



Research Article

Traceability of Halal and Food Safety Practices in a Senior High School Canteen in Indonesia: Integrating Halal Control Point, GMP, and SSOP Approaches

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Abstract

School canteens play an important role in supporting students' nutritional intake and academic performance. However, studies integrating halal assurance and food safety in school food services remain limited, particularly in Muslim-majority countries. This study evaluated halal traceability and food safety practices in the canteen of SMA X, Indonesia, by assessing raw materials, production processes, facilities, and food-handling practices. This descriptive case study used purposive sampling and involved three school canteen tenants. Data were collected through direct observation, interviews, halal traceability analysis, and food safety evaluation using the Halal Product Assurance System (HPAS), Halal Control Point (HCP) decision tree, Good Manufacturing Practices (GMP), and Sanitation Standard Operating Procedures (SSOP). The findings revealed several Halal Control Points (HCP) ingredients due to unclear ingredient origins and the absence of halal certification. Tenant 2 showed the highest proportion of HCP ingredients (20.67%), followed by Tenant 3 (9.52%), and Tenant 1 (9.09%). Food safety deficiencies were identified in waste management, drainage systems, utensil sanitation, and food handler hygiene training, with approximately 30% of indicators failing to meet GMP and SSOP standards. Strengthening halal-certified ingredient procurement, sanitation infrastructure, and regular training is essential to support sustainable, safe, and halal school food systems.

Keywords

GMP; halal control point; halal traceability; school canteen; SSOP



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INTRODUCTION

Food safety and halal assurance have become increasingly important concerns in institutional foodservice systems, particularly in educational environments (Nazri & Maifiah, 2026). School canteens are not only responsible for providing food and beverages to students and school staff, but also contribute significantly to students' nutritional quality, health outcomes, and academic performance (Cohen et al., 2021; Liouaeddine et al., 2025; Wang et al., 2021). Unsafe or non-halal food products may negatively affect students physically, psychologically, and socially, especially in Muslim-majority countries, such as Indonesia (Febriastuti, 2024).

Indonesia has the largest Muslim population in the world, making halal food assurance a critical component of national food governance (BPJPH, 2025). The Indonesian government has strengthened halal regulations through Law No. 33 of 2014 concerning Halal Product Assurance and Government Regulation No. 39 of 2021. These regulations require food products circulating in Indonesia to comply with halal standards and gradually obtain halal certification (Zhang et al., 2026). The implementation of halal assurance has expanded beyond large-scale industries to include micro and small food enterprises, including school canteens (Ardiansyah & Wulandari, 2025; Yusnitasari et al., 2023).

The concept of halal in Islam extends beyond the prohibition of pork and alcohol. Halal food must also fulfill the principle of "*halalan tayyiban*," which emphasizes safety, cleanliness, hygiene, quality, and ethical processing (Muhammed Ali et al., 2023). Consequently, halal assurance is closely associated with food safety systems (Ahmad et al., 2021). Previous studies have reported that integrating halal assurance and food safety management improves consumer trust, reduces contamination risks, and enhances food quality (Hidayati et al., 2024; Nugroho et al., 2024).

Foodborne disease outbreaks associated with school food services remain a public health concern worldwide (Denis et al., 2026). Inadequate sanitation, improper food handling, cross-contamination, and poor hygiene practices are among the major causes of food contamination in institutional catering systems (Hasan et al., 2026). Several studies in developing countries have demonstrated that food handlers in school canteens frequently possess limited knowledge regarding food hygiene, sanitation, and halal handling procedures (Sucipto et al., 2023).

To minimize contamination risks, food businesses are encouraged to implement prerequisite food safety programs such as Good Manufacturing Practices (GMP) and Sanitation Standard Operating Procedures (SSOP) (Zubir et al., 2022). GMP focuses on production, environmental control, equipment sanitation, worker hygiene, and operational management, while SSOP ensures sanitation consistency throughout processing activities. These systems serve as the foundation before implementing Hazard Analysis and Critical Control Point (HACCP) (Amrinola & Syaugi, 2025).

In halal food systems, identifying Halal Control Points (HCP) is essential. HCP refers to process stages or materials with potential halal criticality due to uncertain sources, processing aids, additives, or contamination risks (Daffa et al., 2026; Sucipto et al., 2021). The decision tree model developed for HCP identification has been widely used in halal assessment studies involving small-scale food industries and food service establishments (Sucipto et al., 2022).

Despite growing attention to halal ecosystems in Indonesia, research on halal traceability and food safety practices in school canteens remains limited. Most studies primarily investigate nutritional adequacy or general hygiene without integrating halal assurance frameworks (Sucipto et al., 2023; Yusnitasari et al., 2023). Therefore, this study aimed to evaluate halal traceability and

food safety practices in the canteen at SMA X, Indonesia, through an integrated assessment of HCP, GMP, and SSOP implementation. The findings are expected to contribute to the development of safer, more halal-compliant school food service systems.

