

Brief Communication

Developing, translating, and validating a survey instrument for assessing hospital food service staff's food safety knowledge, perceptions, and practices during the COVID-19 pandemic

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ABSTRACT

Objectives: To develop and validate a questionnaire to assess the food safety knowledge, perceptions, and practices (KPPs) of hospital food service staff (FSS) amidst the challenges of the coronavirus disease-2019 (COVID-19) pandemic.

Methods: The questionnaire was subjected to a rigorous evaluation process, which included a literature review and focus groups comprising the general public, FSS, and key experts in food service. The pilot testing highlighted its utility and determined its content validity ratio (CVR).

Results: Most items received high CVR scores of 0.96, indicating excellent content validity. A subsequent pilot study involved 40 FSS. Reliability testing, using Cronbach's alpha value of 0.914, demonstrated good internal consistency across the questionnaire scales. The final version consisted of 115 items.

Conclusion: The developed questionnaire, available in both English and Arabic, exhibits both validity and reliability. It acts as a crucial tool for healthcare facilities to assess food safety KPPs among FSS, both under regular operations and during crises like the COVID-19 pandemic. This tool is adaptable to various hospital settings, aiding in the reduction of foodborne diseases risks.

Keywords: COVID-19 pandemic, healthcare facilities, SARS-CoV-2, foodborne diseases, food handlers, food safety, food services

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Food safety is essential for preserving public health. Recent research indicates that outbreaks of foodborne diseases (FBDs) in hospitals can stem from a lack of food safety awareness among food handlers.¹ An absence of a robust food safety culture can lead to

numerous food hygiene infractions, potentially causing severe illnesses in patients or triggering FBD outbreaks within healthcare facilities.²

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus responsible for coronavirus disease-2019 (COVID-19), can remain viable on inanimate surfaces for up to 72 hours after leaving the body of an infected individual.³ Consequently, if respiratory secretions from an infected person come into contact with food, those contaminated items could theoretically act as temporary carriers. If another individual touches the contaminated food and subsequently touches their nose, eyes, or mouth without first washing or sanitizing their hands, transmission is possible.^{4,5} The COVID-19 pandemic, given its mode of transmission primarily through respiratory droplets, introduces an added layer of intricacy to food preparation and delivery processes.⁴ This insight highlights the urgent need for a comprehensive and specific instrument to assess food safety knowledge, perceptions, and practices (KPPs) among healthcare staff, particularly in the context of such a pandemic.

The aim of this brief communication is to introduce a meticulously crafted food safety questionnaire, designed specifically to address the distinct challenges faced by food service staff in healthcare environments during the COVID-19 crisis. The questionnaire zeroes in on key facets of food safety, underscoring the criticality of cleanliness, separation, cooking, and chilling, while also incorporating safety protocols relevant to the pandemic.⁶ In the healthcare realm, this questionnaire emerges as an indispensable asset for gauging food safety awareness and practices, both during routine operations and in crisis scenarios. Its bilingual availability, in English and Arabic, further broadens its applicability, making it a versatile tool for a range of healthcare settings and diverse demographic groups.

Methods. This study unfolded over 3 consecutive phases: I) instrument development; II) validation; and III) translation, as depicted in (Figure 1). A structured, self-administered questionnaire was employed to gather data from participants, and informed consent was secured from all involved. The research spanned from January to September 2022 in hospitals located in Jeddah, Saudi Arabia. A cross-sectional approach utilizing the questionnaire was chosen. The questionnaire's

