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The Influence of Elements on Food Safety Culture in Food Services

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Abstract Food Safety Culture consists of the 'aggregation of prevailing attitudes, values, and relatively constant, learned, and shared beliefs that contribute to hygiene behaviors in handling food within an environment.' This concept has increasingly piqued interest in the food production sector. Among its essential elements are management systems, leadership, communication, commitment, environment, and risk perception. This study aimed to conduct a non-systematic literature review on the concept of Food Safety Culture and how its elements contribute to maintaining the quality of food services, given that consumers rely on the food services they frequent for their meals. Food safety culture focuses on the human element, acknowledging the diversity of cultures and individual perspectives. Understanding how these elements impact the reduction of foodborne illnesses guides food service professionals in promoting good hygiene practices and strengthening Food Safety Culture. Considering the perceptions of the target audience is crucial to make information more understandable and relevant, thereby increasing adherence to food safety recommendations and consequently reducing the risks of foodborne illnesses. In summary, strengthening food safety culture requires the integration of all elements affecting food safety, encouraging food service companies to constantly seek improvement in these processes.

Keywords: *Food service, food safety, work environment, prevention and control*

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1. Introduction

A lack of effective measures in food safety (FS) has been recognized as a growing risk element associated with outbreaks of foodborne illnesses [1]. FS is a paramount concern worldwide, considering its impacts on public health and the economy. Food service establishments play a crucial role in ensuring FS, as they are responsible for preparing and serving food to consumers. However, for a comprehensive understanding of the challenges and opportunities related to FS in these contexts, it becomes essential to analyze the impact of elements such as leadership, risk perception, management practices, communication, knowledge, and the work environment, aiming to develop educational actions intended to instigate a change in culture [2].

With the advancement of globalization, the food sector has been characterized by a more agile supply and broad international distribution of food products. This has led to a challenge concerning foodborne illnesses in both developed and developing countries, where they have become a considerable factor in public health morbidity [3].

Issues related to FS persist in the 21st century, despite the advancement and application of various scientific approaches. This includes risk analysis, microbiological predictive models, and public and private regulations aimed at designing and enhancing FS management systems [1] [4-14] [15-33].

Food plays a fundamental role as a vehicle for the transmission of various diseases, serving as a conductive substrate for pathogenic microbial agents. However, this susceptibility is intricately linked to the chemical composition of foods, storage conditions, exposure to air, oxygen levels, and handling processes [34].

Globally, foodborne illnesses not only pose a significant threat to public health but also serve as a substantial obstacle to socioeconomic development. It is estimated that approximately 33 million healthy lives are lost worldwide due to this issue, suggesting that this figure may underestimate the true magnitude of the problem [35].

Foodborne diseases are infectious conditions caused by the presence of microorganisms or their toxins in contaminated food. These illnesses can trigger gastrointestinal disorders and, in some situations, lead to hospitalization and even result in death [21].

Foodborne illnesses present symptoms such as fever, nausea, vomiting, and diarrhea. However, the similarity of these symptoms to those of other illnesses, like the flu, can make their identification challenging. While anyone can be affected by these diseases, certain groups such as pregnant women, young children, infants, and the elderly face an increased risk of complications due to their higher susceptibility and weakened immune systems, raising the possibility of severe outcomes, including death [36].

Adding to these concerns is the high frequency of meals consumed outside the home, often from unknown origins. We must also consider changes in dietary habits, the globalization of foods from various origins and natures, which are consumed and traded worldwide, often associated with a wide range of causal factors [19].

As a result of foodborne illnesses, more than 600 million people worldwide fall ill each year, nearly 1 in 10 people globally, with approximately 420,000 deaths occurring after ingesting contaminated food, resulting in the loss of 33 million healthy life years. Children under 5 years of age represent 40% of the total cases of foodborne illnesses, leading to 125,000 deaths annually. Each year, low- and middle-income countries suffer a loss of $110 billion in productivity and medical expenses due to food insecurity [3,35] [36,37,38,39,41].

In the European Union, over 350,000 reported cases of foodborne illnesses with approximately 480 confirmed deaths occurred [42]. In the year 2021, in the United States alone, there were 1,963 cases of foodborne illness outbreaks, resulting in 1,568 hospitalizations and 65 deaths [43].

