
Health Promotion Based Hygiene and Sanitation Practices: An Observational Study of Food Handlers' Behavior and Kitchen Facility Cleanliness at Megah Kupa Restaurant, Medan, Indonesia

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Abstract . Food safety remains a major public health concern in food service settings because inadequate hygiene and sanitation may increase contamination risks. This study aimed to describe health promotion based hygiene and sanitation practices, focusing on kitchen sanitation facilities and food handlers' behavior at Megah Kupa Restaurant, Medan, Indonesia. A descriptive observational study with a quantitative approach was conducted in the restaurant kitchen during 2026. The study included all food handlers and sanitation facility components observed during the study period using a structured observation checklist and photographic documentation. Ten kitchen sanitation indicators and ten food handler behavior indicators were assessed as compliant or non compliant. The mean of the indicator level compliance percentages presented in the tables was 56.5% for kitchen sanitation facilities and 73.5% for food handlers' behavior, giving an overall descriptive mean of 65.0%. Major sanitation deficiencies included the absence of a grease trap and employee lockers, inadequate pest and rodent prevention, incomplete wastewater drainage coverage, and concerns regarding water quality. Behavioral deficiencies included inconsistent use of hair covers and food covers during serving. The findings indicate that hygiene and sanitation practices had not been implemented optimally. Strengthening sanitation infrastructure, routine supervision, food safety education, and supportive workplace policies is recommended to improve hygienic behavior and reduce food contamination risks. The observation also identified variation among individual indicators, with the highest compliance found for kitchen floors, utensil washing facilities, apron use, and non-smoking behavior. These findings provide a descriptive basis for prioritizing facility improvement and reinforcement of hygienic practices through routine health promotion activities.

Keywords: food safety, hygiene sanitation, food handlers, health promotion, restaurant sanitation

INTRODUCTION

Food safety has become one of the most significant global public health concerns, particularly in developing countries where sanitation management systems are still evolving. Unsafe food consumption is not only associated with nutritional quality but also directly influences public health outcomes, labor productivity, and overall quality of life. The World Health Organization (WHO) estimated that approximately 600 million people worldwide suffer from foodborne diseases annually,

resulting in nearly 420,000 deaths each year [1]. Furthermore, WHO reported that more than 200 diseases may be transmitted through contaminated food containing bacteria, viruses, parasites, or harmful chemical substances [1]. These findings indicate that food safety represents a multidimensional public health challenge requiring sustainable monitoring and preventive interventions. One of the primary causes of food contamination is poor hygiene and sanitation practices during food preparation and processing, particularly within restaurants and food service establishments. Therefore, strengthening sanitation standards has become essential to reduce foodborne disease transmission and improve consumer protection [1].

The rapid growth of the culinary and food service industry in Indonesia has intensified concerns regarding food safety management in restaurants and catering facilities. Statistics Indonesia reported a substantial increase in food and beverage businesses in 2024, driven by urbanization, economic expansion, and changing consumer lifestyles [2]. Although the growth of the culinary sector contributes positively to employment opportunities and regional economic development, it simultaneously increases the risk of food contamination when sanitation standards are poorly implemented. Restaurants serve a large number of consumers daily and therefore possess considerable potential to become sources of foodborne disease transmission if food processing activities are conducted under unhygienic conditions. Several mass food poisoning incidents reported in Indonesia were associated with inadequate hygiene sanitation practices among food handlers and insufficient food safety supervision. Consequently, improving restaurant hygiene sanitation requires not only regulatory enforcement but also health promotion approaches capable of fostering sustainable healthy behaviors among food handlers and restaurant workers [2].