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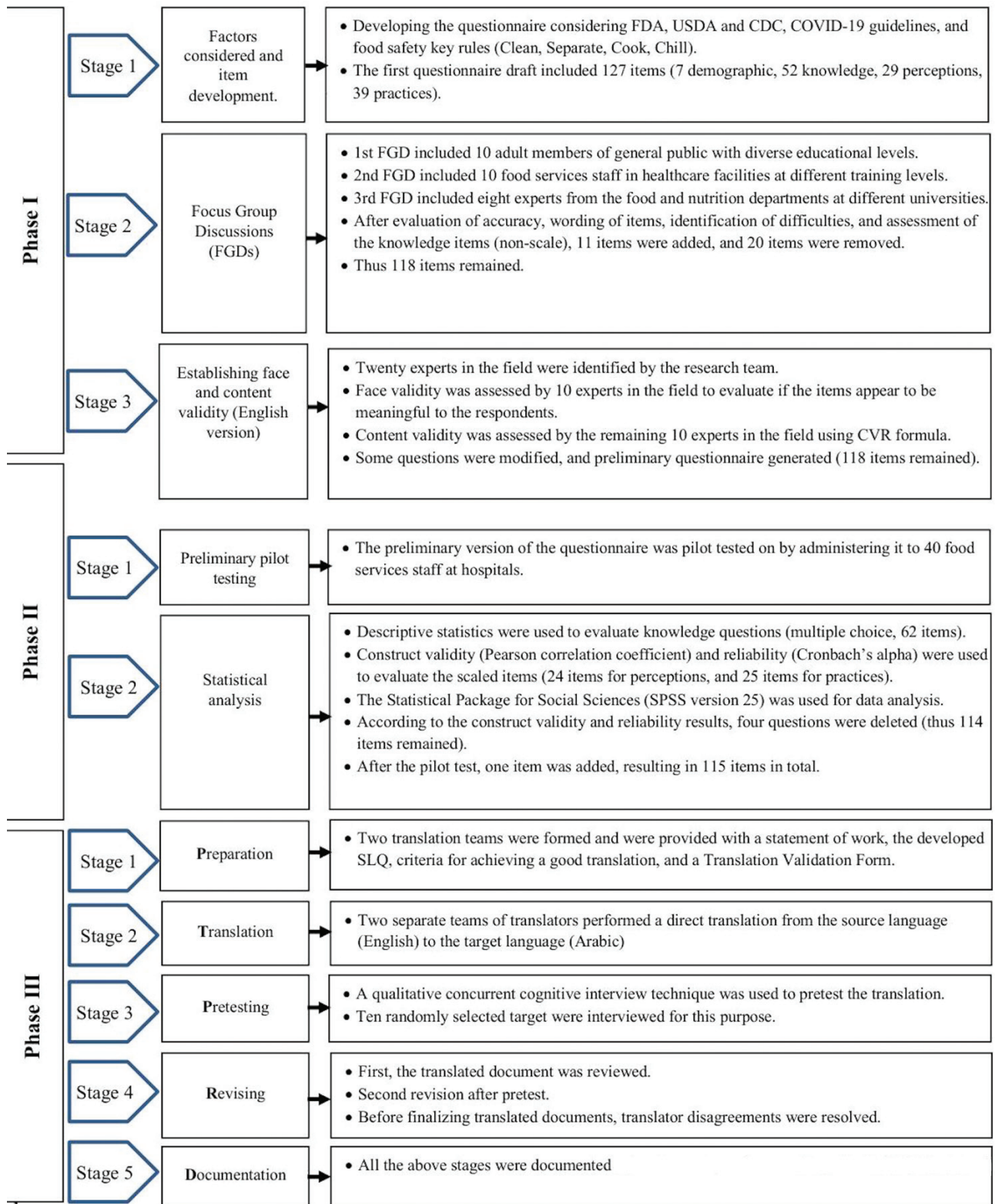


Figure 1 - Flow chart of the process adopted when developing the survey instrument. FDA: Food and Drug Administration, USDA: United States Department of Agriculture, CDC: Centers for Disease Control and Prevention, COVID-19: coronavirus disease-2019, CVR: content validity ratio, SLQ: source language questionnaire

development involved consulting relevant literature and integrating guidelines from authoritative food safety entities such as the Centers for Disease Control and Prevention and Food and Drug Administration.^{6,7} The questionnaire was crafted to address fundamental elements of food safety, encompassing cleanliness, separation, cooking, and chilling, with an added emphasis on safety protocols related to COVID-19.

All Ministry of Health (MOH)-affiliated hospitals within the city of Jeddah, Saudi Arabia, were included in the study. The criteria for inclusion were hospitals with a food safety management system (FSMS). Both male and female staff, who are formally employed and currently working in the main kitchen and cafeteria of government hospitals (including MOH staff as well as those from contracted companies), were included. All languages were taken into consideration. Exclusions from the study were hospitals without an applied FSMS, private hospitals and clinics, volunteers, students undergoing training or internships in hospitals, and clinical dietitian staff. The study was approved by the Research Ethics Committee of King Abdul-Aziz University, Jeddah, Saudi Arabia (approval no.: HA-02-J-008).

The validation phase aimed to ensure the clarity, relevance, and content validity of the questionnaire. 3 focus group discussions (FGDs) were carried out to gather diverse feedback and perspectives.

The first FGD consisted of 10 members from the general public. This group aimed to assess the comprehensibility of the questionnaire items and provide feedback regarding the clarity of the questions.

The second FGD included 10 food service staff from various roles and responsibilities related to food handling in healthcare facilities. This group's feedback was primarily centered on the clarity and relevance of the questionnaire in relation to food safety protocols during the pandemic.

