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Food Hygiene and Sanitation of the University Canteens in South Sumatra Province, Indonesia

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Abstract

Food safety is a critical public health issue, especially in institutional settings such as university canteens, where large populations are served daily. Inadequate hygiene and sanitation practices by food handlers can lead to foodborne illnesses, placing students and staff at risk. This study evaluated hygiene and sanitation conditions in the canteens of a leading public university in South Sumatra Province, Indonesia, known for its active food service facilities. This study examined food handlers' knowledge, attitudes, and practices and assessed the microbiological safety of chicken curry by testing for *Escherichia coli* (*E. coli)* contamination and total plate count. Using a cross-sectional design, data were collected from 35 food handlers and 7 chicken curry samples across multiple canteens. Structured questionnaires and microbiological analysis were employed. Results revealed that although most food handlers demonstrated good knowledge and positive attitudes, 57.1% exhibited poor hygiene practices. Several chicken curry samples exceeded acceptable *E. coli* levels, indicating potential health risks. These findings underscore the urgent need for ongoing hygiene training, strict supervision, and standardized certification for food handlers to mitigate microbial hazards and ensure food safety in university settings.

Keywords: *Escherichia coli*, food handlers, Hygiene, Sanitation, Total Plate Count

Introduction

Food and beverage hygiene remains a major public health issue in Indonesia. According to data from the National Agency for Drug and Food Control, the incidence of food poisoning increased from 45.29% in 2019 to 46.62% in 2020. More strikingly, in 2022, poisoning cases related to drugs and food rose significantly compared to 2021, reaching 65%.[1] This trend indicates inadequate hygiene and sanitation practices, which affect not only snacks but also food served in institutional settings, including universities.

The largest and most reputable public university located in Palembang City and Ogan Ilir District, South Sumatra Province, Indonesia, was selected as this study's location. The canteen is a primary food source for students and staff. Poor hygiene and sanitation in this environment can lead to serious health issues. Contamination often results from untrained or non-compliant food handlers, increasing the likelihood of foodborne illnesses.[2] Notably, the university has recorded several food poisoning incidents linked to snack consumption, with four cases reported in 2020 and nine in 2021.[3]

Inadequate hygiene endangers student health and may harm the university's reputation. Given the high volume of food transactions in university canteens, poor practices can potentially spread illness to a wide population. Therefore, there is a pressing need to evaluate hygiene and sanitation practices in such environments.[4,5] A common issue is the insufficient knowledge and understanding among food handlers regarding hygiene and sanitation principles. This gap often leads to unsafe food handling, improper storage, and an unhygienic working environment. Furthermore, attitudes and behaviors toward hygiene procedures critically influence food sanitation outcomes.[6]

From a microbiological perspective, contamination is a key concern. *Escherichia coli (E. coli)* is a pathogen frequently found in improperly processed or handled food, and it can cause severe gastrointestinal illness.[7] Therefore, assessing *E. coli* contamination in canteen food is essential to ensuring load in the food or beverages. A high total plate count (TPC)

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value indicates microbial contamination and reduced food quality.[8]

This study aimed to assess hygiene and sanitation practices at the university canteens by evaluating food handlers' knowledge, attitudes, and practices (KAP) and conducting microbiological analysis of chicken curry for *E. coli* contamination and TPC. The chicken curry was selected due to its popularity and potential for microbial growth if improperly prepared or stored. The dish also includes ingredients supporting microbial growth, making it a suitable indicator for assessing food safety risks.

Although food hygiene has been extensively studied, there remains a notable gap in the literature regarding hygiene and sanitation practices in university canteens, particularly in Indonesia. A previous study has primarily focused on the general food industry, often overlooking the unique conditions of academic institutions.[9] Furthermore, most studies have limited their scope to evaluating food handlers' knowledge and attitudes without integrating microbiological analysis of the food itself.[10,11] This study addresses this gap by assessing hygiene practices and conducting microbiological evaluations of a commonly consumed dish, such as chicken curry, thus offering a more comprehensive perspective on food safety in university settings.

Method

This study employed a quantitative approach with a cross-sectional design. Data was collected in November 2023 at a University in Palembang City and Ogan Ilir District, Indonesia. A total of seven canteens from the Faculty of Public Health, Faculty of Law, Faculty of Education, Faculty of Political and Social Sciences, Faculty of Engineering, Faculty of Agriculture, located in Ogan Ilir District, and Faculty of Economics, located in Palembang City, were identified. Although 10 canteens were situated within the university complex, only 7 were selected due to their consistent operation; the remaining three were temporarily closed due to the COVID-19 pandemic.