MATERIALS AND METHODS

Study Design and Location

This study employed a descriptive case study design with a purposive sampling approach. The research was conducted at the canteen of SMA X East Java, Indonesia.

Materials

The primary materials and subjects of this study consisted of three food tenants operating within the school canteen that met the following inclusion criteria: possessing permanent operational facilities, being actively engaged in food production and service during the study period, and demonstrating willingness to participate in interviews and observations. The food samples evaluated included a variety of traditional Indonesian foods sold by these tenants, such as fried snacks, noodles, chicken soup, beverages, and fish-based products. Furthermore, the ingredients used were classified as plant-based, animal-based, or other supporting ingredients for subsequent analysis. The physical infrastructure of the canteen, including building conditions, waste management, water supply, drainage, equipment, and storage facilities, along with the food handlers themselves, also served as the material objects of observation.

Methods

In this study, halal traceability was clearly defined as transparency of where ingredients came from and whether they were certified, and it was one of the five HCP evaluation criteria. It wasn't about checking all the documentation or records that tenants or suppliers kept. This definition was chosen because information about where ingredients came from was collected by talking to the people who handled the food, rather than by checking the papers that prove the source. Data collection used a combination of direct observation and structured interviews with food handlers. Halal traceability was assessed using the Halal Product Assurance System (HPAS) guidelines and the Halal Control Point (HCP) decision tree analysis. Each ingredient was evaluated based on five criteria: halal certification status, ingredient origin, processing method, potential contamination risks, and the use of additives or processing aids. Ingredients lacking halal certification or clear processing origins were classified as HCP ingredients.

Concurrently, food safety practices were evaluated against Good Manufacturing Practices (GMP) and Sanitation Standard Operating Procedures (SSOP) principles, adapted from the Healthy School Canteen Observation Form. This assessment covered eight core operational aspects: building and facility conditions, waste management, water supply and drainage, food handler hygiene, equipment sanitation, food storage practices, cross-contamination prevention, and food serving practices. Finally, data were analyzed descriptively using percentages and narrative interpretation. The proportion of HCP ingredients was calculated for each tenant, and food safety deficiencies were systematically identified based on non-compliance with established GMP and SSOP standards.

RESULT AND DISCUSSION

Data were obtained from three tenants, with characteristics as shown in Table 1.

Table 1. Characteristics of School Canteen Tenants

Tenant	Main Products	Years of Operation	Food Handler Education	Major Halal Concerns
Tenant 1	Fried snacks, rice dishes	19 years	Junior high school	Processed tofu products and uncertified ingredients
Tenant 2	Noodles, <i>pempek</i> , and beverages	25 years	Elementary–high school	Uncertified noodles, poultry, <i>dawet</i> , and processed products
Tenant 3	Chicken soup	17 years	High school	Poultry sourcing

The characteristics of participating tenants indicate that school canteen businesses are predominantly small-scale, family-operated enterprises. Similar conditions have been widely observed in food service sectors across developing countries, where food safety management is strongly influenced by educational background, operational experience, and access to training (Rachmadewi et al., 2021).

This study was conducted at the canteen of SMA X. The school was selected as the study site because it represents an urban public high school with a high-density student population and active daily operations. The school's institutional setting and facility infrastructure provided an appropriate environment to assess the practical implementation of food safety standards and halal product assurance. Furthermore, institutional support and access to active on-site subjects ensured the methodological feasibility and integrity of the data collection process.

At the time of data collection, the canteen had five tenants. Of these, three tenants met the eligibility criteria for inclusion in this study: actively selling processed/ready-to-eat food, operating continuously during the data collection period, and willing to participate. The remaining two tenants were excluded because they were temporarily closed during the data collection period. The three eligible tenants were selected using purposive sampling and included in this study. Each tenant employed two food handlers from a total of six food handlers who participated in the structured interviews.