The third FGD consisted of experts in the healthcare domain. These experts recommended modifications, such as highlighting potential hazards-biological, chemical, or physical-associated with specific questionnaire items. Adjustments were carried out to items concerning diseases that required reporting. Furthermore, 20 duplicate or irrelevant items were eliminated from the questionnaire.

Content validity was assessed using the content validity ratio (CVR) framework. Content validity ratios were determined for each questionnaire item, and an average score was computed to establish the overall CVR score. The CVR for each item was calculated based on the formula developed by:⁸

$$CVR = \frac{ne - (\frac{N}{2})}{\frac{N}{2}}$$

Where: ne=number of experts indicating that a measurement item is essential, and N=total number of experts that rated the item.

The second draft of the questionnaire consisted of 118 items and underwent pilot testing with 40 respondents to assess construct validity and internal consistency. Descriptive statistics were utilized to evaluate non-scaled items.¹ Only scaled statements were considered in the validity testing, which involved determining Pearson's correlation coefficients.

For reliability testing, Cronbach's alpha was employed, with values of 0.7 or higher signifying good reliability.⁹ The questionnaire exhibited strong internal consistency across various scales. The overall Cronbach's alpha was 0.914, reflecting exceptional reliability for the entire instrument.

During the instrument translation phase, the final English version of the questionnaire was translated by 2 dedicated translation teams. These teams ensured that the translations from the source language (English) to the target language (Arabic) maintained semantic, conceptual, and normative equivalence, while also being reliable, comprehensive, accurate, and culturally relevant. Adhering to the Census Bureau's guidelines for the translation of data collection instruments and supporting materials, the translation process was structured into 5 stages: preparation, translation, pretesting, revision, and documentation.¹⁰

Statistical analysis. The Statistical Package for the Social Sciences, version 26.0 (IBM Corp., Armonk, NY, USA) was utilized for analysis. To facilitate the analysis, raw data were numerically transformed into a format suitable for statistical processing to align with the research objectives. Correct answers for each question were also identified. Participant responses were analyzed and depicted using frequency distribution.

Results. The initial draft of the questionnaire was formulated in English, encompassing 127 items across 4 sections: demographic details, and KPPs pertaining to food safety. The subsequent draft, which contained 118 items, some of which underwent modifications, was then subjected to face and content validity evaluations, as follow: I) face validity: feedback from experts was incorporated, leading to the rephrasing of certain terms into more understandable language or providing explanations where necessary; II) content validity: this was quantified using the CVR. Content validity ratios

were determined for each questionnaire item, and an average CVR score was computed to establish the overall CVR score for the instrument. The Lawshe table⁶ was used to determine the minimum CVR required for an item to be retained in the questionnaire; and III) post-CVR computation, 117 out of the 118 items achieved CVR scores exceeding 0.62 (the threshold set for satisfactory content validity by experts). One item, which secured a CVR of 0.4, was an exception. After this adjustment, the instrument achieved a collective CVR of 0.96, signifying a commendable overall CVR. The refined questionnaire was then pilot tested on 40 respondents to ascertain construct validity and confirm internal consistency. Additionally, descriptive statistics were derived for all non-scaled items.

The results are presented in **Table 1**. For validity testing, only scaled statements were considered, and Pearson's correlation coefficients were computed. The overall Cronbach's alpha value of 0.914 emphasizes the excellent reliability of the entire instrument, as shown in **Table 2**.

Discussion. Hospital food services play a pivotal role in the comprehensive care of patients, a contribution that is often overlooked.¹¹ The questionnaire developed in this study marks a significant stride in gauging food safety KPPs among staff in healthcare settings. What distinguishes this tool is its keen sensitivity to the unique challenges introduced by the COVID-19 pandemic.

The questionnaire's validation process, which encompassed FGDs and content validity assessments, ensured it transcended being a mere survey to become a pivotal tool. Feedback from the general public, food service staff (FSS), and experts proved instrumental in refining the questionnaire. Its content validity was also assessed using the Lawshe method and the CVR of 0.96 indicated good content validity.⁸ Its clarity and relevance are vital, ensuring the tool effectively captures the nuances of food safety in healthcare environments. It is noteworthy that the questionnaire's applicability extends beyond routine scenarios, addressing global challenges like pandemics that amplify food safety concerns.

