledge their limitations in detecting asymptomatic cases, which constitute a significant proportion of COVID-19 infections (CDC, 2020). Therefore, while temperature screening is a valuable tool in the arsenal of infection prevention measures, it should be complemented by other strategies, such as symptom monitoring and adherence to hygiene protocols, to comprehensively mitigate the risk of COVID-19 transmission in the workplace.

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

Ensuring an adequate supply of personal protective equipment (PPE) and cleaning materials is crucial for maintaining hygiene standards and protecting staff and customers in the context of the COVID-19 pandemic. With 29 participants ranking it sixth in priority, the availability of sufficient stock of gloves, masks, sanitizers, and cleaning chemicals is recognized as a critical measure for mitigating transmission risks (CDC, 2020). Adequate PPE enables frontline workers to adhere to recommended infection prevention and control practices, such as wearing face masks and gloves, thereby reducing the risk of exposure to infectious agents (CDC, 2020). Similarly, access to sanitizers and cleaning chemicals facilitates regular disinfection of surfaces and equipment, contributing to a safer environment for both employees and patrons (CDC, 2020).

Physical distance between workers:

Maintaining physical distance between workers emerges as a critical measure for minimizing the spread of respiratory droplets and reducing the risk of COVID-19 transmission in the workplace. With 25 participants ranking it seventh in priority, the emphasis on physical distancing underscores its importance in mitigating close-contact interactions among employees (CDC, 2020). By adhering to recommended distancing guidelines, such as maintaining a minimum of six feet of separation between individuals, workplaces can help prevent the transmission of respiratory droplets, particularly in settings where it is challenging to wear masks continuously (CDC, 2020). This measure aligns with broader social distancing recommendations aimed at curbing the spread of infectious diseases within community and workplace settings (CDC, 2020).

Use of masks and gloves:

Acknowledging the importance of personal protective equipment (PPE) in reducing the risk of contamination during food handling, 29 participants ranked the use of masks and gloves eighth in priority. Masks and gloves act as essential barriers against respiratory droplets and direct contact with potentially contaminated surfaces, helping to mitigate the spread of COVID-19 in foodservice settings (CDC, 2021). Proper usage of masks, including covering both the nose and mouth securely, is crucial for effective protection against respiratory droplets expelled during speaking, coughing, or sneezing (CDC, 2021). Similarly, gloves

should be worn when handling ready-to-eat foods and changed regularly to prevent cross-contamination between different food items and surfaces (FDA, 2020). By adhering to recommended PPE protocols, food establishments can enhance food safety practices and minimize the risk of viral transmission among employees and customers.

Prevent/limit visits to the food:

Recognizing the potential impact on business operations and customer satisfaction, 38 participants ranked the prevention or limitation of visits to food establishments as the least effective measure. Although restricting access can reduce potential exposure to the virus, it may also pose challenges in terms of maintaining customer engagement and revenue generation for food establishments (Ahmed et al., 2020). Striking a balance between public health considerations and economic viability is essential for ensuring the sustainability of foodservice businesses during the COVID-19 pandemic (Brouwer et al., 2020). Implementing alternative strategies such as online ordering, delivery services, and outdoor dining options can help mitigate risks while providing customers with safe and convenient dining experiences (Brouwer et al., 2020; Reimann et al., 2020).