INTEGRATED FRAMEWORK OF HALAL TRACEABILITY AND FOOD SAFETY ASSESSMENT

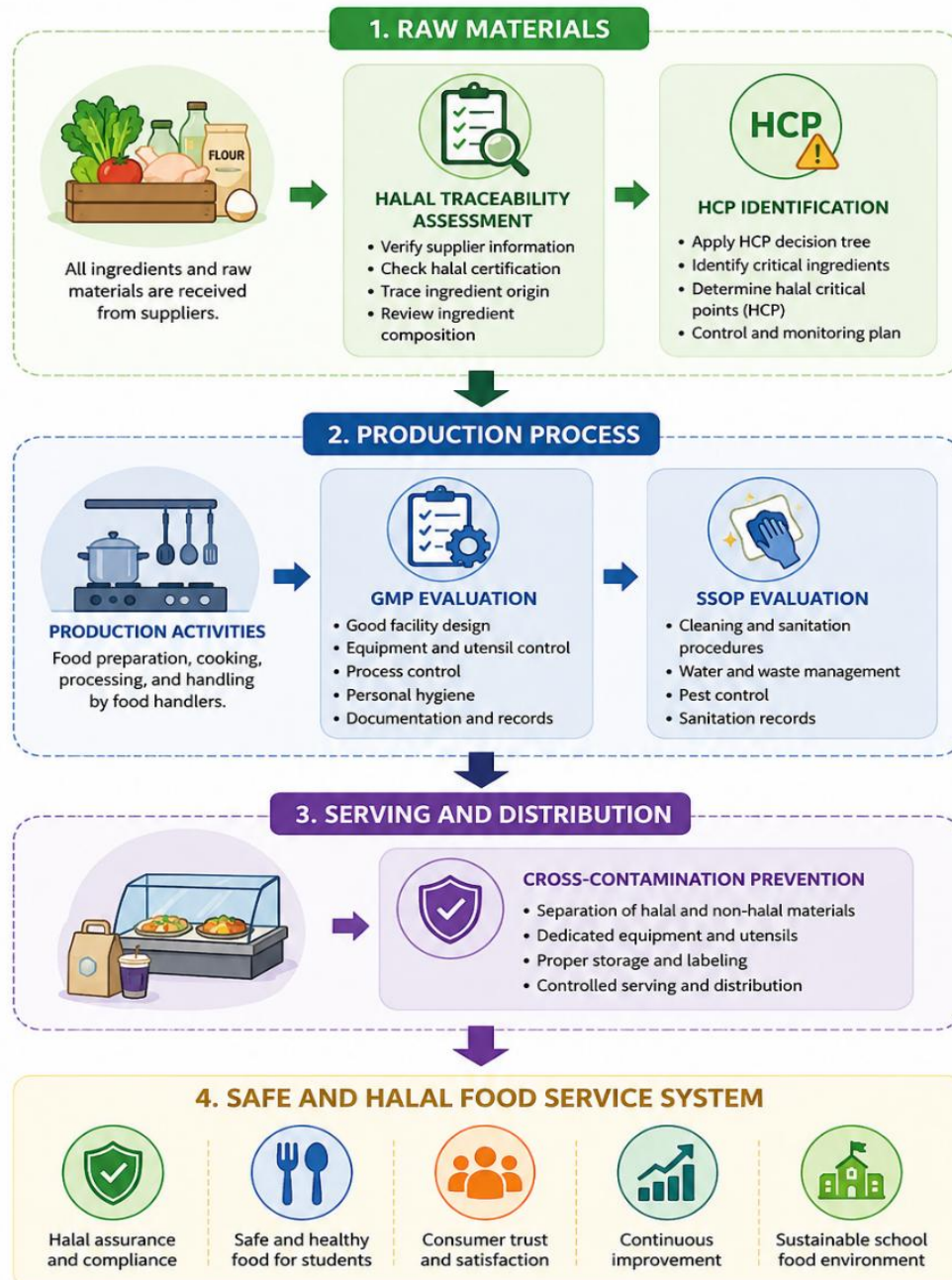


Figure 1. Integrated Framework of Halal Traceability and Food Safety Assessment

Figure 1 illustrates the integration between halal assurance and food safety evaluation used in this study. The framework demonstrates that halal traceability assessment and food safety management are interconnected systems supporting the implementation of “halalan tayyiban” principles in school food services (Ma’rifah et al., 2026).

Based on the ingredient analysis, several major ingredients were identified as Halal Control Points (HCPs) due to unclear or unverified halal status, as summarized in Table 2.

Table 2. Halal Control Point (HCP) Identification of Major Ingredients

Ingredient	Ingredient Category	HCP Status	Main Halal Risk
Fresh chicken	Animal-based	HCP	Unverified slaughtering process
Processed noodles	Plant-based	HCP	Unclear additives and L-cysteine source
<i>Dawet</i>	Plant-based	HCP	Unclear coloring agents and additives
Fish crackers	Animal-based	HCP	Unverified supporting ingredients
<i>Pempek</i>	Animal-based	HCP	Mixed ingredients and uncertified processing
Bulk sugar	Plant-based	HCP	Activated carbon purification source
Vinegar	Supporting ingredient	Halal certified	No significant risk
Baking powder	Supporting ingredient	Halal certified	Controlled fermentation source

Identification of Halal Control Points (HCPs) was performed on all primary raw materials to systematically outline potential halal hazards during the ingredient supply and processing phases. This analysis focused on categorizing ingredients by origin (animal-based, plant-based, and supporting ingredients), assessing each ingredient's HCP status, and pinpointing the main halal-related risk linked to it. As shown in Table 2, most main ingredients, specifically fresh chicken, processed noodles, *dawet*, fish crackers, *pempek*, and bulk sugar, were categorized as HCPs because of significant aspects needing further confirmation, such as unverified slaughter methods, ambiguous sources of additives and colorings, uncertain origins of L-cysteine, and unverified purification and processing techniques (Sucipto et al., 2022). Conversely, aiding components like vinegar and baking powder were already certified halal and posed no notable risk. These results highlight the importance of specific verification and control actions at each identified HCP to guarantee the complete halal integrity of the product (Sulai & Saidin, 2023).

