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Original Research

EVALUATION OF SANITATION STANDARD OPERATING PROCEDURES (SSOP) IMPLEMENTATION IN READY-TO-EAT HOME FOOD INDUSTRIES

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ABSTRACT

Evaluation of Sanitation Standard Operating Procedures (SSOP) Implementation in Ready-to-Eat Home Food Industries. *Home-based food industries play an important role in food supply but often face challenges in implementing food safety standards. This study aimed to evaluate the implementation of Sanitation Standard Operating Procedures (SSOP) in a ready-to-eat home-based food industry in Banjarbaru City. A descriptive mixed-methods approach was employed using direct observation, in-depth interviews, and questionnaires to assess compliance with eight SSOP aspects and identify factors affecting implementation. The results showed that the average SSOP implementation rate was only 44.3%, indicating substantial gaps in sanitation practices. The highest compliance was observed for cleanliness of food-contact surfaces (62.5%), followed by handwashing, hand sanitation, and toilet facilities (57.2%). In contrast, cross-contamination prevention showed the lowest compliance (28.6%), while employee health control and pest management each reached only 33.3%. Major deficiencies included the absence of routine bacteriological water monitoring, inadequate cross-contamination control procedures, improper chemical storage, lack of employee health monitoring, and insufficient pest control documentation. Limited knowledge, inadequate facilities, insufficient trained personnel, and weak monitoring were identified as important barriers to SSOP implementation. These findings indicate that sanitation practices have not yet been systematically integrated into food production operations. Strengthening training, sanitation infrastructure, routine monitoring, and documented corrective actions is therefore essential to improve SSOP compliance and food safety in home-based food industries.*

INTRODUCTION

Ready-to-eat home-based food industries play an important role in urban food systems by providing readily accessible and relatively affordable food products while contributing to local economic development. However, the growth of home-based food enterprises is not always accompanied by adequate implementation of food safety management systems. Their predominantly informal nature, limited resources, and suboptimal implementation of Good Manufacturing Practices (GMP) and Good Hygiene Practices (GHP) make these enterprises particularly vulnerable to microbiological contamination[1–3]. Several studies have demonstrated that foods produced in home-based settings may be contaminated with *Escherichia coli*, *Staphylococcus aureus*, *Salmonella*, and other indicator microorganisms[4,5]. Across various international settings, inadequate personal hygiene, poor environmental sanitation, and insufficient cross-contamination prevention have also been identified as important factors contributing to increased food safety risks in small-scale and home-based food enterprises[1–3,6,7].

The primary concern in home-based food industries extends beyond the potential presence of contaminants to the inconsistent implementation of standardized and documented sanitation procedures. Many small-scale food enterprises continue to conduct production activities based largely on practical experience and routine working practices; consequently, sanitation monitoring, corrective actions, and contamination prevention are not systematically implemented[1,2]. This issue is particularly critical for ready-to-eat foods, which are generally consumed without further processing that could reduce microbiological hazards. Inadequate production facilities, layouts that do not provide appropriate separation between raw materials and finished products, and insufficient control of worker hygiene further increase the potential for cross-contamination.

One approach to controlling these risks is the implementation of Sanitation Standard Operating Procedures (SSOP). SSOP are documented sanitation procedures that govern hygiene and sanitation practices before, during, and after food production and constitute an essential component of food safety management systems. SSOP complement GMP and GHP and support the effectiveness of Hazard Analysis and Critical Control Points (HACCP)[1,6,8]. Operationally, SSOP encompass eight major aspects: water safety, cleanliness of food-contact surfaces, prevention of cross-contamination, maintenance of handwashing and toilet facilities, protection from contaminants, proper labeling and storage of chemicals, employee health control, and pest control[9].

Evidence indicates that consistent SSOP implementation can improve hygiene practices, minimize cross-contamination, and enhance food safety. In small-scale food enterprises, food safety training and strengthened sanitation practices have been reported to improve worker compliance and reduce indicators of microbiological contamination[1,10]. The cleanliness of food-contact surfaces is also particularly important because equipment and working surfaces may serve as microbial reservoirs and facilitate pathogen transfer when inadequately cleaned and sanitized[3,8,11]. Nevertheless, successful SSOP implementation is strongly influenced by management commitment, worker competence, availability of training, effective supervision, and adequate sanitation facilities[1,2,12]. Constraints related to production space, handwashing facilities, material storage, and other supporting infrastructure may further impede optimal SSOP implementation[13–15].