Following the pilot study, the questionnaire was revised to include 115 items. Descriptive analysis of this version confirmed that the majority of respondents had a strong grasp of all topics covered in the survey. Similar results were found by Alqurashi et al¹² in a study carried out across 10 hospitals in Al-Madinah Al-Munawarah, Saudi Arabia. The insights derived from the pilot testing of the questionnaire were invaluable. The evident comprehensive understanding of the

subject matter among respondents is both encouraging and a testament to the tool's effectiveness. This contrasts with earlier studies that identified knowledge gaps among food handlers, emphasizing the potential of our questionnaire to detect and address such shortcomings.¹⁴ Reliability testing, underpinned by Cronbach's alpha values, affirmed the instrument's internal consistency and validity. A slight decrease in the Cronbach's alpha values for the scales focused on COVID-19 is expected due to the unprecedented nature of the pandemic.⁸ However, these values remain within the acceptable range, further endorsing the questionnaire's reliability.

The instrument underwent an assessment for internal consistency, and the results affirmatively demonstrated its robustness. With an overall Cronbach's alpha reliability of 0.914 for all scales, it surpasses the recommended 0.7 threshold.⁹ This high Cronbach's alpha value emphasizes the instrument's strong reliability. Notably, the tool encompasses both traditional pillars of food safety, such as cleanliness, separation, cooking, and chilling, and also integrates protocols specific to COVID-19. Designed to adapt to the challenges presented by emerging infectious diseases, the comprehensive and inclusive approach to the questionnaire's development and validation, which engaged a variety of stakeholders, ensures its practicality and relevance. Beyond just an academic exercise, this instrument is a pragmatic solution crafted specifically for frontline healthcare workers.

Moreover, the bilingual availability of the questionnaire in both English and Arabic broadens its reach across varied healthcare settings and demographics. Such inclusivity fosters standardized food safety practices in healthcare facilities worldwide, bridging language divides and fostering a global safety ethos.¹³ Patients can thus have greater trust in the meals they receive during hospital stays. The creation and validation of this food safety questionnaire are monumental contributions to the healthcare sector, especially in pandemic times.

Study limitations. A limitation of this study is its confinement to food handlers working in hospitals within Jeddah, Saudi Arabia, which may not be representative of other populations in various regions of Saudi Arabia. Consequently, it is recommended that future validation studies include workers from other healthcare facilities across the country to further assess the validity and reliability of this questionnaire.

Language barriers often pose challenges in research, particularly in multicultural environments like hospitals. Given that food service workers in this study might hail from varied linguistic backgrounds, effective communication during data collection can be

Table 1 - Correlation coefficients of items that evaluate the food safety perceptions and practices of food service staff.

