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ORIGINAL ARTICLE

Assessment of Kitchen Feasibility Based on Hygiene–Sanitation Aspects and Food Microbiological Quality at Nutrition Fulfillment Service Units (SPPG) in Kediri Regency, East Java, Indonesia

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ABSTRACT

Background: Food safety is a crucial aspect in the implementation of nutrition fulfillment services. Kitchens at the Nutrition Fulfillment Service Units (Satuan Pelayanan Pemenuhan Gizi/SPPG) play an important role in providing safe, high-quality, and consumable food. This study aimed to assess kitchen feasibility based on hygienic–sanitation aspects and the microbiological quality of food at SPPG in Kediri Regency, East Java, Indonesia. **Methods**: This study employed a descriptive observational design with a cross-sectional approach. The study sample consisted of all SPPG operating in Kediri Regency, selected using a total sampling technique. Data were collected through direct observation using a hygienic–sanitation checklist, short interviews, and microbiological examination of ready-to-eat food, including Total Plate Count (TPC), Escherichia coli, and Salmonella sp. Data were analyzed descriptively and compared with applicable standards. **Results**: The average hygienic–sanitation score of SPPG kitchens was 77%, which was categorized as feasible. The lowest scoring aspect was food handlers' hygiene, which had not yet optimally met the required standards. Microbiological analysis indicated that all food samples met food microbiological quality standards, with TPC values below the permissible limits and no contamination by E. coli or Salmonella sp. detected. **Conclusion**: SPPG kitchens in Kediri Regency are generally feasible based on hygienic–sanitation aspects and microbiological food quality. However, improvements in food handlers' hygiene through continuous training and supervision are necessary to ensure food safety.

Keywords: SPPG, hygiene and sanitation, microbiological quality, food safety

INTRODUCTION

Community nutrition fulfillment is one of the main priorities in national health development. This effort is implemented through various nutrition intervention programs carried out by the government, one of which is the Nutrition Fulfillment Service Unit (Satuan Pelayanan Pemenuhan Gizi / SPPG). SPPG is responsible for providing food that is not only nutritious but also safe and suitable for consumption as part of improving public health status (Ministry of Health of the Republic of Indonesia, 2020; WHO, 2015).

The kitchen plays an important role in ensuring food safety. Inadequate implementation of hygiene and sanitation practices can increase the risk of microbiological contamination in food, which may lead to foodborne diseases. Microorganisms such as Escherichia coli and Salmonella are commonly used as indicators of food safety and are often associated with poor hygiene practices among food handlers and unsanitary food processing environments (FAO & WHO, 2011; Jay et al., 2005). The application of proper hygienic–sanitation standards in food processing areas is essential to prevent health risks.

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Kediri Regency has several SPPGs that actively provide nutrition services to the community. However, comprehensive data regarding the hygienic–sanitation conditions of kitchens and the microbiological quality of the food produced are still limited. The lack of such data may hinder monitoring and quality improvement efforts in nutrition services. Therefore, this study was conducted to provide an empirical overview of the hygienic–sanitation conditions of SPPG kitchens and the microbiological quality of food as a basis for evaluation and improvement of food safety practices.

Food safety refers to the conditions and measures required to prevent food from biological, chemical, and physical contamination that may endanger human health. According to the WHO, food safety is the assurance that food will not cause harm to the consumer when it is prepared and/or consumed according to its intended use (WHO, 2022). In the context of institutional food services, food safety is a fundamental aspect because food is produced in large quantities and consumed by vulnerable target groups, making strict control of hygiene and sanitation essential.

Food safety is influenced by the entire food service chain, including food selection, storage, processing, transportation, and serving. Failure to implement food safety principles may result in foodborne diseases, which can lead to increased morbidity, decreased productivity, and a greater burden on health care systems (FAO, 2022; WHO, 2022). Foodborne diseases remain a major public health problem globally, particularly in low- and middle-income countries, where institutional food services often face limitations in infrastructure and supervision (WHO, 2022).

Food hygiene and sanitation are efforts to control risk factors that may lead to food contamination. Food hygiene is related to personal cleanliness, particularly that of food handlers, while sanitation refers to the cleanliness of the environment, buildings, equipment, and supporting facilities used in food processing. Food hygiene and sanitation aim to produce food that is safe, of good quality, and suitable for consumption (WHO, 2022; FAO, 2022).