The inclusion criteria for canteens were: (1) serving food via a buffet system; (2) employing food handlers responsible for preparing chicken curry on the day of observation; and (3) management under faculty administration. Canteens without on-site food preparation and serving facilities or those not operating during data collection were excluded. The study population comprised food handlers working in university canteens. A total of 35 food handlers were selected using a cluster random sampling method to ensure representation across different faculties. Although the microbiological analysis specifically focused on chicken curry, only food handlers involved in the preparation and serving of this dish were included. The inclusion criteria for food handlers were: (1) having worked for at least three months and (2) directly handling food. The exclusion criterion was the presence of specific diseases among food handlers.

These criteria were designed to ensure the relevance and consistency of hygiene practices and microbiological assessments across canteens. Microbiological analysis focused on *E. coli* contamination and TPC in chicken curry. Samples were collected using proportional random sampling from the seven selected canteens that sold chicken curry. This dish was chosen due to its popularity, frequent consumption, and high risk of contamination when improperly handled. Additionally, its ingredients provide an environment conducive to microbial growth, making it suitable for assessing food safety.

The primary independent variables were the KAP of food handlers. A descriptive and analytical observational method was applied to evaluate the microbiological safety of chicken curry sold in the canteens, specifically concerning *E. coli* contamination and TPC. Data on food handlers' knowledge and attitudes were collected using a questionnaire comprising 15 and 10 questions, respectively. Hygiene and sanitation practices were measured as the dependent variable using a 22-item questionnaire. Both the independent and dependent variables were categorized as "Good" if the total score exceeded 75%, and "Not Enough" if the score was ≤75%.

This questionnaire was developed based on food safety guidelines and tested for validity and reliability. Knowledge was measured using multiple-choice questions, attitudes with a Likert scale, and practices through direct observation using a checklist. Each component was scored and classified as good, fair, or poor. Chicken curry samples were analyzed at the Laboratory of the Industrial Service Standardization Center in Palembang City using standard methods to detect *E. coli* and calculate TPC.

The control variables included age, sex, education level, and years of service. Age was calculated from the respondent's date of birth and categorized into late adolescence (17–25 years), early adulthood (26–35 years), middle adulthood (36–45 years), and early elderly (46–55 years), using an ordinal scale. Sex was regarded as male or female based on biological characteristics, using a nominal scale. Education level was categorized as low (uneducated or elementary school), medium (junior to senior high school), and high (higher education), using an ordinal scale. Years of

service were categorized as ≤5 years (new) and >5 years (experienced) using a nominal scale.

Data were analyzed using univariate and bivariate techniques. Univariate analysis was conducted to determine the frequency and percentage of each variable. Bivariate analysis was performed using the Chi-squared test to assess the association between food handlers' knowledge and attitudes and their hygiene and sanitation practices. Spearman's correlation and continuity correction tests were used to assess statistical significance for numeric and categorical data, respectively. Microbiological test results were analyzed descriptively, reporting *E. coli* contamination and TPC in chicken curry samples as colony-forming units per gram (CFU/gram). Data analysis was conducted using SPSS software (free version).

Results

A total of seven canteens were included in the study, located in the Faculty of Public Health (A), Faculty of Law (B), Faculty of Education (C), Faculty of Social and Political Sciences (D), Faculty of Engineering (E), Faculty of Agriculture (F), and Faculty of Economics (G). Based on Table 1, the canteens across the seven faculties differed in terms of year of establishment, the number of food portions sold daily, the number of food handlers, and compliance with sanitation hygiene standards.

The years of establishment for the canteens were as follows: Faculties of Public Health (2022), Law (2016), Economics (2016), Education (2017), Social and Political Sciences (2003), Engineering (2007), and Agriculture (2010). Each canteen provided between 10 and 20 portions of food per day, which were consistently sold out. The number of food handlers varied: the canteen at the Faculty of Teacher Training and Education had the highest number (10 people), while the others averaged 3–5 handlers. Only the canteens at the Faculties of Public Health, Social and Political Sciences, and Engineering had sanitation hygiene certificates. However, all canteens received hygiene socialization education or socialization.