In Indonesia, hygiene sanitation issues remain common within food service operations and continue to represent an important environmental health problem. Reports from WHO Indonesia and the Indonesian Ministry of Health demonstrated that many food service establishments still fail to comply with environmental sanitation standards and food hygiene regulations [3]. Inadequate kitchen cleanliness, poor waste management systems, contaminated water sources, and weak sanitation supervision continue to be observed in many restaurants and food preparation facilities. Such conditions may facilitate the growth and transmission of pathogenic microorganisms capable of contaminating food products and increasing foodborne disease incidence among consumers. These problems are not limited to small scale vendors but are also found in large food production facilities serving high consumer volumes. From a health promotion perspective, these conditions highlight the importance of educational interventions and behavioral change strategies targeting food handlers as key actors in food processing activities [4].

Food handlers play a central role in maintaining food quality and safety because they are directly involved in all stages of food preparation, processing, and serving. Unhygienic behaviors such as inadequate handwashing, improper use of protective equipment, and unsafe handling practices may become major sources of microbial contamination in food products [5]. Likewise, poor kitchen sanitation conditions including dirty surfaces, humid environments, and disorganized food preparation areas may accelerate bacterial growth and increase cross contamination risks. In many restaurant settings, management often prioritizes food taste and customer satisfaction while paying insufficient attention to hygiene sanitation standards. In reality, food safety constitutes a critical indicator of restaurant quality and consumer trust. Therefore, health promotion approaches emphasizing behavioral awareness, sanitation education, and sustainable hygienic practices are highly relevant for strengthening food safety implementation among restaurant workers and food handlers [6].

Health promotion concepts in food hygiene sanitation emphasize healthy behavior as a primary strategy for disease prevention. Health promotion not only involves delivering health related

information but also empowering individuals to gain greater control over factors influencing their health status [7]. In restaurant settings, health promotion may be implemented through food safety education, sanitation training for food handlers, development of healthy workplace cultures, and continuous supervision of hygienic behavior. This approach is particularly important because human behavior frequently determines the success of environmental health policy implementation in workplaces. Restaurants implementing health promotion based sanitation systems are more capable of creating healthy, safe, and consumer oriented food processing environments. In addition, health promotion interventions contribute to long term public awareness regarding the importance of sanitation and food safety amid increasing consumption of ready to eat foods in urban communities [7].

Several previous studies have investigated hygiene sanitation practices within restaurants and catering industries. Nuraini et al. [5] reported that food handlers' behavior significantly influences food safety quality, particularly regarding hand hygiene and personal protective equipment use during food preparation activities. Similarly, Sari and Rahmawati [6] found that inadequate kitchen sanitation facilities were associated with increased bacterial contamination in ready to eat foods served in urban restaurants. Another study conducted by Putri et al. [12] revealed that many food handlers still possessed limited sanitation knowledge despite extensive work experience within the culinary industry. Furthermore, Wahyuni et al. [8] demonstrated that hygiene sanitation supervision in restaurants often focuses primarily on administrative compliance rather than comprehensive behavioral change. These findings suggest that both environmental sanitation and individual behavior strongly influence food safety outcomes in food service establishments. Nevertheless, most previous studies have focused mainly on technical sanitation assessments without comprehensively integrating health promotion perspectives as behavioral intervention strategies [8].

Based on previous findings, a significant research gap remains regarding the simultaneous assessment of food handlers' behavior and kitchen sanitation conditions within modern restaurant environments using a health promotion framework. Most earlier studies focused either on physical sanitation facilities or food handlers' knowledge levels without examining behavioral reinforcement and environmental support comprehensively. In addition, previous research was generally conducted in school canteens, small restaurants, or traditional catering services, while studies involving modern urban restaurants with complex consumer interactions remain limited. This study therefore aims to address these gaps by conducting an observational assessment of food handlers' behavior and kitchen sanitation conditions at Megah Kupa Restaurant in Medan using a health promotion based approach. The findings are expected to contribute scientifically by providing empirical evidence regarding hygiene sanitation implementation in modern restaurant settings and supporting the development of more effective food safety promotion programs in Indonesia [9].