Although previous studies have addressed hygiene, sanitation, and contamination in small-scale food enterprises, an important gap remains in evaluations that systematically assess all eight SSOP aspects at the individual parameter level in ready-to-eat home-based food industries, particularly within local urban settings. Existing studies have predominantly focused on the presence of contaminants or food-handler behavior, whereas evidence regarding which SSOP components exhibit the greatest compliance deficiencies and which internal factors contribute to non-compliance remains limited[2]. Addressing this gap is important because a structured assessment can identify specific intervention priorities more effectively than a general evaluation of hygiene conditions alone.

Against this background, this study aimed to evaluate SSOP implementation in a ready-to-eat home-based food industry in Banjarbaru City through a case study of Home-Based Food Industry “X” in Banjarbaru. The study assessed the implementation levels of eight SSOP aspects, identified compliance gaps within each aspect, and examined internal factors influencing their implementation. The principal contribution of this study lies in providing a parameter-based assessment of SSOP implementation that can serve as an empirical basis for

risk-based supervision, prioritization of corrective measures, and strengthening of food safety management in ready-to-eat home-based food industries.

MATERIALS AND RESEARCH METHODS

This study employed a descriptive design using a mixed qualitative and quantitative approach to evaluate the implementation of Sanitation Standard Operating Procedures (SSOP) in ready-to-eat home-based food industries in Banjarbaru City. The mixed-methods approach was used to provide a comprehensive assessment of actual sanitation practices, compliance with SSOP requirements, and factors influencing their implementation. This approach enabled quantitative data on SSOP implementation levels to be interpreted alongside qualitative information describing field conditions and barriers to implementation.
The study population comprised home-based food industries in Banjarbaru City that had obtained a Home-Based Food Production Certificate (SPP-IRT). The sample was selected using purposive sampling based on the following eligibility criteria: producing ready-to-eat foods, possessing a valid business license, and having operated for at least one year. The primary variable was the level of SSOP implementation, assessed across eight operational sanitation aspects: water safety, cleanliness of food-contact surfaces, prevention of cross-contamination, maintenance of handwashing and toilet facilities, protection from contaminants, proper labeling and storage of chemicals, employee health control, and pest control. The assessment was conducted using a checklist based on SSOP and Good Manufacturing Practices principles.
Data were collected through direct observation, in-depth interviews, and questionnaires. Direct observation was conducted to assess facility conditions and actual sanitation practices throughout the production process. In-depth interviews with the owner and workers were undertaken to explore their understanding of SSOP, routine work practices, supervision mechanisms, and barriers to sanitation implementation. Questionnaires were used to obtain quantitative data on respondents' levels of compliance with and understanding of SSOP. The three data collection methods were used concurrently to facilitate data triangulation and enhance the consistency of result interpretation.
Quantitative data were analyzed using descriptive statistics by calculating the percentage of implementation and the compliance gap for each SSOP aspect. Qualitative data were analyzed using thematic analysis, involving a review of interview and observational data, grouping information according to similarities in meaning, identifying major themes, and interpreting factors influencing SSOP implementation. The emerging themes primarily concerned knowledge, facility limitations, workforce capacity, supervision, and work practices. The qualitative findings were subsequently integrated with the quantitative results to explain the factors underlying high or low compliance levels across the SSOP aspects. Thus, the qualitative evidence was used to strengthen and contextualize the compliance percentages obtained from the quantitative assessment.

Figure 1. Scope of SSOP for the Home-Based Food Industry

RESEARCH RESULTS AND DISCUSSION

Production Flow of the Home-Based Food Industry

Home-Based Food Industry "X" in Banjarbaru is a ready-to-eat home-based food enterprise operating in Banjarbaru City and was selected as the study site to evaluate the implementation of Sanitation Standard Operating Procedures (SSOP). The enterprise has been operating since 2000. Production activities are conducted daily from 06:00 to 17:00 Central Indonesian Time (WITA) and may be extended until 22:00 WITA when order volumes increase. Production is carried out routinely by eight workers in the production section, all of whom are male, with most having completed senior high school education.

The products consist primarily of sweet bread with various shapes and toppings. The highest daily production volumes are for roti boy and sweet bread, at 140 pieces each per day, followed by chocolate-sprinkle square bread at 64 pieces, braided bread at 60 pieces, pull-apart bread and rolled bread at 50 pieces each, and bread sticks at 40 pieces. These production characteristics indicate continuous processing activities involving multiple stages of raw-material and product handling.