In line with these findings, earlier research has also indicated that intricate supply chains and ambiguous processing aids often lead to halal uncertainty within small food enterprises (Masudin et al., 2022). In contrast to large manufacturers with specialized quality assurance teams, small-scale producers often lack the means to conduct extensive traceability checks across multiple supplier levels, complicating efforts to confirm the halal status of all raw materials or additives used in production (Dewi & Rahmawati, 2026). This difficulty is amplified by the extensive use of processing aids like enzymes, emulsifiers, and flavoring agents whose sources (animal, plant, or synthetic) are not always revealed or easily recognized from supplier materials (Masudin et al., 2022). Consequently, small business owners might unintentionally include non-halal or questionable (*syubhah*) ingredients in their products, despite their intention to adhere completely to halal standards. These results highlight the need for straightforward traceability tools, more transparent ingredient information from suppliers, and specific support for small businesses as they manage a more complex, globalized food supply chain.

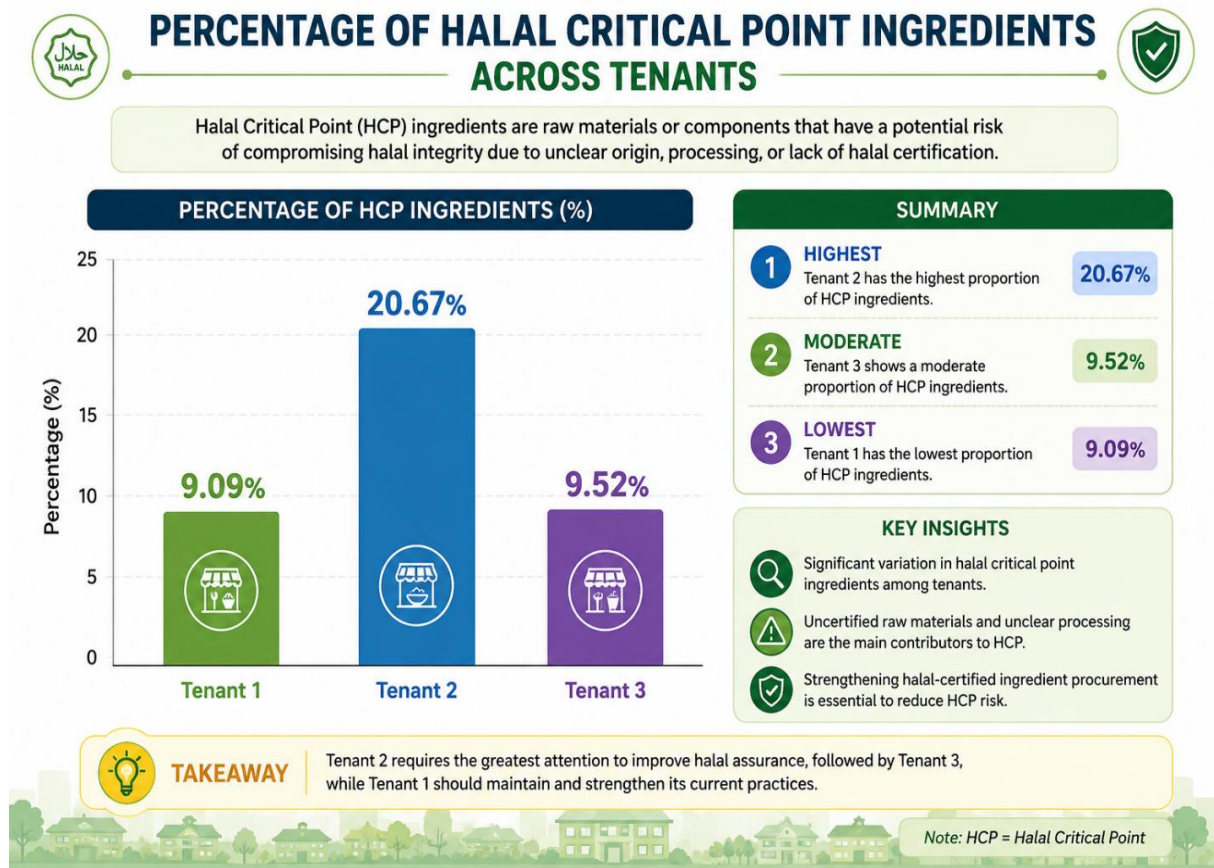


Figure 2. Percentage of Halal Control Point Ingredients Across Tenants

Tenant 2 had the highest percentage of HCP ingredients because its menu relied heavily on commercially processed products, such as noodles, *pempek*, and beverage components. Processed foods generally have greater halal traceability complexity due to the use of additives, emulsifiers, flavor enhancers, and processing aids (Sulai & Saidin, 2023).

The GMP and SSOP evaluation revealed several food safety deficiencies across various aspects of the production process, as presented in Table 3.