In an effort to prevent foodborne illnesses, Good Hygiene and Food Handling Practices were created. The aim is to produce safe food, free from hazards or contaminants that may endanger consumer health [32].

O conceito de Food Safety Culture (FSC) refers to the common values, beliefs, and patterns that influence the mindset and actions related to FS at all levels and areas of an organization. The importance of FSC has been recognized as a crucial element in promoting FS [44].

In 2020, on an international scale, the Codex Alimentarius suggested the inclusion of FSC in the revision of the General Principles of Food Hygiene (CXC 1-1969), making it clear that FSC should be treated as a fundamental strategic element within organizations. In this regard, leadership holds the responsibility to assess the current level of FSC within the company and work towards developing it to achieve a positive culture (Regulation (EC) No 382/2021), [2,34] [45,46,47,48,49,50,51,52].

Within this context, FSC is the leading trend and innovation, as the technocratic path is generally insufficient to consistently support a food management system. Given that the most common causes of foodborne illnesses are unsafe human behavior, which refers to actions, attitudes, and practices by individuals that can compromise FS [53].

One reason for the importance of analyzing FSC elements within a food production establishment is to contribute to the potential compliance assessment with safety management systems in order to prevent errors/food poisoning costs [6].

Considering this context, the objective of this article is to analyze FSC in food services, identifying its constituent elements and evaluating its impact on the quality and safety of the food offered to consumers.

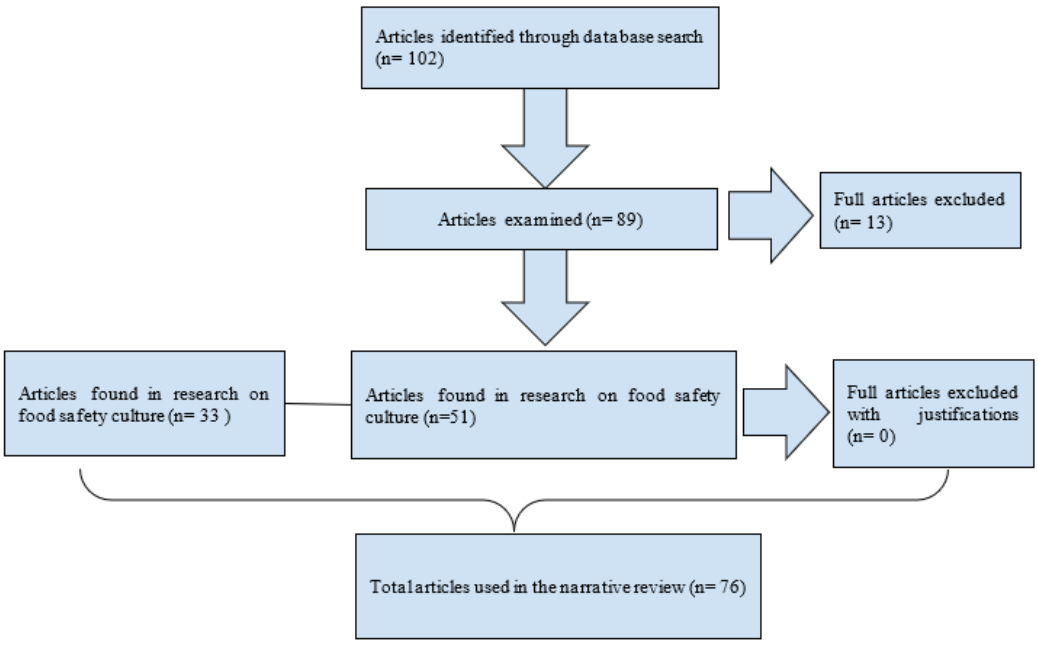

Figure 1. Schematic of the article inclusion and exclusion process for the narrative review

2. Materials and Methodos

To conduct the bibliographic review, descriptors such as Food service, FS, work environment, prevention, and control. were used. Searches were carried out in various national and international scientific databases, including ScienceDirect, Google Scholar, CAPES Periodicals, and PubMed, totaling the analysis of 84 studies. Inclusion criteria consisted of the presence of the CSA concept and its composing factors. The compilation of works extended over two months, covering the period from July to November 2023.The Figure 1 displays the diagram representing the selection process of the articles investigated in this review.