Interview results indicated that food preparation typically began at 09:00 a.m. in the canteen. Food was served until it ran out or until the canteen closed. Ingredients were purchased around 06:00 a.m. Any leftover food was taken home, consumed, or shared. Protein sources were not stored or were left in containers directly from the market. Most canteens served food buffet style. Observations of the canteens revealed that most food handlers did not wear Personal Protective Equipment (PPE) and had long fingernails. Although food tongs were available, handwashing stations were not separated from the food preparation area. In addition, toilets were separated from the handwashing areas, although food was served in closed containers.

Table 1. Characteristics of the Canteens

Question	Answer						
	A	B	C	D	E	F	G
Started selling at the canteen	Around 2022 (1-2 years)	Around 2016 (8 years)	Around 2017 (7 years)	Around 2003 (21 years)	Around 2007 (16 years)	Around 2010 (14 years)	February 2016 (8 years)
Number of portions provided in a day	Twenty servings (always sold out)	Not more than 12 servings (always sold out)	Not more than 10–20 servings (always sold out)	Fifteen servings (always sold out)	Not more than 12 servings (always sold out)	Fifteen servings (always sold out)	100–150 servings
Number of food handlers	3	3	10	4	9	5	5
Obtain a hygiene sanitation certificate	Yes	No	No	Yes	Yes	No	No
Participate in hygiene and sanitation socialization	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chicken curry processing finish time	09:00 a.m.	09:00 a.m.	10:00 a.m.	09:00 a.m.	09:00 a.m.	07:00 a.m.	08:00 a.m.
Chicken curry processing completion area	In the canteen	In the canteen	In the canteen	In the canteen	In the canteen	In the canteen	In the canteen
Chicken curry serving time	Until the canteen closes or until the chicken curry runs out	Until the canteen closes or until the chicken curry runs out	Until the canteen closes or until the chicken curry runs out	Until the canteen closes or until the chicken curry runs out	Until the canteen closes or until the chicken curry runs out	Until the canteen closes or until the chicken curry runs out	Until the canteen closes or until the chicken curry runs out
Water sources for food processing	Tap water	Tap water	Tap water	Tap water	Gallon water	Gallon water	Gallon water
Groceries purchasing time	06:30 a.m.	06:00 a.m.	06:00 a.m.	05:30 a.m.	06:00 a.m.	06:00 a.m.	06:00 a.m.
Groceries purchasing place	traditional markets	traditional markets	traditional markets	traditional markets	traditional markets	traditional markets	traditional markets
Treatment of the leftovers	Take home, eat, and share	Stored in the refrigerator and processed again	Take home, eat, and share	Always out of stock	Take home, eat, and share	Take home, eat, and share	Take home, eat, and share
Protein source for food storage	None or just left in the container from the market	None or just left in the container from the market	None or just left in the container from the market	In container	None or just left in the container from the market	None or just left in the container from the market	None or just left in the container from the market
Way of serving food	Buffet style	Buffet style	Buffet style	Buffet style	Buffet style	Buffet style	Buffet style
Use of Personal Protective Equipment such as (mask/ mouth cover, gloves, apron) while serving food	Apron	Apron	No	No	No	No	No
Food handlers have long nails	No	No	Yes	No	Yes	Yes	Yes
Availability of food tongs on the food served	Yes	No	Yes	Yes	Yes	Yes	Yes
Hand washing station for food handlers	Yes	Yes	Yes	Yes	Yes	Yes	Yes
The hand washing station is separate from the food washing station	No	No	No	No	No	No	No
Availability of soap at the hand washing place and food washing station	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Toilet availability	Yes	Yes	Yes	Yes	Yes	Yes	Yes
The toilet is separate from the hand washing, equipment, and food ingredients station	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Food served in closed containers	No	Yes	Yes	No	Yes	Yes	Yes

Source: Primary Data, 2023

This study involved 35 food handlers. Their demographic characteristics, age, sex, educational level, and years of service are shown in Table 2. Most food handlers were women (32 respondents, 91.4%) in their middle adulthood (aged 36–45 years), comprising 14 respondents (40.0%). Most food handlers belong to the medium educational level (26 respondents, 74.3%), while only 2 respondents (5.7%) had low educational attainment (uneducated or elementary school). In terms of work experience, 21 (60%) had been working for five years or less, and 14 (40%) had more than five years of experience.