Table 3. Food Safety Deficiencies Based on GMP and SSOP Evaluation

Evaluation Aspect	Observation Findings	Potential Risk
Waste management	Open waste bins	Pest contamination
Drainage system	Open drainage channels	Microbial contamination
Utensil washing area	Limited washing infrastructure	Cross-contamination
Food handler hygiene	Inconsistent PPE usage	Biological contamination
Sanitation monitoring	No formal documentation	Inconsistent sanitation practices
Hygiene training	Limited periodic training	Low food safety awareness

Table 3 presents various food safety deficiencies identified through Good Manufacturing Practices (GMP) and Sanitation Standard Operating Procedures (SSOP) evaluations. These findings indicate that contamination risks in the evaluated setting do not stem from a single source, but rather result from interrelated weaknesses across physical infrastructure, worker behavior, and sanitation management systems (Jati et al., 2026).

In terms of physical infrastructure, the presence of open waste bins and open drainage channels indicates that basic facilities have not yet met adequate sanitation standards. This condition potentially creates entry points for disease vectors such as insects and rodents, leading to pest contamination, while also fostering an environment conducive to microbial growth due to standing water or organic waste accumulation in open drainage systems (Jati et al., 2026). Similarly, limited utensil washing infrastructure may increase the risk of cross-contamination, as cooking and eating utensils are at risk of not being cleaned hygienically due to facility constraints (Alghaniya & Fitriani, 2023).

In terms of worker behavior and compliance, inconsistent use of personal protective equipment (PPE) among food handlers was identified. This is a serious concern, as food handlers represent a critical control point for the spread of biological contamination through hand contact, hair, or respiratory droplets when basic hygiene procedures are not consistently followed (Hasan et al., 2026). This finding suggests a gap between written policy (if any exists) and actual daily operational practice.

In terms of management systems and documentation, the absence of formal sanitation monitoring documentation reflects weak ongoing oversight. Without a systematic documentation process, sanitation practices tend to be inconsistently implemented and difficult to evaluate over time (Putri et al., 2022). This is further compounded by limited periodic hygiene training, which contributes to low food safety awareness among workers. Discontinuous training can result in outdated or poorly internalized knowledge, particularly in the event of staff turnover (Tamimi & Pratama, 2023).

Overall, the pattern of findings in Table 3 demonstrates that food safety deficiencies are multidimensional, encompassing physical (infrastructure), human (behavior and competency), and managerial (documentation and oversight) dimensions. This implies that corrective interventions cannot focus on a single aspect alone, such as facility improvements, without also strengthening continuous training systems and consistent documentation/monitoring mechanisms. These findings are also relevant to the halal assurance and food safety integration framework discussed earlier (Figure 1), as weaknesses in GMP and SSOP implementation may amplify halal status uncertainty, for instance, through increased risk of cross-contamination between halal and non-halal materials or equipment resulting from inadequate sanitation and monitoring systems (Ali et al., 2026).