Table 1. Types and daily production volumes of bread products at Home-Based Food Industry "X" in Banjarbaru

No.	Bread Type	Daily Production (pieces/day)
1	Roti Boy	140
2	Sweet Bread	140
3	Chocolate-Sprinkle Square Bread	64
4	Braided Bread	60
5	Pull-Apart Bread	50
6	Rolled Bread	50
7	Bread Sticks	40

The production facility consists of a single production room used for raw-material storage, processing, packaging, and packaging-material storage. Clear physical separation between these areas is not yet available. The main equipment includes three mixers, three ovens, one steamer, one freezer, three production tables, one digital scale, one dough divider, 100 baking trays, one bread knife, two cheese graters, and two brushes.

Table 2. Production equipment used at Home-Based Food Industry "X" in Banjarbaru

No.	Equipment/Facility	Quantity	Function
1.	Mixer	3 units	Used to mix and knead bread dough
2.	Oven	3 units	Used to bake bread
3.	Steamer	1 unit	Used to support dough expansion
4.	Freezer	1 unit	Used to store ingredients
5.	Production table	3 units	Used for shaping dough during production
6.	Digital scale	1 unit	Used to measure the weight of ingredients
7.	Dough divider	1 unit	Used to divide dough evenly
8.	Baking trays	100 units	Used as trays during baking
9.	Bread knife	1 unit	Used to cut bread manually
10.	Cheese grater	2 units	Used to grate cheese
11.	Brush	2 units	Used to brush bread with butter

The production process begins with planning the required ingredients, production costs, and processing time, followed by processing stages until the products are ready for distribution to customers. The production flow is presented in Figure 2.

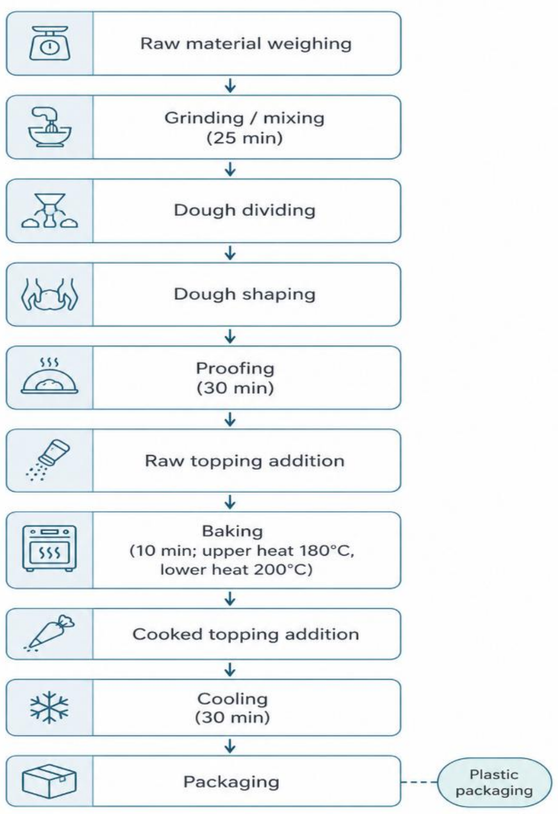

Figure 2. Production flow diagram for bread at Home-Based Food Industry "X" in Banjarbaru

SSOP Implementation at Home-Based Food Industry "X" in Banjarbaru

SSOP implementation was evaluated across eight sanitation aspects. The results showed that implementation levels varied across aspects, and compliance gaps remained in all assessed components.