3. Results

3.1. Food Safety Culture

Food Safety Culture (FSC) refers to a set of values, beliefs, attitudes, and behaviors typically embedded within an organization, directly or indirectly impacting the safety of food produced and/or marketed on-site [54].

Another conception of FSC was presented, characterizing it as a long-term framework within the organizational context. This culture is inherently linked to deeply ingrained beliefs, behaviors, and premises shared by all employees, exerting a direct influence on the organization's FS performance. This broader view of FSC highlights its importance as a fundamental element in maintaining and promoting safe practices over time [55].

Food Safety Culture should encompass both processes and the human aspect, drawing upon scientific knowledge of human behavior. This involves considering employees' thoughts, attitudes, beliefs, and behaviors in food production. Well-structured processes and documented safety standards are not sufficient unless effectively implemented by employees. Understanding employees' mindset is crucial because even with stringent regulations, situations of non-compliance that pose risks to consumers may arise. Each employee plays a significant role in FSC, capable of positively or negatively influencing FS [53].

Within the field of FS, the FSC has recently been discussed and recognized as a cause of the increased risk of foodborne diseases. Therefore, diagnosing FSC and its elements can support decision-making and the implementation of appropriate actions to mitigate foodborne illness risk [56].

Organizational culture, defined as the set of values, beliefs, attitudes, and behaviors frequently adopted within an organization, directly or indirectly impacts the FS produced and/or marketed within its scope. Evaluating FSC and its components plays a critical role, as it can directly impact results related to FS. Insights obtained from analyzing FSC necessitate the formulation of new strategies based on these results to effectively manage and exert control over FS [54].

Numerous studies have examined prevalent FSC in various sectors. This includes research conducted in smaller restaurants [57], meat processing establishments [49], the food industry, even encompassing the dairy sector [28]. Additionally, there has been increasing recognition of the importance of FSC in the food service sector [18]. Similarly, studies have explored FSC in food service businesses, such as those involved in catering [58].

The effects of FSC in food services are significant. A strong FSC can lead to a reduction in the incidence of foodborne illnesses [31]. Furthermore, a positive FSC can enhance the reputation of food services and customer satisfaction [39].

3.2. Food Safety

According to ISO 2200:2018, the concept of FS encompasses the assurance that consuming food will not pose harm to the consumer's health, safeguarded through precautions taken during the consumption of the final product. It is important to affirm that food must be free from hazards, risks, and threats that may reach the consumer.

The training of food handlers has always been considered a way to improve FS, offering long-term improvements for the organization. However, increasing knowledge does not always translate into expected and compliant behaviors [59].

A study conducted in Brazil with 183 food handlers from different companies evaluated the role of theoretical training in FS regarding knowledge, attitude, and practice. It was found that those who received training had more knowledge about FS in their attitudes and self-reported practices. However, in observed practices, they were not significantly different from those who did not receive training [46].

The concepts of FS and FSC are intrinsically interconnected as they relate to individuals dedicated to ensuring the safe handling of food daily. Ensuring efficient performance in a food production unit, maintaining organization and strict hygienic and sanitary control, is not enough to effectively implement FSC. This is because FSC focuses on the human element, recognizing that each individual brings different cultures and perspectives. When FSC is incorporated into an organization, it promotes the adoption of unified practices by all employees, resulting in a reduced risk of contamination during food production [60].

Considering the discussed definitions, the knowledge, development, and leadership of FSC have been increasingly recognized as a significant tool with the potential to contribute to reducing the risk of Foodborne Diseases in organizations in the food sector.

3.3. Elements of Food Safety Culture

According to [6,10,44,49], FSC comprises six elements: management systems, leadership, communication, commitment, environment, and risk perception. This definition mainly focused on the organizational elements believed to contribute to FSC.

Understanding the impact of these elements on reducing the risks of foodborne diseases can guide actions for professionals in the food sector responsible for good hygiene practices, aiming to strengthen positive FSC in the area of interest and therefore decrease foodborne disease outbreaks [6].