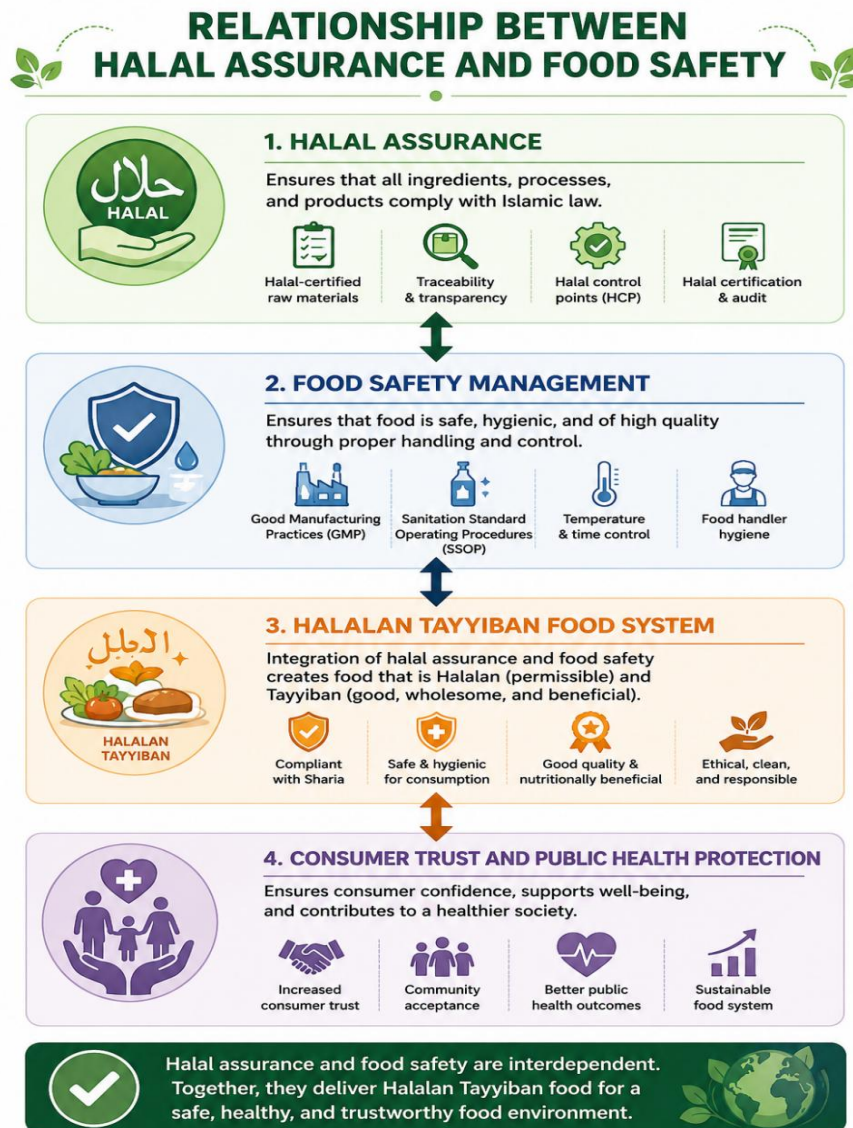


Figure 3. Relationship between Halal Assurance and Food Safety

Figure 3 demonstrates the conceptual relationship between halal assurance and food safety systems. The principle of “*halalan tayyiban*” emphasizes that food products should not only be religiously permissible but also safe, hygienic, nutritious, and wholesome for consumption (Mokti et al., 2022)

Characteristics of School Canteen Tenants

Three tenants participated in this study. Tenant 1 sold fried foods and rice-based dishes; Tenant 2 sold noodle dishes, fish cakes, and beverages; and Tenant 3 specialized in chicken soup. The tenants had operated within the school environment for 17–25 years, indicating strong integration with the school food culture.

Most food handlers possessed limited formal education, ranging from elementary to high school level (Siddiky et al., 2024). Similar findings have been reported in previous food safety studies involving small-scale food service establishments in Southeast Asia, where educational background often influences food hygiene knowledge and halal awareness (Kulpiisova et al., 2025; Zhang et al., 2026).

Long operational experience may improve practical food handling skills; however, it does not automatically guarantee compliance with modern food safety and halal assurance standards (Centonze et al., 2026). Continuous training remains necessary to improve knowledge and ensure consistent implementation (Chen et al., 2025).

Halal Assurance Practices

Halal Training and Awareness

The school had previously organized halal-related training with external institutions, including halal authorities and food safety agencies. Nevertheless, training remained infrequent and irregular. Food handlers demonstrated a basic understanding of prohibited ingredients but lacked deeper knowledge of halal traceability, halal-certified sourcing, and halal control points (Oksidriyani et al., 2026).

Several previous studies have emphasized that halal awareness among small food businesses is frequently constrained by limited access to training, complex certification procedures, and financial barriers. In this study, food vendors acknowledged the importance of halal certification but considered the process administratively demanding (Anggriani et al., 2024).

Periodic halal education programs are essential because halal assurance requires continuous implementation rather than a one-time compliance check. Strengthening halal literacy among food handlers may improve purchasing decisions, ingredient verification, and contamination prevention (Rahayu & Mardiyani, 2023).

Identification of Halal Control Points (HCP)

Plant-Based Ingredients

Plant-based ingredients accounted for the largest share of materials used in the canteen. Fresh vegetables, spices, and raw agricultural products generally appeared on the halal-positive list because they underwent minimal processing (Alzeer et al., 2025). However, several processed plant-based ingredients were identified as halal control points due to uncertain additives and processing aids. These ingredients included:

- Bulk sugar
- Processed noodles
- *Dawet*
- *Cincau* products
- Fish crackers
- Tofu products

Processed flour-based products were considered critical because flour manufacturing may involve the use of L-cysteine and vitamin coatings derived from non-halal sources (Mariyam et al., 2022). L-cysteine can be derived from animal or human hair, raising halal concerns when the source is unclear (Caballero Cerbon et al., 2024).

The noodle products used by Tenant 2 were among the most significant halal concerns identified in this study. The products lacked halal certification and were associated with food businesses selling non-halal menus (Arifyanto & Medan, 2026; Zaharani, 2025). Although cross-contamination was not directly observed, the absence of halal verification increased uncertainty regarding ingredient sourcing and processing (Sucipto et al., 2021).

These findings are consistent with previous halal traceability studies, which show that processed ingredients often become halal control points due to complex supply chains and insufficient transparency (Bux et al., 2022).

Animal-Based Ingredients

Animal-derived ingredients were associated with a higher halal risk than plant-based ingredients. Fresh chicken was identified as an HCP ingredient because vendors purchased poultry from traditional markets without halal slaughter certification (Khan et al., 2023).

In halal systems, the permissibility of meat products depends not only on animal species but also on slaughtering methods, handling, transportation, and storage (Abdallah et al., 2021). Improper slaughtering practices may render otherwise halal animals non-halal (Fathima et al., 2024).