The implementation of food hygiene and sanitation involves controlling four main components, namely food ingredients, food handlers, equipment, and the processing environment. If one of these components does not meet the required standards, the risk of food contamination will increase, which may compromise food safety and public health (FAO, 2022; Codex Alimentarius Commission, 2023).

Kitchen feasibility refers to the condition of a kitchen that meets technical and health requirements for food processing activities. A feasible kitchen must be properly designed and managed to prevent cross-contamination and to support the implementation of hygiene and sanitation practices. Proper kitchen design is a critical component of food safety management systems, particularly in institutional food services where large-scale food production is conducted (WHO, 2022; Codex Alimentarius Commission, 2023).

The requirements for kitchen feasibility include building structure, layout, floors, walls, ceilings, ventilation, lighting, clean water supply, waste disposal systems, and facilities for handwashing and equipment cleaning. Kitchen layout should allow a one-way workflow, starting from raw materials to cooked food, in order to minimize the risk of cross-contamination and ensure safe food handling practices (FAO, 2022; Codex Alimentarius Commission, 2023).

Food handlers are individuals who are directly involved in food and equipment during the processes of food preparation, storage, and serving. Food handlers' hygiene is a crucial factor influencing food safety, as hands, clothing, and personal behavior may serve as sources of pathogenic microorganism contamination. Inadequate hygiene practices among food handlers are recognized as one of the main causes of foodborne disease outbreaks in institutional food services (WHO, 2022; Codex Alimentarius Commission, 2023).

The requirements for food handlers' hygiene include health status, personal cleanliness, use of personal protective equipment, and hygienic working behavior. Food handlers should be in good

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health, free from infectious diseases, and consistently apply proper handwashing practices before and during food processing activities. Good personal hygiene among food handlers plays a significant role in preventing cross-contamination and ensuring the microbiological safety of food (FAO, 2022; WHO, 2022).

Kitchen environmental sanitation includes efforts to maintain cleanliness and health in the food processing environment. A kitchen environment that does not meet sanitation requirements can become a breeding place for disease vectors such as flies, cockroaches, and rodents, which may increase the risk of food contamination and foodborne diseases (WHO, 2022; FAO, 2022).

Environmental sanitation involves the management of solid and liquid waste, cleanliness of floors and walls, availability of covered waste bins, and pest control measures. Proper waste management aims to prevent environmental pollution and reduce the risk of food contamination. Effective pest control and environmental sanitation are essential components of food safety systems, particularly in institutional food service settings (Codex Alimentarius Commission, 2023; WHO, 2022).

Microbiological food quality reflects the level of microorganism contamination in food. Microbiological contamination may originate from raw materials, water, equipment, the processing environment, and food handlers. Microbiological examination is conducted to assess food safety and to ensure that the consumed food does not pose health risks to consumers (WHO, 2022; FAO, 2022).

Common parameters used to evaluate microbiological food quality include Total Plate Count (TPC) and Escherichia coli. TPC represents the total number of aerobic bacteria in food and is widely used as an indicator of the cleanliness of food processing practices. The presence of Escherichia coli indicates fecal contamination and serves as an important indicator in food safety assessment, as it reflects poor hygiene and sanitation conditions during food handling and processing (Codex Alimentarius Commission, 2023; WHO, 2022).

The Nutrition Fulfillment Service Unit (Satuan Pelayanan Pemenuhan Gizi / SPPG) is a service unit responsible for providing nutritious food for target populations in accordance with nutritional standards and food safety requirements. SPPG plays an important role in supporting community nutrition improvement programs through the provision of safe, high-quality food that meets nutritional needs (Ministry of Health of the Republic of Indonesia, 2022; WHO, 2022).

In its implementation, SPPG is required to apply hygiene and sanitation principles and to conduct regular food quality monitoring. The feasibility of SPPG kitchens is a key determinant of service success, as it is directly related to the safety and quality of the food produced. Proper kitchen management and compliance with hygiene–sanitation standards are essential to ensure effective and sustainable institutional food services (FAO, 2022; Codex Alimentarius Commission, 2023).

This study aims to assess the feasibility of the kitchens at the Nutrition Fulfillment Service Units (Satuan Pelayanan Pemenuhan Gizi / SPPG) in Kediri Regency based on hygienic–sanitation aspects. In addition, this study aims to analyze the microbiological quality of ready-to-eat food as an indicator of food safety at SPPG.