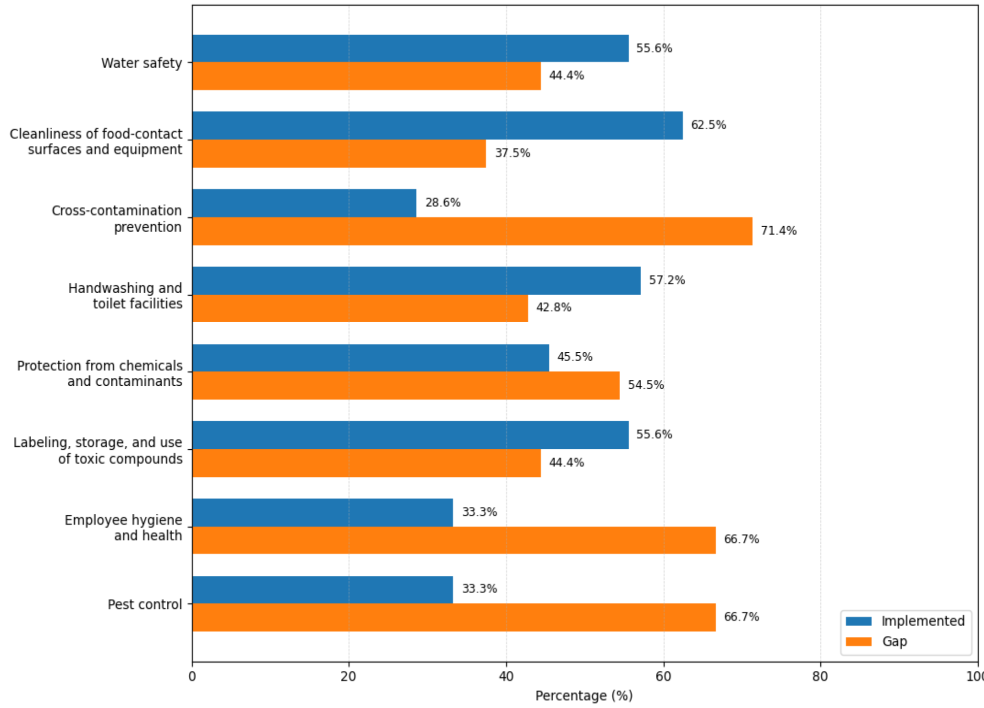

Figure 3. Assessment results

Water Safety

The water safety aspect was assessed using nine parameters. The implementation level reached 55.6%, while the compliance gap was 44.4%. Water used in food production was obtained from a refill drinking-water depot, whereas water used for cleaning and other non-production purposes was supplied by the municipal water utility (PDAM). No physical problems with the water were identified during observation. Clean-water and non-clean-water piping systems were separated. However, bacteriological water-quality testing was not conducted routinely, and no periodic water-quality monitoring system was in place.

Cleanliness of Food-Contact Surfaces

This aspect showed the highest implementation level, at 62.5%, with a 37.5% gap across the eight assessed parameters. Production equipment that came into direct contact with food was generally in good condition and cleaned routinely. Specific personnel had been assigned responsibility for cleaning. However, sanitation activities did not cover all food-contact media, particularly workers' gloves. Disposable gloves were observed to be reused. Cleaning activities were also not monitored routinely, and sanitation records were unavailable.

Prevention of Cross-Contamination

Cross-contamination prevention was the aspect with the lowest implementation level. Of the 14 parameters assessed, only 28.6% were implemented, while the gap reached 71.4%. Potential sources of cross-contamination were identified among food handlers, within the production-room environment, and in raw-material storage. Storage, processing, and packaging areas were not clearly separated. In addition, no specific written procedure for preventing cross-contamination was available, and corrective actions were not systematically implemented when deviations were identified.

Maintenance of Handwashing, Hand Sanitation, and Toilet Facilities
Of the seven parameters assessed, implementation reached 57.2%, with a 42.8% gap. Handwashing and toilet facilities were available and were generally maintained in clean condition. However, no specific awareness activities concerning facility maintenance had been conducted, and there were no routine monitoring procedures or documentation of cleaning and sanitation activities for these facilities.

Protection from Contaminants
For protection from contaminants, implementation reached 45.5%, while the gap was 54.5% across 11 assessed parameters. Non-food materials were still found in the production room and had not been placed in a dedicated storage area. Some were located close to food ingredients and packaging materials. Control over the presence and placement of non-food materials during production was also not implemented consistently.

Proper Labeling and Storage of Chemicals
The implementation level for chemical labeling and storage was 55.6%, with a 44.4% gap across nine parameters. Chemicals generally had labels on their packaging and were used according to the available instructions. However, chemicals were not stored in a dedicated area and were not systematically categorized. No designated worker was responsible for chemical management, and no records were available regarding chemical handling, labeling, or storage.

Employee Health Control
Employee health control had an implementation level of 33.3%, with a 66.7% gap across six parameters. Periodic health examinations had not been conducted, and workers' health-history records were unavailable. Personal hygiene practices were also inconsistent, including the use of work-related protective equipment during production activities.

Pest Control
Pest control also had an implementation level of 33.3%, with a 66.7% gap across 15 parameters. The physical condition of the production room still allowed pest entry. Some parts of the building were not equipped with adequate barriers to prevent the entry of flies, cockroaches, or rodents. Pest-control activities were not conducted routinely, no designated person was responsible for pest management, and monitoring and documentation of pest-control activities were unavailable.
A summary of SSOP implementation at Home-Based Food Industry "X" in Banjarbaru is presented in Table 3.