Table 2. Characteristics of Food Handlers

Variable	Frequency	Percentage
Age		
Late adolescence (17-25 years)	7	20.0
Early adulthood (26-35 years)	6	17.1
Middle adulthood (36-45 years)	14	40.0
Early elderly (46-55 years)	8	22.9
Sex		
Male	3	8.60
Female	32	91.4
Educational level		
Low	2	5.7
Medium	26	74.3
High	7	20.0
Years of service		
New	22	62.9
Experienced	13	37.1

Source: Primary Data, 2023

Table 3. Frequency Distribution of Knowledge, Attitude, and Practice of Food Handlers in the University Canteen

Variables	Frequency	Percentage
Knowledge		
Good	19	54.3
Not enough	16	45.7
Attitude		
Good	19	54.3
Not enough	16	45.7
Practice		
Good	15	42.9
Not enough	20	57.1

Source: Primary Data, 2023

Table 3 shows that most food handlers had good knowledge regarding sanitation and hygiene (19 respondents, 54.3%). Similarly, 19 respondents (54.3%) demonstrated a good attitude. However, only 15 food handlers (42.9%) had good sanitation and hygiene practices, while 20 (57.1%) had poor practices.

Table 4. Relationship between Food Handlers' Knowledge and Attitudes and Their Hygiene and Sanitation Practices in the University Canteen

Food Handlers' Knowledge	Food Handlers' Hygiene and Sanitation Practices						PR (95% CI)	p-value
	Not enough		Good		Total			
	n	%	n	%	n	%		
Not enough	7	43.8	9	56.3	16	100		
Good	13	68.3	6	31.6	19	100	0.639 (0.339–1.205)	0.260
Total	20	57.1	15	42.9	35	100		
Food Handlers' Attitudes	**Food Handlers' Hygiene and Sanitation Practices**						**PR (95% CI)**	**p-value**
	Not enough		**Good**		**Total**			
	n	**%**	**n**	**%**	**n**	**%**		
Not enough	14	87.5	2	12.5	16	100		
Good	6	31.6	13	68.4	19	100	2.771 (1.394–5.509)	0.003
Total	20	57.1	15	42.9	35	100		

Source: Primary Data, 2023, Notes: PR = prevalence ratio, CI = confidence interval

As shown in Table 4, a higher proportion of respondents with good hygiene and sanitation practices was observed among those with poor knowledge (56.3%) compared to those with good knowledge (31.6%). The continuity correction analysis yielded a p-value of 0.260 (p-value >0.05), indicating that the null hypothesis could not be rejected. These results suggested no significant relationship between food handlers' knowledge and their hygiene and sanitation practices at the university canteens. The prevalence ratio (PR) was 0.639 (95% CI = 1.394–5.509), implying that respondents with poor knowledge had a 0.639 times greater likelihood of engaging in poor hygiene and sanitation practices than those with good knowledge.

In contrast, more respondents with good hygiene practices were found among those with a positive attitude (68.4%) than those with a poor attitude (12.5%). The analysis using continuity correction produced a p-value of 0.003 (p-value <0.05), indicating a statistically significant relationship between food handlers' attitudes and their hygiene and sanitation practices. The PR was 2.771 (95% CI = 1.394–5.509), showing that respondents with poor attitudes were 2.771 times more likely to exhibit poor hygiene and sanitation practices.

Table 5. *E. Coli* Bacteria Content and Total Microbial Plate Count in Chicken Curry Samples from Seven Faculty Canteens

Results of *E. Coli* Bacteria Examination in Chicken Curry Samples			
Canteen Sample	**Test Results (CFU/gram) (1)**	**Repetition (2)**	**Average (CFU/gram)**
A	38.0	38.0	38.0
B	36.0	38.0	37.0
C	36.0	38.0	37.0
D	75.0	75.0	75.0
E	64.0	64.0	64.0
F	23.0	23.0	23.0
G	2.3	2.3	2.3
Results of the Total Microbial Plate Count Examination in Chicken Curry Samples			
Canteen Sample	**Test Results (CFU/gram) (1)**	**Repetition (2)**	**Average (CFU/gram)**
A	1.4×10^5	1.3×10^5	1.35×10^5
B	1.8×10^5	1.8×10^5	1.8×10^5
C	1.2×10^5	1.2×10^5	1.2×10^5
D	2.1×10^5	2.1×10^5	2.1×10^5
E	2.1×10^5	2.2×10^5	2.15×10^5
F	7.5×10^4	8.2×10^4	7.5×10^4
G	5.1×10^5	5.1×10^5	5.1×10^5