Processed fish products, such as fish crackers and *pempek*, also exhibited halal criticality because their supporting ingredients, flavor enhancers, and flour components lacked verified halal certification (Pratiwi & Purwanto, 2024; Sartono et al., 2026).

The findings indicate that halal assurance challenges in small food service establishments are often associated with upstream supply chain constraints rather than intentional non-compliance. Small vendors commonly prioritize affordability and availability over certification status (Dewi & Rahmawati, 2026; Khan et al., 2023).

Other Supporting Ingredients

Several supporting ingredients, such as vinegar and baking powder, were categorized as halal critical due to potential fermentation and chemical processing concerns. Nevertheless, the products used by the tenants already possessed halal certification (Faizah et al., 2024; Permadi et al., 2026).

This demonstrates that halal-certified alternatives for supporting ingredients are increasingly accessible in Indonesia. However, awareness and verification practices remain inconsistent among small food businesses (Rofiah et al., 2024).

Comparison of Halal Control Point Proportions

Tenant 2 exhibited the highest percentage of HCP ingredients (20.67%), followed by Tenant 3 (9.52%) and Tenant 1 (9.09%). The higher proportion observed in Tenant 2 was strongly associated with intensive use of processed commercial products.

Foods that require multiple processed ingredients generally have higher halal traceability complexity, as each ingredient may contain additives, emulsifiers, stabilizers, or processing aids sourced from uncertain origins (Mariyam et al., 2022).

The noodle and mixed-ice beverage products sold by Tenant 2 illustrate how traditional foods can become halal-critical due to industrial processing and ingredient modification.

Food Safety Practices

Good Manufacturing Practices (GMP)

The canteen demonstrated several positive GMP aspects, including:

- Adequate natural lighting
- Separation between food preparation and customer areas

- Relatively organized food production flow
- Separate washing facilities

However, important deficiencies remained.

Open waste bins were still in use in several areas, increasing contamination risk from pests and airborne contaminants (Arum Sari et al., 2024). Drainage channels near food preparation areas were also partially open, posing a potential microbial hazard (Ali et al., 2026).

Improper drainage systems may contribute to water stagnation, odor accumulation, insect breeding, and bacterial growth (Issa-Zacharia & Said Seif, 2023). Similar sanitation deficiencies have been identified in other school canteen studies in developing countries (Matela et al., 2026).

Food handler hygiene practices also varied among tenants. Although basic cleanliness was maintained, consistent use of personal protective equipment, such as gloves, aprons, and hair covers, was limited. Basic hygiene is often maintained. The use of PPE by food handlers is often not consistent. A pattern shows up: many studies say that hands, fingernails, work uniforms, and work areas look fairly clean (Hasan et al., 2026). The use of gloves, aprons, masks, and hairnets remains low or inconsistent. This shows that food handler hygiene practices differ across tenants. The literature says that while basic hygiene often looks good, the use of PPE gloves, aprons, and hairnets remains a regular weak spot (Licata et al., 2024).

The absence of routine hygiene monitoring and periodic health examinations may increase the risk of microbial contamination. Systematic microbiological monitoring helps keep food safe in catering (Lupattelli et al., 2023). It helps identify and manage contamination risks. Just having operating procedures or HACCP documents is not enough. The real test is how well these procedures are followed in practice. Regular checks on how work's done are more important than simply having the paperwork. Without field execution and evaluation, control points may not be truly under control (Bittsánszky et al., 2026).

The bigger picture shows that food safety does not rely on a single factor. Training, good manufacturing practices, personal hygiene, and safety management all need to work (Mohammad & Ahmad, 2024). They cannot function alone. In developing countries, problems often start with monitoring, weak supervision, and a lack of proper facilities. These gaps cause food contamination. When there are no inspections, already weak systems become even worse. The lack of oversight makes it harder to catch problems early (Chawla et al., 2023).

Sanitation Standard Operating Procedures (SSOP)

SSOP implementation in the school canteen remained suboptimal. Approximately 30% of the evaluated indicators failed to meet the expected standards. The main non-compliance findings included:

- Open drainage systems
- Inadequate waste management
- Limited sanitation documentation
- Insufficient utensil washing infrastructure
- Lack of structured sanitation schedules

Sanitation management is critical in small-scale food service systems because microbial contamination frequently occurs through environmental exposure and inadequate equipment cleaning. The implementation of Sanitation Standard Operating Procedures in school canteens remains poor, with 30 percent of indicators showing non-compliance. This finding aligns with

studies on school canteen hygiene and sanitation, especially in developing countries (Denis et al., 2026). The main problems are drainage, poor waste management, inadequate washing facilities, missing written sanitation procedures, and unclear sanitation schedules. The lack of sanitation documentation is a major weakness because Sanitation Standard Operating Procedures are needed to train staff, implement rules, and ensure regular sanitation (Ferreira et al., 2022). When Sanitation Standard Operating Procedures are missing, the risk of contamination increases from the environment, food handlers' hands, food-contact surfaces, and poorly cleaned equipment. In elementary school canteens in Nganjuk, research found that handler hygiene, equipment cleanliness, food-service practices, and vendor facilities are linked to *E. coli* contamination in food (Arum Sari et al., 2024). Similar results were seen in Ethiopia, where 14.4 percent of school food samples did not meet standards and 23.4 percent of drinking water samples were unsafe (Tamiru et al., 2024).