In this context, reaching a consensus on the concept, elements, indicators, classifications, methodology, and

implications of FSC remains a challenge. However, establishing research determinants of FSC can bring clarity to research and provide a useful starting point for common understanding [29].

Some researchers have proposed additional elements and assessment methods for FSC that were not addressed in this research. Reference [53] shows emphasizes employee trust, management support, and knowledge sharing. According to De Boeck [2], incorporate resources and risk awareness and GFSI [44] stresses vision, mission, people, adaptability, consistency, hazards, and risk awareness. However, some authors consider individual commitment and relationships [61]. In the study, exploring the military environment in food service, introduces factors such as knowledge, work pressure, normative beliefs, management system, style, and process [56]. These adaptations underscore the need for a comprehensive assessment of FSC not explored in this article. Figure 2 highlights the six relevant elements identified as applicable in highly regulated environments.

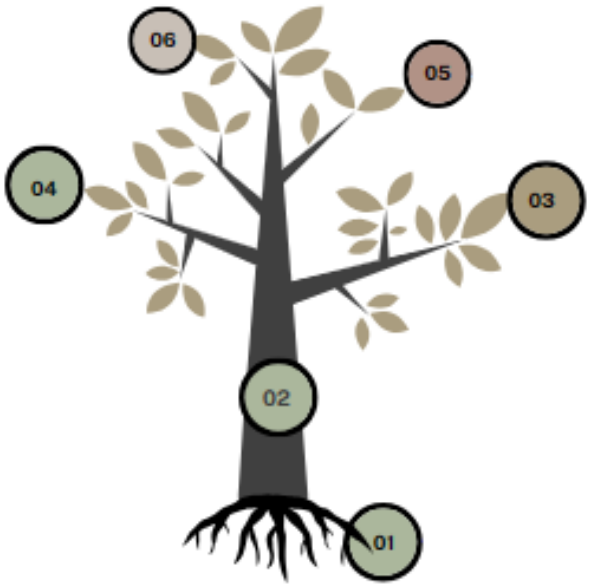

Figure 2. Tree diagram depicting the elements relevant to FSC, 01. Management, 2. Leadership, 3. Communication, 4. Commitment, 5. Environment, 6. Risk perception

3.3.1. Management System

The "system" is a set of dynamically related elements that interact with each other to function as a whole [62]. Starting from the system concept, "management" can be defined based on ISO 9000:2005 as coordinated activities to achieve and control the activities in an organization. Therefore, management systems can be understood as structured and integrated approaches aimed at ensuring the quality, safety, compliance, and efficiency of operations related to the production, processing, and distribution of food [6].

The management system plays a pivotal role in the FSC as it provides an organized framework to ensure the safe production, processing, and distribution of food [25]. This system encompasses procedures, practices, and resources involving all members of the organization, from top management to operational staff [28].

Moreover, this is an element presented by several studies to facilitate the implementation of a FSC within companies and organizations, as it establishes and deploys the company's own policies according to compliance to communicate the importance of a safe and hygienic workplace [24,25,26,27,28,29].

Organizations seek to enhance their management by investing in staff knowledge development and careers, encouraging training and competent supervision. However, it is essential to remember that training alone doesn't guarantee safe food handling practices; other factors such as organizational culture, monitoring, and incentives are also crucial [63].

To further strengthen FS, it is essential to ensure that employees actively support management and leadership, contributing positively to FSC in the organization. This effective collaboration is fundamental to consolidate safe practices and promote a safer work environment [53].

An effective management system in FSC is based on recognized international standards and norms, such as ISO 22000:2018, which sets requirements for a FS management system, covering all aspects of the food chain to ensure FS from raw material harvesting to the table [9]. Additionally, effective systems are required to regularly monitor and assess FS practices in the organization [41].

As a way to assess the effectiveness of the FS management system in an organization, the implementation of continuous monitoring programs is important to ensure that FS standards are met. In case of identified breaches in established safety standards, corrective measures should be taken to prevent future recurrences [13].

On the other hand studies, [1] point out that two essential aspects are directly linked to management: Leadership and Management Commitment. Management commitment includes prioritizing FS. This difference can arise when announced practices (Leadership) are not fully implemented (Management Commitment). This means that restaurants may have solid established good practices, but the practical realities of operating a restaurant can lead to failures in implementing these practices.