Source: Primary Data, 2023, Notes: CFU = colony-forming units per gram

As shown in Table 5, chicken curry samples in most canteens had *E. coli* levels of more than 3 CFU/gram, indicating that they did not meet the required microbial contamination limits for food. However, sample G had a slightly lower value of 2.3 CFU/gram. Although this result was still above the acceptable limit, typically <1 CFU/gram for ready-to-eat foods, the lower value may suggest better handling or storage conditions than the other samples. Nevertheless, it remains unacceptable according to food safety standards, as outlined in SNI 7388:2009 on Maximum Limit of Microbial Contamination in Food.

TPC test on six samples, A, B, C, D, E, and G, showed counts greater than 10^5 CFU/gram, exceeding the maximum acceptable limit according to SNI No. 7388:2009, which sets the Total Plate Count limit for ready-to-eat foods at ≤1×10^5 CFU/gram. However, the TPC for sample F was below 10^5 CFU/gram, thus meeting the required standard for microbial contamination in food based on the same regulation.

Table 6. Correlation Between Food Handlers' Knowledge, Attitude, and Practice and *E. Coli* and Total Plate Count Test Results

Variables	***E. coli* Test Results**		**TPC Test Results**	
	p-value	**r**	**p-value**	**r**
Knowledge	1	0	0.894	0.023
Attitude	0.738	0.059	0.689	−0.070
Practice	0.676	−0.073	0.037	−0.354

Source: Primary Data, 2023, Notes: TPC = total plate count

According to Table 6, the Spearman correlation test revealed no significant relationship between food handlers' knowledge, attitude, or practices and *E. coli* contamination. The knowledge yielded a p-value of >0.05 and an r of 0, indicating no association between knowledge and the presence of *E. coli* on food handlers. Similarly, the attitude variable

showed a p-value of 0.738 and r = 0.059, while the practices variable had a p-value of 0.676 and r = −0.073. Although the letter was a negative correlation, it was very weak and statistically significant, suggesting only a slight tendency for better practices to reduce *E. coil* count.

However, a different trend was observed for the TPC result. Among the three variables, only hygiene and sanitation practices demonstrated a statistically significant relationship with TPC values (p-value = 0.037; r = −0.354). This moderate negative correlation indicated that better hygiene and sanitation practices were associated with lower microbial counts on eating utensils. In contrast, knowledge and attitude did not significantly correlate with TPC results, showing p-values of 0.894 and 0.689, respectively, and very weak correlations. These findings underscored the critical role of actual hygiene practice over knowledge or attitude in minimizing microbial contamination on eating utensils.

Discussion

This study's results indicated that the hygiene and sanitation practices in university canteens varied across faculties. These variations were evident in aspects such as the year of establishment, the quantity of food portions provided, the number of food handlers, and compliance with hygiene certification. Canteens under the Faculties of Public Health and Social and Political Sciences possess hygiene certificates, while others do not, despite ongoing socialization efforts. Hygiene certification ensures compliance with established standards, thereby allowing students, lecturers, and staff to consume safe food.[12]

Food handlers generally demonstrate good knowledge and attitudes regarding hygiene practices. However, approximately 57% still exhibit poor hygiene behaviors. This data suggests that while knowledge is important, actual implementation relies heavily on awareness and training.[13,14] Despite efforts at socialization, effective field supervision remains critical to ensure that knowledge is translated into action. Therefore, stricter supervision and regular training are necessary to improve food sanitation quality.[15]

This study found a significant association between food handlers' attitudes and sanitation hygiene practices. Positive attitudes—such as regular handwashing, the use of PPE use, and maintaining cleanliness—were associated with better hygiene behavior. These results supported previous findings that proactive attitudes positively affect sanitation quality.[16,17] However, no significant relationship was found between knowledge and hygiene practice, suggesting that knowledge alone is insufficient. It highlights the need to cultivate a culture of workplace cleanliness through continuous training.[18,19]