Table 3. Summary of SSOP implementation at Home-Based Food Industry "X" in Banjarbaru

No.	SSOP Aspect	Number of Parameters	Percentage (%)	
			Implementation	Gap
1.	Water Safety	9	55,6	44,4
2.	Cleanliness of Food-Contact Surfaces	8	62,5	37,5
3.	Prevention of Cross-Contamination	14	28,6	71,4
4.	Maintenance of Handwashing, Hand Sanitation, and Toilet Facilities	7	57,2	42,8
5.	Protection from Contaminants	11	45,5	54,5
6.	Labeling and Storage of Chemicals	9	55,6	44,4
7.	Employee Health Control	6	33,3	66,7
8.	Pest Control	15	33,3	66,7
	Average		44,3	55,7

The findings indicate that the implementation of Sanitation Standard Operating Procedures (SSOP) at Home-Based Food Industry "X" in Banjarbaru remains suboptimal, with an average implementation rate of 44.3% and a compliance gap of 55.7%, as presented in Table 3. This result indicates that more than half of the sanitation parameters assessed had not been implemented in accordance with the required standards. This condition is consistent with several studies on small-scale and home-based food enterprises, which have reported that SSOP and GMP implementation is often only partial. Limited sanitation facilities, insufficient training, and weak supervisory mechanisms have repeatedly been identified as major barriers to achieving full compliance[1,2,6,24,33,34].

The implementation pattern observed in this study also shows that technical and readily observable aspects tend to achieve higher compliance than aspects requiring more systematic control. Cleanliness of food-contact surfaces reached 62.5%, representing the highest level of compliance, whereas cross-contamination prevention reached only 28.6%. Employee health control and pest control were also low, each at 33.3%. Similar patterns have been reported in previous studies, showing that small-scale enterprises tend to be more consistent in performing visible cleaning activities, while documentation, monitoring, verification, and control of worker behavior are often less adequately implemented[35–39]. This suggests that SSOP has not yet been fully adopted as an integrated sanitation management system.

Poor compliance with SSOP has direct implications for the increased potential for microbiological, chemical, and physical contamination in ready-to-eat foods. The literature shows that weak implementation of SSOP and GMP is associated with higher levels of surface contamination, reduced cleaning effectiveness, and a greater likelihood of microorganisms being present in food-processing environments[40–42]. This risk becomes even more important when biofilms develop on food-contact surfaces, as established microbial communities may survive routine cleaning procedures and become persistent sources of repeated contamination[21,42,43].

Cross-contamination prevention emerged as the most critical finding in this study. The low level of implementation in this aspect was associated with the absence of clear separation between production areas, shared use of equipment, and inconsistent worker hygiene practices. In food-processing environments, workers' hands, equipment, and working surfaces are important vehicles for the transfer of microorganisms from raw materials or the environment to ready-to-eat products[10,44–47]. The use of the same production space for storage, processing, and packaging may further increase opportunities for cross-contact. Therefore, the low score in this aspect reflects not merely administrative non-compliance, but rather inadequate control of contamination pathways throughout the production process.

Water safety also requires particular attention because routine bacteriological quality monitoring has not been implemented. Although the water source was considered physically acceptable, the absence of microbiological verification means that its safety cannot be objectively assured. Water is used extensively in production and sanitation activities, making its quality a key determinant of contamination control effectiveness. The literature indicates that contaminated water may act as a vehicle for microbial dissemination and may exacerbate cross-contamination within food-processing environments[23,24,48–50]. Therefore, routine water testing should form part of SSOP verification rather than relying solely on assumptions regarding the safety of the water source.

Compliance with food-contact surface cleanliness was relatively higher than with other SSOP components. However, the reuse of disposable gloves and the absence of routine sanitation monitoring were still observed. This is important because surfaces and materials that directly contact food may act as microbial reservoirs if they are not cleaned, sanitized, or replaced according to established procedures. The literature indicates that poorly managed food-contact surfaces can serve as persistent sites for bacteria and biofilms, thereby increasing the likelihood of recurrent product contamination[1,2,33]. Consequently, the relatively high compliance level in this aspect should not be regarded as adequate in the absence of effective verification and documentation systems.

Low compliance with employee health control was another important finding. The absence of periodic health examinations and employee health records indicates that worker health has not yet been fully integrated into the food safety control system. However, the literature emphasizes that worker health status and personal hygiene are closely associated with the risk of pathogen introduction into food products and processing environments[1,6,20]. This limitation is particularly relevant in small-scale food enterprises, where production processes often rely heavily on manual handling and direct worker contact with food, making employee behavior a critical determinant of product safety.