METHODS

This study employed a descriptive observational design with a cross-sectional approach to assess kitchen feasibility based on hygienic–sanitation aspects and the microbiological quality of food at the Nutrition Fulfillment Service Units (SPPG) in Kediri Regency, East Java, Indonesia. The study was conducted at SPPGs operating in Kediri Regency during a single period of observation without any intervention. The study population consisted of all SPPGs in Kediri Regency, while the sample included SPPGs that met the inclusion criteria, namely actively operating, having food processing kitchens, and agreeing to participate in the study. A total sampling or purposive sampling technique was applied depending on field conditions.

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The study variables included hygienic–sanitation aspects of the kitchen as the independent variable, and kitchen feasibility and microbiological food quality as the dependent variables. Data were collected through direct observation using a hygienic–sanitation checklist referring to the Indonesian Ministry of Health Regulation No. 1096/Menkes/Per/VI/2011, short interviews with kitchen managers, and microbiological examination of ready-to-eat food, including Total Plate Count (TPC), Escherichia coli, and Salmonella sp. Data were analyzed descriptively by converting hygienic–sanitation scores into percentages, with kitchens categorized as feasible if they obtained a score of ≥75%. The microbiological test results were compared with the food safety standards stipulated in the Indonesian National Agency of Drug and Food Control Regulation No. 13 of 2019, and the findings were presented in tables and narrative form.

RESULTS AND DISCUSSION

The study was conducted at SPPG located in Kediri Regency, East Java, Indonesia. These SPPGs function as food providers for target groups in nutrition programs, including school children, toddlers, pregnant women, and other vulnerable populations.

The observation results showed that most SPPG kitchens were located away from potential sources of contamination and had permanent building structures. The average score for the location and building aspect was 82%, which was categorized as feasible. Sanitation facilities such as clean water supply, handwashing stations, and wastewater disposal systems were available in most kitchens. However, some SPPGs did not have proper handwashing facilities equipped with soap and running water. The average sanitation facilities score was 78%.

Most of the food processing equipment was made of materials that were easy to clean and non-rusting. However, some equipment was still found to be stored in open areas. The score for this aspect was 75%. Food handlers' hygiene obtained the lowest score, which was 70% and therefore categorized as not feasible. This condition was mainly due to incomplete use of personal protective equipment, the lack of hygiene–sanitation training among some food handlers, and inconsistent handwashing practices. Food processing practices generally followed proper workflow procedures, with a score of 80%, indicating a feasible category. Overall, the total hygienic–sanitation score of SPPG kitchens was 77%, which was categorized as feasible.

Table 1. Summary of Hygienic–Sanitation Assessment of SPPG Kitchens

Assessment Aspect	Score (%)	Category
Location and building	82	Feasible
Sanitation facilities	78	Feasible
Equipment	75	Feasible
Food handlers' hygiene	70	Not feasible
Food processing practices	80	Feasible
Total	**77**	**Feasible**

Microbiological examination of ready-to-eat food showed that the Total Plate Count was 8.5×10^4 CFU/g, which was below the permissible limit of 1×10^5 CFU/g. The level of Escherichia coli was less than 3 MPN/g, and Salmonella sp. was not detected in any of the samples. These findings indicate that all food samples met the microbiological quality standards.

Table 2. Microbiological Quality of Ready-to-Eat Food

Parameter	Result	Standard Limit	Interpretation
TPC	8.5×10^4 CFU/g	$\leq 1\times10^5$ CFU/g	Acceptable
E. coli	< 3 MPN/g	< 3 MPN/g	Acceptable
Salmonella sp.	Negative	Negative /25 g	Acceptable

Based on the combined results of the hygienic sanitation assessment and microbiological examination (Table 2), approximately 80% of SPPG kitchens were categorized as feasible, while about 20% still required improvements, particularly in the aspect of food handlers' hygiene.

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Kitchen Feasibility of SPPG Based on Hygienic–Sanitation Aspects

The results of this study indicate that, in general, the kitchens of the SPPG in Kediri Regency were categorized as feasible based on hygienic–sanitation assessment, with an average score of 77%. This assessment refers to the Indonesian Ministry of Health Regulation No. 1096/Menkes/Per/VI/2011 concerning food service hygiene and sanitation standards.