3.3.2. Leadership

Food safety culture within an organization is shaped and guided by organizational leadership [44]. Leadership refers to the ability of a potential leader to maximize the effectiveness of a group [27]. The management of leadership in FS highlights the role of leaders in influencing others and leading the way for safe food handling [53].

Promoting a robust FSC is essential, and leadership plays a crucial role in this process. The attitudes and behaviors of organizational members are directly influenced by the actions of leaders. Therefore, the effectiveness of teams in executing and complying with the FS standards of the business is intrinsically linked to the support and guidance provided by their leaders [7].

The role of leadership in FSC within an organization is essential to ensure the quality and integrity of food products until they reach consumers [23]. Leadership is committed to FS throughout the organization, setting goals and targets that must be achieved collectively with all team members [53].

The leader not only guides their followers but also inspires them to adopt work practices that meet the highest standards of hygiene and safety. In a transparent manner,

the leader sets expectations for FS, ensuring that everyone understands and is committed to these crucial requirements. Additionally, they value feedback from their followers, encouraging a collaborative environment where suggestions for improvements in FS are welcomed and considered. This approach fosters a solid and proactive organizational culture regarding FS [2].

There are two very common leadership styles in FS: transactional and transformational. Both have distinct differences, but within an organization, they influence behaviors. The transactional leadership style involves rewards to employees from management, such as bonuses and promotions, to motivate team members to achieve their goals, while the transformational leadership style focuses on inspiring and stimulating the team to achieve higher levels of performance and innovation. FS concerns behaviors and inadequate conditions that may lead to contamination, causing illnesses [30].

A study conducted with school food service employees in northern Taiwan evaluated the influence of leadership styles on FS behavior and organizational climate. In this study, there is a clear positive correlation between leadership styles and employees' adherence to FS and hygiene behaviors, showing that employee motivation reflects the healthy relationship the company has with its employees [14].

In organizations, leadership is responsible for implementing policies and procedures that ensure FS, from production, processing, storage, to distribution [14]. Therefore, it's important for leaders to create an environment where employees feel comfortable reporting problems or concerns related to FS, encouraging open, harmonious, and transparent communication [64].

Although an organization invests in training practices and sector engagement for FS, it's common for the team to feel unmotivated to do the right thing. In this perspective, studies have been conducted to assess the involvement of employees in FS training based on internal values and beliefs about FS and observed that each employee has an internal value scheme related to FS, and even with external rewards for good adherence to safe practices, they are not enough to change behavior [6,8,65,66].

Another important aspect of leadership in FSC is investing in team training. This methodology ensures that all members receive adequate training for good FS practices, in addition to continuous learning [6]. A study to determine the effect of team training on knowledge, self-reported attitude, and practice in food handling in restaurants during the Covid-19 pandemic showed that the level of knowledge of food handlers after the food company's training increased, while their attitude changed from negative to positive, and their practice changed from acceptable to desirable, demonstrating to be a fundamental strategy to increase FS [22].

Employees' perceptions of training and capacity building can vary according to age. According to [67] the study carried out in 2020, it was observed that workers between 21 and 35 years old tend to consider training mainly as opportunities to acquire new knowledge; those between 36 and 50 years old predominantly use them for information sharing, while employees between 51 and 65 years old can associate and take advantage of both mentioned approaches. Leadership can implement approaches that consider behavioral diversity, not only considering age but also various other factors, aiming to achieve the best results in training and compliance with FS.

One of the most impactful factors of leadership in FSC is setting a good example. An adopted model of good leadership within an organization favors strict compliance with FS practices and the commitment of the entire work team. Overall, leadership is not just a specific position; it is a figure that encourages the constant pursuit of safer and more effective practices in the FSC, with a commitment to protect consumers' health and strengthen the company's trust [35].

3.3.3. Communication

In food handling organizations, communication is fundamental in the FSC, being an essential element for the team's understanding and adoption of FS practices [5,6]. It is crucial to clarify to employees what is expected of them to obtain safe food and the consequences of good and poor food handling practices [53].