These risks matter a lot because school children are very vulnerable to illnesses, such as food poisoning and diarrhea (Denis et al., 2026; Ling Song Jing et al., 2026). In Sudan, a study even reported that 19 percent of students had suffered an illness. In short, the 30 percent non-compliance rate for drainage, waste, documentation, equipment washing, and sanitation schedules matches what other studies show. It creates a real risk of microbes in the food that schoolchildren eat (Abuagla & Omer, 2025).

Relationship Between Halal Assurance and Food Safety

This study demonstrated that halal assurance and food safety are strongly interconnected (Wahyuni et al., 2024). The concept of *halalan tayyiban* emphasizes not only religious permissibility but also hygienic, safe, and wholesome food production (Awang, 2021). The concept of *halalan tayyiban* consistently involves safety, hygiene, quality, and authenticity. It goes beyond simple Sharia permissibility (Kamaruddin et al., 2023).

Several identified halal control points also corresponded with food safety concerns. In the poultry supply chain, critical halal control points are directly linked to slaughtering, storage temperatures, traceability, biosecurity, and contamination prevention (Wahyuni et al., 2024; Khamnurak, 2025). Slaughter is a primary critical point for Halal compliance, and one study on chicken slaughter found that only 50% of the operations met the criteria for Halal assurance standards (Hammam, 2022). The cold chain emerges as a Critical Control Point (CCP) alongside knife sharpness, and the absence of cold storage facilities is considered to compromise both halal integrity and food safety (Hapsari et al., 2025; Wahyuni et al., 2024).

Similarly, inadequate sanitation infrastructure may increase contamination risks, affecting both food safety and halal integrity. Inadequate sanitation and infrastructure can increase contamination risk. In a halal context, this risk also endangers product integrity. It can happen through contact with unclean items in Islamic religious contexts or *najis*. It can also occur from commingling with non-halal items or from unhygienic handling practices. All of these factors can compromise the purity and safety of halal products (Ali et al., 2026).

Integrating the halal assurance system with food safety management indeed provides a more comprehensive framework. The most consistent evidence supports increased consumer confidence, strengthened public health protection, and support for a sustainable halal ecosystem, although direct implementation in institutional food services still requires broader testing (Puspaningtyas et al., 2026).

Implications for School Food Services

The findings of this study provide practical implications for school canteen management and policymakers. First, schools should encourage vendors to gradually transition toward halal-certified ingredients, especially for processed foods and animal-derived products. Second, schools should institutionalize periodic training programs on halal assurance, hygiene, and sanitation. Third, infrastructure improvements such as closed waste bins, improved drainage systems, and standardized washing stations are necessary. Finally, collaborative partnerships among schools, halal authorities, local governments, and universities may accelerate the development of safer, halal-compliant school canteens.

Limitation

This study has several limitations. Ingredient sourcing and halal verification relied on self-reported vendor interviews rather than documentary evidence (e.g., purchase receipts or supplier halal certificates), introducing potential recall and information biases. Future studies should employ objective measures, such as mock recall tests or purchase log audits, to better assess canteen traceability. Nonetheless, identified challenges such as reliance on informal suppliers, limited food safety training, and spatial constraints remain characteristic of small-scale school canteens, supporting the broader relevance of our findings.

CONCLUSIONS

This study demonstrated that halal control points and food safety deficiencies remained in the school canteen at SMA X. Tenant 2 exhibited the highest proportion of halal critical ingredients due to intensive use of processed commercial products without verified halal certification. Major halal concerns involved poultry sourcing, processed noodle products, fish-based products, and traditional beverage components.

The food safety evaluation also revealed several shortcomings in sanitation infrastructure, waste management, drainage systems, and hygiene practices. Approximately 30% of food safety indicators did not comply with GMP and SSOP standards.

Despite these limitations, the canteen showed relatively good facility organization and a low risk of direct contamination with non-halal materials. Strengthening procurement of halal-certified ingredients, improving sanitation systems, and implementing regular food safety and halal training are essential to support sustainable halal assurance in school food services.

Integrating halal traceability and food safety management can contribute significantly to healthier, safer, and more trustworthy school food environments. These findings illustrate the practical challenges of halal traceability and food safety implementation observed in this case, which may offer insights applicable to school canteens with similar operational and institutional characteristics.

Future research is recommended to reassess halal traceability status in similar school canteen settings following the full implementation of Indonesia's mandatory halal certification policy, to evaluate the extent to which regulatory enforcement has improved ingredient traceability and certification compliance at the tenant level.

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