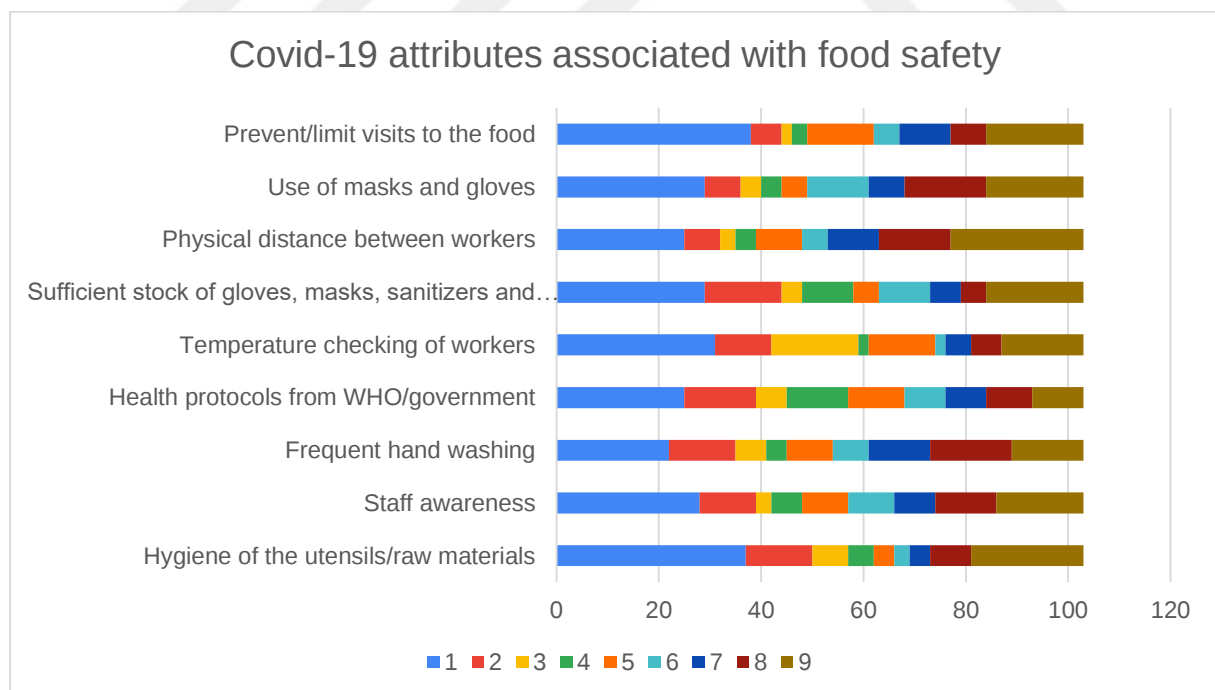


Figure 4.13 Ranking of the attributes

Overall, the rankings reflect a multifaceted approach to COVID-19 mitigation, encompassing hygiene practices, staff training, adherence to health protocols, and the availability of PPE. By prioritizing these measures, food establishments can enhance safety standards and contribute to the containment of viral spread within their premises.

4.5. Final remarks

The participants of the survey was asked that if there is anything they wanted to add and their results were collected and evaluated. The responses provided by the participants offer valuable insights into various aspects of how their companies impact the food safety process, particularly in the context of the COVID-19 pandemic. Several key themes emerge from these responses, highlighting both proactive measures taken and areas for potential improvement.

Firstly, some participants emphasized the intrinsic safety measures embedded within their production processes. For instance, one participant mentioned that their company produces and sells food supplements, and as the food is packaged by them, they ensure safety in their contact with food and interpersonal distance. This highlights the importance of internal quality control measures and the role of packaging in maintaining food safety standards.

Another notable aspect is the acquisition of certifications, such as the Turkish Standards Institute COVID-19 certificate. This demonstrates a commitment to implementing and adhering to recognized standards and protocols for mitigating the risk of COVID-19 transmission within the workplace.

Additionally, some participants mentioned that their operations were minimally affected by the pandemic due to the nature of their business. For example, an alcohol factory noted that they did not experience significant food safety issues, indicating that certain industries may be less susceptible to disruptions in food safety processes during a pandemic.

However, challenges and areas for improvement were also highlighted in the responses. Concerns were raised about maintaining adequate hygiene practices, particularly in high-contact items such as utensils. Some participants expressed the need for increased inspections and emphasized the importance of adhering to government guidance for implementing COVID-19 precautions.

Furthermore, issues related to workforce management and anxiety among employees were mentioned. For example, one participant noted that the intensity of personnel services during the transfer of workers to the workplace remained unchanged, leading to anxiety among employees due to close proximity. This underscores the importance of implementing measures to ensure both physical and psychological safety in the workplace.

Overall, these responses shed light on the multifaceted nature of managing food safety processes during a pandemic, highlighting the importance of proactive measures, certifications, adherence to guidelines, and ongoing efforts to address challenges and improve practices in the food industry.



5. CONCLUSION

The aim of this study was to gain insights into how the catering industry and fast food chains in Adana, Turkey, navigated the challenges posed by the COVID-19 pandemic and adapted their food safety practices in response. Through surveys conducted with 103 participants representing a diverse range of food-related businesses, including restaurants, food manufacturing companies, and catering services, several key findings emerged.

Firstly, the majority of participants reported having a valid and certified food safety management system (FSMS) in place, with a significant portion implementing Hazard Analysis and Critical Control Points (HACCP) systems. This indicates a proactive approach to ensuring food safety and regulatory compliance among the surveyed companies.

Furthermore, the survey revealed that a considerable number of participants recognized pandemics, such as COVID-19, as potential emergency situations within their FSMS. This underscores the importance of integrating pandemic preparedness into food safety management practices, aligning with recommendations from authoritative sources such as the World Health Organization (WHO).

In response to the pandemic, many companies implemented additional hygiene protocols, including frequent hand washing, use of personal protective equipment (PPE), and physical distancing measures. These measures reflect a concerted effort to mitigate the transmission of COVID-19 within food establishments and prioritize the health and safety of both employees and customers.

However, challenges and areas for improvement were also identified. Some participants expressed concerns about maintaining adequate hygiene practices and workforce management, highlighting the need for increased inspections and adherence to government guidance. Additionally, issues such as anxiety among employees due to close proximity in the workplace underscored the importance of addressing both physical and psychological safety concerns.

Overall, the findings of this study provide valuable insights into the adaptation of food safety practices in the face of the COVID-19 pandemic within the catering industry and fast food chains in Adana, Turkey. By understanding the experiences and perspectives of industry stakeholders, policymakers and businesses can better inform strategies for enhancing resilience and response capabilities in future public health emergencies.



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