For effective communication in food handling organizations, it is essential to establish clear and accessible communication channels such as posters, leaflets, and notices that promote the rapid and accurate dissemination of relevant information, along with feedback and ideas related to FS [53]. Technologies like the internet, emails, and messaging groups can also be used to facilitate real-time information exchange, always tailored to the target audience, using clear and straightforward language to enhance comprehension [13,16].

Risk communication in FS is a fundamental process aimed at informing and alerting all involved parties about potential hazards associated with food consumption [12]. Risk communication in FS is also essential for a swift response to food crises. An example was observed during the Covid-19 pandemic, which led to panic worldwide, and the public had to rely on scientific information provided by governments [68].

According to the United Nations (UN), approximately 600 million cases of foodborne illnesses are reported worldwide every year [40]. Among these occurrences are cases of food poisoning, such as the one that occurred in Suan Tang Zi, China, resulting in deaths. This incident highlights the overlooked FS issues, as the risk communication regarding the habit of storing frozen foods for long periods during winter, which may lead to contamination, was issued by the government but ignored [69].

According to the study carried out, it was demonstrated that the use of social media as a communication channel related to food risks plays a significant role in the swift dissemination of accurate food-related information. This, in turn, plays a crucial role in minimizing the likelihood of food poisoning occurrences in consumers' daily lives [69].

An organization committed to FSC seeks to implement clear, consistent, and targeted communication regarding food handling safety measures in its team [70], thus contributing to the confidence of its consumers [6].

3.3.4. Commitment

This is an essential element in FSC, and commitment should be evidenced by everyone who is part of an organization's team within their responsibilities.

Administrative management must execute managerial actions, provide adequate infrastructure, and foster leaders with positive attitudes. In this sense, the dedication and responsibility of the organization in safety at all stages, from production, processing, and distribution of food safely and with quality, is fundamental [6,70].

In FSC, commitment starts in the organization's leadership through their example and commitment to strictly following all standard operational procedures, which consequently extends to all employees. A committed leadership continually invests in training and capacity building for the team, providing employees with the necessary knowledge to ensure FS [26].

In their research, it was observed that employees with a long history in the company demonstrate significant commitment, contributing positively to Customer Satisfaction, suggesting the presence of a notable FSC. This finding highlights the importance of stability within the team, characterized by low turnover rates, playing a crucial role in consolidating FSC. This stability fosters the formation of a cohesive team, strengthens interpersonal relationships, and ensures a solid commitment to excellence in executing responsibilities related to FS [1,20].

3.3.5. Environment

The environment plays a fundamental role in FSC as it creates suitable conditions for food handlers during their work shifts. Good infrastructure with equipment designed for professional handling, well-maintained, appropriate, durable, and easily sanitized materials contribute to FS. Another favorable condition for the environment in fostering a FSC is investing in well-designed spaces, such as suitable layouts to separate areas like production, processing, and storage. These strategies can minimize the risk of cross-contamination and contribute to good FS practices [6,70].

The work environment encompasses facility design, selection of equipment, and work tools that influence an individual's behaviors and actions [53].

Inherent aspects of the work environment conditions, such as infrastructure, exposure to noise, and bodily aches related to the use of inappropriate equipment, can contribute to non-compliance with FS measures and increase the risks of foodborne illnesses [71].

A positive relationship was found between workers' age and the level of environmental support. This phenomenon is closely linked to the quality of workplace infrastructure, including elements such as access to handwashing sinks and the availability of equipment and utensils in good condition. Research results indicated that more experienced employees tend to use the available equipment, materials, and facilities more effectively in the workplace compared to their younger colleagues [20].

3.3.6. Risk Perception

The risk perception involves the judgment and decision-making processes that allow individuals to assess the possibilities of being affected by a particular risk. In this definition, risk perception is not solely based on the objective existence of a danger, but also on the cognitive and emotional mechanisms that people use to evaluate the probability and severity of this risk in relation to themselves or others. This includes considering factors such as past experiences, acquired knowledge, trust in information sources, personal beliefs, and the nature of the risk itself [7].

Risk perception encompasses the subjective assessment of the probability of a specific type of accident occurring and the level of concern people have regarding its consequences. Therefore, understanding the factors that influence risk assessment and gathering information about the perceptions, beliefs, and knowledge of the target audience becomes essential for the professional responsible for FS. This understanding allows for more effective dialogue, addressing important issues related to the prevention of foodborne illnesses and risk reduction [51].