Statements	Correlation coefficient	P-values
<i>Correlation coefficients of items that evaluate the food safety perceptions of food service staff</i>		
- Food safety is an important public health issue.	0.507**	0.00
- The health status of workers should be evaluated before employment.	0.697**	0.00
- There is no problem with allowing my fingernails to grow because wearing gloves prevents germ transmission.	0.444**	0.00
- Washing fruits and vegetables reduces the amount of contaminants that lead to food poisoning.	0.446**	0.00
- Cleaning and sanitizing all food contact surfaces is important to reduce food poisoning.	0.520**	0.00
- Preparing food in advance and holding it without temperature control (namely, between 5-60°C) contributes to food poisoning.	0.476**	0.00
- Freezing food kills harmful microbes or germs.	0.153	0.347
- Foods stored at incorrect temperature are considered damaged and must be discarded.	0.608**	0.00
- It is unsafe to leave food inside the temperature danger zone (between 5-60°C) for more than 2 hours.	0.401*	0.00
- Encoding the colors of cutting boards, equipment, and utensils, reduces cross-contamination.†	0.738**	0.00
- Defrosted foods can be refrozen.	0.408**	0.00
- Multi-use dishtowels can be a source of food contamination.	0.564**	0.00
- Knives and cutting boards should be properly sanitized to prevent cross-contamination.	0.812**	0.00
- Food handlers such as chefs and food preparation area workers generally can be a source of foodborne diseases.	0.595**	0.00
- Raw and ready-to-eat foods should be stored separately to reduce the risk of cross-contamination.	0.765**	0.00
- Wearing masks, gloves, and hair restraints is an important practice to reduce the risk of food contamination.	0.801**	0.00
- Practicing good personal hygiene prevents foodborne diseases.	0.764**	0.00
- Hand washing prevents foodborne diseases.	0.787**	0.00
<i>Correlation coefficients of items that evaluate the perceptions of food safety among food service staff during COVID-19</i>		
- There is a high risk of transmitting COVID-19 virus through food.	0.361*	0.022
- It is necessary to use antibacterial soap when washing hands to prevent COVID-19 virus transmission.	0.236	0.143
- Regular cleaning throughout meal preparation is only needed when there are COVID-19 cases.	0.714**	0.000
- During the COVID-19 pandemic, using hand sanitizer should replace washing hands with soap and water.	0.475**	0.002
- COVID-19 virus can be transmitted once food containing the virus is touched, even without touching the nose, eyes, and mouth.	0.854**	0.000
- Improving hygiene practices is important during the COVID-19 pandemic only.	0.854**	0.000
<i>Correlation coefficients of the items that evaluate the food safety practices of food service staff</i>		
- Do you clean your workplace before and after each stage of food preparation?	0.483**	0.002
- Do you use the same cutting board to prepare raw and cooked food?	0.703**	0.000
- Do you wash your hands before and after using gloves?	0.270	0.092
- Do you wash your hands after coming back from breaks?	0.342*	0.031
- Do you wash your hands after handling raw meat, fish, or chicken?	0.435**	0.005
- Do you prepare food during lunchtime and leave it until dinnertime?	0.725**	0.000
- Do you wear personal protective equipment (PPE), such as an apron, mask, and head covering, when preparing or distributing food?	0.756**	0.000
- Do you wear gloves when preparing ready-to-eat food, such as salads and sandwiches?	0.687**	0.000
- Do you allow your fingernails to grow long as you use gloves to protect food from the transmission of germs?	0.490**	0.001
- Do you measure and record the temperature of refrigerators/freezers at least 3 times per day?	0.512**	0.001
- Do you check the internal temperature of food while cooking using a food thermometer?	0.636**	0.000
- Do you thaw frozen food by leaving it in the kitchen or submerging it in hot water?	0.562**	0.000
- When you finish cooking, do you serve the food immediately?	0.496**	0.001
- When you finish cooking, do you cool the food within 6 hours to reach 5°C or less?	-0.278	0.083
- When you finish cooking, do you keep the food at the kitchen temperature for more than 2 hours?	0.600**	0.000
- When you finish cooking, do you keep hot food in hot boxes (63°C or higher) until serving?	0.648**	0.000
- Do you check whether meat is cooked properly by visually inspecting it or touching it?	0.325*	0.040
<i>Correlation coefficients of the items that evaluate the food safety practices related to COVID-19 among food service staff</i>		
- If you suspect COVID-19 symptoms, do you report your symptoms to your supervisor?	0.550**	0.000
- During the COVID-19 pandemic, do you use an alcohol sanitizer with a 70-80% concentration to clean your hands?	0.573**	0.000
- During the COVID-19 pandemic, do you use an alcohol sanitizer with a 70-80% concentration to clean all food contact surfaces?	0.543**	0.000
- During the COVID-19 pandemic, do you wash your hands for at least 20 seconds using warm water and soap before touching food?	0.507**	0.001
- If you suspect COVID-19 symptoms, do you take medicine and complete your work?	0.502**	0.001
- During the COVID-19 pandemic, do you sanitize your hands before touching food?	0.761**	0.000
- During the COVID-19 pandemic, do you check if there is any damage to food packaging upon receipt?	0.644**	0.000
- During the COVID-19 pandemic, do you check if there is any damage to food packaging before preparing the food?	0.688**	0.000

*The correlation is significant at the 0.05 level. **Correlation is significant at the 0.01 level. †Such as red color use for red meat and green color for vegetables.
 COVID-19: coronavirus disease-2019

Table 2 - Reliability of the perceptions and practices scales (N=40).

Scales	Number of items	Cronbach's alpha
Evaluation of food safety perceptions among food service staff	17 (37.0)	0.875
Evaluation of food safety perceptions among food service staff during COVID-19	5 (11.0)	0.712
Evaluation of food safety practices among food service staff	15 (33.0)	0.830
Evaluation of food safety practices related to COVID-19 among food service staff	8 (17.0)	0.727
Overall reliability of the scales	45 (100)	0.914

Values are presented as numbers and percentages (%). COVID-19: coronavirus disease-2019

challenging. As a result, researchers should prioritize using clear and straightforward language when interacting with participants. Employing professional translators when needed and pretesting the survey can ensure its cultural and linguistic appropriateness for the intended audience. This study did not account for potential influences of organizational factors, such as management support, training programs, or the work environment, on food safety KPPs. Future research should delve into how these factors influence food safety outcomes among FSS.

In conclusion, the scarcity of validated survey tools tailored for healthcare facilities to assess the food safety status among FSS, especially when catering to vulnerable hospital patients, underscores the importance of developing and validating a dedicated instrument for this purpose. This succinct and reliable tool stands as a pivotal resource for gauging food safety KPPs among FSS. The questionnaire proves invaluable not only during regular operations but also during health emergencies like the COVID-19 pandemic, as it bolsters food safety measures, safeguarding patients, staff, and other stakeholders.

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