Pest control also demonstrated a low level of compliance. Structural conditions that still permit pest entry, the absence of routine monitoring, and inadequate documentation indicate that pest control remains largely reactive. Pests can carry microorganisms, contaminate food materials and products through excreta, and damage packaging. Effective pest management requires a combination of environmental improvement, entry prevention, monitoring, and documented corrective actions[3,28,30,32,33]. These findings indicate that pest control at Home-Based Food Industry “X” in Banjarbaru should shift from an incidental approach toward a more preventive and systematic system.

The interview findings further showed that inadequate SSOP implementation was influenced by limited knowledge, restricted financial resources, insufficiently trained workers, and inadequate production facilities. These findings are consistent with the literature identifying resource limitations as major structural barriers in small-scale food enterprises[1,2,33]. Business operators often prioritize production continuity and distribution over investment in documentation, training, and sanitation infrastructure. As a result, food safety practices that are operationally important are implemented inconsistently and are often not formally documented.

A gap between knowledge and practice was also evident in this study. Awareness of the importance of cleanliness was not always translated into consistent operational procedures. This phenomenon has been reported in various studies of informal food sectors, where food operators may possess basic hygiene knowledge but still experience difficulties in implementation due to limited facilities, established work habits, and insufficient supervision[1,28,33,34]. Therefore, increasing knowledge alone is unlikely to be sufficient unless it is accompanied by changes in the working environment and stronger supervisory mechanisms.

Physical facility limitations were also important determinants of SSOP implementation. Production areas that are not clearly separated between raw material handling, processing, and finished-product zones increase opportunities for cross-contamination. This condition is common among small-scale food enterprises operating within limited spaces and without facility layouts designed according to food safety principles. Previous studies have shown that inadequate facility layout can impede sanitation procedures and increase contamination risks at multiple stages of food production[1,33,51,52].

The interventions required should therefore be integrated. Continuous training can improve worker knowledge and skills, but its effectiveness is likely to be greater when supported by written procedures, routine monitoring, and periodic evaluation[1,3,33,53,54]. Internal audits and sanitation documentation can help ensure that deviations are promptly identified and corrective actions are consistently implemented. Integrating SSOP with GMP and HACCP may further strengthen food safety management by placing each sanitation component within a more systematic risk-control framework[1,2,6,10,11,33].

Facility improvement also remains essential, particularly in relation to handwashing facilities, separation of production zones, chemical storage, and pest-entry prevention. In small-scale enterprises, improvements may be implemented gradually by prioritizing the highest-risk areas, especially cross-contamination prevention, worker health control, and pest management[1,33,51,52]. Regulatory support and technical assistance are also needed to enable resource-constrained food enterprises to meet the required standards. The literature suggests that a combination of regulation, capacity building, and technical support can accelerate improvements in sanitation compliance among small-scale food businesses[7,17,23,25,31,47,55,56].

CONCLUSIONS AND RECOMMENDATIONS

This study demonstrates that the implementation of Sanitation Standard Operating Procedures (SSOP) at Home-Based Food Industry "X" in Banjarbaru remains inadequate, with an average implementation rate of 44.3% and a compliance gap of 55.7%. The highest compliance level was observed for cleanliness of food-contact surfaces at 62.5%, whereas cross-contamination prevention showed the lowest compliance at 28.6%. Employee health control and pest control also demonstrated low compliance levels, each reaching only 33.3%. The inadequate implementation of SSOP was mainly influenced by limited knowledge, insufficient numbers of trained workers, inadequate production facilities, and weak monitoring and documentation systems.

It is recommended that the management of home-based food industries strengthen SSOP implementation through regular training, the development of written procedures, improvement of sanitation facilities, and routine monitoring and documentation. Priority improvements should focus on cross-contamination prevention, employee health control, water safety, and pest management. Future research should incorporate microbiological testing to assess the relationship between the level of SSOP compliance and food safety quality.

ETHICAL APPROVAL

This study did not require formal ethical approval because it did not involve clinical interventions, collection of sensitive personal data, or procedures that posed risks to participants. Data were obtained through observation, interviews, and questionnaires related to the implementation of sanitation practices in a home-based food industry.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest related to this study.

AUTHOR CONTRIBUTIONS

R: conceptualization, methodology, and study design; E and FIH: data collection, investigation, and statistical analysis; MP: manuscript preparation, literature review, and critical revision of the manuscript. All authors read and approved the final manuscript.

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