The change in risk perception among managers and food handlers regarding different food handling situations presents a negative trend, indicating that risk perception generally decreases over time. In this context, managers and food handlers are becoming less aware or concerned about the possible risks associated with food handling. This could increase the risk of contamination and foodborne illnesses, jeopardizing consumer health [56].

By understanding the perceptions and beliefs of food handlers, professionals can identify potential gaps in understanding the risks associated with improper food handling. Based on this knowledge, more effective, relevant, and impactful training materials and awareness campaigns can be developed for the target audience [17] [48] [72].

4. Discussion

The concept and elements of FSC are in constant evolution, refined over time and approached in varied ways by various researchers. Understanding FSC and its elements can positively contribute to adopting and promoting good hygiene and food production practices [73]. However, it is unlikely that there exists a standard model suitable for all food industry companies [6].

Nonetheless, improving FS can be achieved by promoting an adequate work environment and developing employees' knowledge, commitment, communication, and risk perception through strong leadership and effective management styles [47]. Thus, an effective strategy to enhance FS should be associated with a FS Management System, which is an ally in transforming FSC [74].

Researchers have adapted the concept and scales to understand the factors affecting FSC. Assessments of FSC help organizations understand why employees do not practice safe food handling at work [6] [53] [70].

Efforts to establish and assess a positive culture concerning FSC, in order to better define its role in improving FS practices, can be facilitated by its measurement. A study involving 19,000 employees from bakeries, food processors, and meat products in Canada developed a tool to assess the degree of maturity of implemented FSC as an important measure in preventing Foodborne Diseases [10].

The organization transitioned from a React' maturity phase to a ´Know´ maturity phase, acknowledging the significance of FS in its operations. Evidence-based decisions are more common, training is more uniform, and there is willingness to invest in infrastructure and tools as needed. However, the market tends not to prioritize

investments in systems (protocols or technology), and the approach to problems is often reactive rather than preventive, leading to responses to problems rather than preventing them [10].

In the element of risk perception, differences can be important in addressing issues of food handling, safety, and public health. There is a need for communication and education efforts to align the general public's perceptions with scientifically grounded information to promote a better understanding and management of the risks associated with food handling [51].

Understanding people's perceptions and beliefs regarding food handling, a company can identify knowledge gaps and potential misconceptions that need addressing. From there, it's possible to develop more appropriate communication strategies and inform the public about best practices in hygiene, storage, and food preparation. Additionally, by considering the public's perceptions, professionals can adapt their approaches to make information more understandable and relevant. This can increase adherence to FS recommendations, thereby reducing the risks of Foodborne Diseases. Furthermore, it's crucial to emphasize the severity of foodborne illnesses, so that handlers understand the potential consequences of their negligent actions [51].

Risk perception can be influenced by cognitive distortions, such as the manifestation of optimistic bias and belief in the illusion of control. It's notable that after many years of service or participation in various ineffective training sessions on hygiene and food production practices, employees can develop excessive confidence in their abilities, which, in turn, can impair their ability to take appropriate measures to minimize the risk of Foodborne Diseases [50].

There's a positive relationship between the level of education and the capacity for risk-based judgment, suggesting that higher education is associated with a higher risk perception. Formal education has the potential to promote the development of essential cognitive skills for social integration, preparation for the job market, and the discovery of individual talents. From this perspective, it can be inferred that there is a trend for a deeper understanding of the concept of risk as cognitive capacity expands [38].

Promoting a greater perception of the risk and severity of foodborne illnesses among food handlers is a crucial step in ensuring FS and protecting consumer health. Educational strategies can help cultivate a culture of responsibility and attentiveness in food handling, reducing the risks of outbreaks and illnesses associated with contaminated food. In summary, by understanding and taking into account the perceptions of the target audience, the professional responsible for FS can play a more effective role in promoting safe food handling practices and protecting public health [17,48,72].

The assessment of FSC plays a crucial role as it has the potential to directly impact outcomes in the realm of FS. The ability to devise innovative action strategies, derived from the results obtained after characterization, becomes fundamental to effectively initiate and manage control over FS standards [54].