One of the key findings of this study was the presence of *E. coli* contamination and TPC values exceeding the threshold established by SNI No. 7388:2009 in several food samples. For example, a chicken curry sample from the Faculty D contained 75 CFU/gram of *E. coli*, surpassing the permissible limit (<3 CFU/gram). These results indicated a serious risk of bacterial contamination in canteen food, potentially endangering consumer health. The primary cause of such contamination is poor hand hygiene, particularly when food handlers fail to wash their hands properly after using the toilet or handling contaminated items.[20,21] Additionally, using unclean water for washing food ingredients, cooking utensils, or kitchen surfaces also contributes to contamination. *E. coli* in food is a key indicator of contamination by pathogenic bacteria that can cause gastrointestinal illnesses, such as diarrhea. These findings underscore that E. coli contamination remains a common issue in food service environments, especially those lacking hygiene certification.[22]

TPC test results further revealed that most samples, particularly from the Faculties of Engineering and Social and Political Sciences, had microbial counts exceeding safety thresholds. The TPC test measured the number of microorganisms in food or beverages to evaluate their safety and quality. Elevated microorganism counts often indicate a decline in product quality or pose potential health risks.[23,24] This reflects inadequate food sanitation and storage practices, which may foster microbial growth. High TPC levels are often linked to unsanitary food handling, including unclean equipment and poor kitchen hygiene.[25] Consistent with earlier studies, the lack of proper storage and handling procedures in educational institution canteens may significantly contribute to the proliferation of pathogenic bacteria.[25]

This study highlighted the urgent need to implement stricter hygiene and sanitation protocols in the canteen environment, particularly in food preparation and serving processes. Proper use of PPE, such as masks and gloves, and separating raw and cooked ingredients are important in preventing cross-contamination. Observations revealed that most food handlers in the university canteens inconsistently use PPE and do not regularly wash their hands with antiseptics. This practice must be addressed to ensure that the food served is free from bacterial contamination. Emphasizing the importance of PPE and regular monitoring can reinforce proper hygiene behaviors.[26] Adhering to established hygiene standards makes PPE usage essential to maintaining sanitation during food processing. Furthermore, this helps food

service providers comply with health regulations and mitigate the risk of disease transmission. Therefore, PPE plays an important role in ensuring consumers' food safety and hygiene.[27,28]

Although food handlers possess adequate knowledge and positive attitudes, their hygiene practices remain suboptimal. To bridge this gap, it is crucial to introduce more intensive training and routine supervision to uphold hygiene and sanitation standards across all faculty canteens. Supervision not only ensures compliance with regulations set by authorities such as the Health Office and the National Agency for Drug and Food Control but also raises awareness among canteen managers about the importance of food safety. Additionally, it enables periodic evaluation of canteen service quality, including cleanliness and food presentation, both of which impact consumer satisfaction.[29-31] Prioritizing hygiene certification for canteens that have not yet been obtained is essential for enhancing food safety on campus.

The strength of this study lies in its mixed-methods approach, which integrates behavioral and microbiological assessments to provide a comprehensive perspective. This methodology captures both the cognitive and practical aspects of hygiene and their implications for food safety. However, this study has several limitations, including time constraints, a limited number of research personnel despite multiple food handlers in each canteen, and restricted access to observe food handling processes. Another limitation was the narrow scope of the food sample, which included only chicken curry.

Conclusion

This study reveals that hygiene and sanitation practices in the university canteens require further improvement, particularly regarding implementation by food handlers. Although the food handlers possess adequate knowledge, their application is insufficient, and several canteens fail to meet hygiene certification standards. Microbiological test results indicate a risk of food contamination, emphasizing the urgency of these concerns. Regular monitoring, structured training programs, and certification are necessary steps to enhance food hygiene standards and reduce the risk of foodborne illnesses within the university setting.

Abbreviations

E. coli: Escherichia coli; TPC: Total Plate Count; KAP: knowledge, attitudes, and practices; CFU: colony-forming units; PPE: Personal Protective Equipment; PR: prevalence ratio;

Ethics Approval and Consent to Participate

This study was ethically approved by the Health Research Ethics Committee, Faculty of Public Health, Sriwijaya University (Approval No: 211/UN9.FKM/TU.KKE/2023).

Competing Interests

The authors declare no financial, professional, or personal conflicts of interest that could have influenced the conduct or reporting of this study.

Availability of Data and Materials

The data and materials used in this study are available from the corresponding authors upon reasonable request.

Authors' Contribution

AR and Y were responsible for data collection, processing, analysis, and interpretation. FF, FE, IPS, M, ESP, and VPS contributed to manuscript drafting and critical revision.

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