The location and building aspect obtained the highest score, indicating that most SPPG kitchens were established in areas relatively safe from potential sources of contamination and had permanent structures that were easy to clean. Proper kitchen location and building design are essential factors in preventing physical, chemical, and biological contaminants from entering food processing areas and are key elements in food safety management systems (Codex Alimentarius Commission, 2023; WHO, 2022).

Sanitation facilities were also categorized as feasible, although several kitchens did not provide complete handwashing facilities equipped with soap and running water. Adequate sanitation facilities play an important role in maintaining food handlers' cleanliness and preventing cross-contamination during food preparation (FAO, 2022; WHO, 2022).

Food Handlers' Hygiene

Food handlers' hygiene obtained the lowest score and was categorized as not feasible. This finding indicates that some food handlers did not use personal protective equipment (PPE) properly, such as head covers, masks, and gloves. In addition, not all food handlers had received hygiene–sanitation training or possessed certification.

Food handlers are recognized as one of the main sources of microbiological contamination in food. Inconsistent handwashing practices and improper use of PPE significantly increase the risk of pathogenic microorganism contamination (Codex Alimentarius Commission, 2023; WHO, 2022). Several studies have shown that poor personal hygiene among food handlers is strongly associated with foodborne disease outbreaks in institutional food services (FAO, 2022; WHO, 2022). Therefore, improving knowledge and hygiene behavior among food handlers is crucial in ensuring food safety.

Food Processing Practices and Equipment

The results showed that food processing practices in SPPG kitchens generally followed proper workflow procedures, starting from raw material reception to food serving. However, some equipment was still stored in open conditions and was not adequately protected from contamination.

Improper storage of food processing equipment may facilitate microbial growth and become a potential source of contamination. Food safety guidelines emphasize that equipment should be cleaned, sanitized, and stored in hygienic conditions to prevent cross-contamination (Codex Alimentarius Commission, 2023; FAO, 2022). Continuous implementation of sanitation procedures for equipment is therefore necessary to maintain microbiological food safety.

Microbiological Quality of Food

Based on microbiological examination, all ready-to-eat food samples met the microbiological quality standards according to the Indonesian National Agency of Drug and Food Control Regulation No. 13 of 2019. The Total Plate Count (TPC) values were below the maximum allowable limit, and no contamination by Escherichia coli or Salmonella sp. was detected.

These results indicate that despite deficiencies in food handlers' hygiene, the overall sanitation practices in SPPG kitchens were sufficient to produce safe food. This condition may be influenced by the cooking process, which involves high temperatures that can effectively reduce the number of pathogenic microorganisms (WHO, 2022; FAO, 2022). Heat treatment is widely recognized as one of the most effective methods for controlling microbiological hazards in food (Codex Alimentarius Commission, 2023).

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Relationship Between Hygienic–Sanitation and Microbiological Food Quality

Kitchen hygienic–sanitation conditions are closely related to microbiological food quality. Kitchens with good sanitation practices tend to produce food that meets microbiological safety standards. Although microbiological results in this study were within acceptable limits, weaknesses in food handlers' hygiene still represent potential risk factors if not immediately addressed.

Therefore, regular sanitation monitoring and continuous training for food handlers are highly recommended to maintain consistent food safety practices in SPPG kitchens. Strengthening hygiene education and supervision is essential to prevent future contamination and to ensure sustainable food safety in institutional nutrition services (FAO, 2022; WHO, 2022; Codex Alimentarius Commission, 2023).

CONCLUSION

This study concludes that, in general, the kitchens of Nutrition Fulfillment Service Units (SPPG) in Kediri Regency are categorized as feasible based on hygienic–sanitation assessment, with an average score of 77%, although the hygiene of food handlers remains inadequate, particularly in the use of personal protective equipment and handwashing practices. Microbiological examination showed that all ready-to-eat food samples met national safety standards, with Total Plate Count values below permissible limits and no contamination by Escherichia coli or Salmonella sp. Therefore, it is recommended that SPPG managers improve food handlers' hygiene through regular training, consistent use of protective equipment, and routine internal supervision, while the local health authority should strengthen monitoring and certification programs, and future studies should include broader microbiological parameters and larger samples to obtain more comprehensive evidence. These efforts are essential to ensure sustainable food safety and protect the health of vulnerable populations served by SPPG.

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