Thus, when an FSC is established within a company, employees incorporate FS as a fundamental value in the production process, recognizing the importance and responsibility they hold throughout the process. Consequently, the repetition of correct actions leads to the development of a habit in executing them without depending on supervision and verification [17,48,72].

In research conducted with employees from 23 food companies in Lebanon, a self-assessment of the FSC revealed that a positive perception of this culture was more pronounced among participants who underwent specific FS training. Moreover, the results indicated a greater perception among those holding management positions and working in the quality department [24].

Training programs should focus on safe food handling, empowering employees to identify risks. Recognizing the importance of human behavior and individual performance is vital. Performance-based incentives encourage safe food handling practices and maintain high hygiene levels [20]. However, it is essential for food handlers to fully understand the real meaning and importance of the necessary procedures to ensure FS, rather than executing them solely for financial rewards [73].

In this sense, it is crucial to emphasize that such approaches require a leader with a strong technical command capable of guiding and empowering team members according to their respective roles to ensure food integrity [6].

In a study conducted across 116 small and medium-sized companies globally, encompassing thirty-six (36) companies from developed nations and eighty (80) companies from developing countries, the impact of implementing FS standards in the food industry was analyzed. The results revealed that after adopting the Food Safety Management System, managerial leadership increased by over 80% in both developed and developing countries [15].

A robust FSC necessitates management that promotes open communication, provides adequate training, and assumes its role as a model. Furthermore, the administration must commit to producing safe foods by providing necessary resources, ensuring legal compliance, appropriate documentation, and performance measurement to promote continuous improvement of the food safety management system. Despite the established theoretical basis, practical interpretation is crucial to effectively integrate FSC, demanding informed and context-specific approaches amid the constantly evolving FS landscape [75].

Strengthening FSC requires alignment of all elements influencing FS. It's a process that demands determination, commitment, and dedication, and employees can effectively achieve it by maintaining regular communication with responsible managers in food service companies [73].

In a study conducted on the predominant FSC within the Air Force food service, educational actions were taken to improve the FSC. The results showed proactive and actively committed FSC, with "work pressure and normative beliefs" scoring the highest, while "risk perception" and "management systems, styles, and processes" received lower scores [76].

Thus, FSC involves essential elements that play a fundamental role in safe production, distribution, and consumption of risk-free food. While they may slightly vary depending on the type of food service, it's crucial for organizational leadership to demonstrate a transparent commitment to FS. Additionally, clear and effective

communication plays a central role in disseminating information about FSC throughout the sector, promoting awareness of the significance of this issue [20].

Another crucial aspect lies in implementing preventive and corrective measures aimed at mitigating risks related to FS. FSC encourages food service companies in a continuous pursuit of improving these processes. It's worth noting that all these elements interact interdependently and must be consistently coordinated to establish an effective FSC. Attention to FS must be ongoing and integrated into all aspects of food-related operations [7,53].

Future research could utilize this approach to test its utility for other specific food service types, as this study was analyzed in a general context.

5. Conclusion

The analysis of the influence of elements on the FSC in food services highlighted the complexity and significant relevance of this aspect in ensuring the quality of products and the health of the consumers. The results of this research provided insights into the crucial contribution of factors such as employee training, management, operational procedures, internal communication, and ongoing supervision in shaping an effective FSC.

However, despite the progress made in this investigation, there are still knowledge gaps that deserve attention in future research. One such gap relates to the influence of emerging technologies on FSC. Exploring how these innovations can strengthen or challenge FSC in food services is a promising area for future research. Another aspect to be explored is the influence of socio-economic and cultural factors on the implementation and adherence to FS practices. Investigating how the specific characteristics of different communities and regions impact the FSC can guide the customization of strategies to meet the specific needs of each context.

In summary, the careful consideration of elements and the perceptions of the target audience is an essential pillar in making information about FSC more accessible and relevant. Employee awareness, coupled with robust operational practices, strengthens the resilience of the industry, ensuring not only legal compliance but also long-term sustainability.

List of Abbreviations

FS - Food safety.
FSC - Food Safety Culture
GFSI - Global Food Safety Initiative
UN - United Nations

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