METHODS

This study employed a descriptive observational design with a quantitative approach to describe hygiene and sanitation practices at Megah Kupa Restaurant, Medan [10]. The observation was conducted in the restaurant kitchen during 2026 and covered food preparation, washing, waste disposal, storage, and food serving areas. The population comprised all food handlers involved in food preparation and serving and all kitchen sanitation facility components available in the observed area. Total sampling was used, meaning that all eligible food handlers and all facility components identified during the observation were included. The manuscript did not report the absolute number of food handlers; therefore, no numerical sample size is added without the underlying observation log. The observation instrument was a structured checklist consisting of 10 kitchen sanitation facility indicators

and 10 food handler behavior indicators. Facility indicators covered floor, walls, ventilation, clean water availability/condition, utensil washing facilities, wastewater drainage, grease trap availability, waste bins, pest and rodent prevention, and employee lockers. Behavioral indicators covered apron use, hair cover use, gloves during serving, handwashing, hand and nail cleanliness, smoking behavior, talking during food preparation, clean uniforms, food cover use, and avoidance of direct hand contact with food. Data collection was performed through direct observation of the kitchen environment and food handling activities, supported by photographic documentation. Observers recorded each checklist item according to the condition seen at the time of observation. The observation focused on the presence, condition, and use of sanitation facilities and on food handlers' routine hygienic practices. Each indicator was classified as compliant or non compliant according to the hygiene and sanitation requirements used in the observation checklist, with reference to the Ministry of Health guidance cited in this manuscript [11]. For each indicator, the compliance percentage was calculated as the proportion of observations meeting the specified requirement. Because the displayed tables contain indicator level percentages rather than the underlying denominators, the overall descriptive value was calculated transparently as the arithmetic mean of the ten indicator percentages within each domain; it should not be interpreted as a weighted or validated sanitation index. Data were analyzed descriptively. Indicator level results were summarized as percentages of compliance and non compliance and presented in tables, followed by narrative interpretation of the main strengths and deficiencies. No inferential statistical test was performed because the study was designed to provide a descriptive observational assessment. Ethical considerations included obtaining permission to conduct the observation at the restaurant, explaining the purpose and non interventional nature of the observation to food handlers, and maintaining confidentiality of individual workers and the restaurant's operational information. No personal identifiers were included in the results. The manuscript did not provide an institutional ethics approval number; therefore, no approval number has been added in this revision.

RESULT

Table 1 presents the compliance results for the two observation domains assessed in this study, namely kitchen sanitation facilities and food handler behavior, including the percentage of compliant and non compliant indicators.

Tabel 1.1. Compliance Table

Domain Compared	Compliance	Non Compliance
Kitchen sanitation facilities	56,5%	43,5%
Food handlers' behavior	73,5%	26,5%

Descriptive analysis shows that the average compliance rate for food handlers' behavior (73.5%) is higher than the average compliance rate for kitchen sanitation facilities (56.5%), with a difference of 17.0 percentage points. This comparison indicates a gap between environmental/facility aspects and behavioral aspects. In practical terms, this suggests that improvements in hygiene behavior are not yet fully supported by adequate sanitation facilities. These descriptive differences form the basis for the interpretation that improvements in hygiene and sanitation must be implemented simultaneously. It is not enough to improve food handlers' behavior through education if supporting facilities such as water quality, wastewater management, pest control, and storage areas for personal belongings do not yet meet sanitation requirements. Conversely, providing good facilities must be accompanied by supervision and the cultivation of habits so that the facilities are actually used consistently.

The following is an assessment of the indicators used in this study:

1. General Overview of Observational Findings

Based on direct observations in the kitchen area of Megah Kupi Restaurant, Medan, hygiene and sanitation implementation showed both adequate and deficient conditions across environmental facilities and food handler practices. The assessment covered all kitchen areas, sanitation facilities, and food handlers involved in food preparation and serving. The results are presented separately for facility indicators and behavioral indicators so that the strengths and gaps can be identified without conflating the two domains.

2. Observation Results of Kitchen Sanitation Facilities

The observation results demonstrated that the ten kitchen sanitation facility indicators showed substantial variation in compliance. The mean of the ten indicator level percentages presented in Table 1 was 56.5% (range 0-100%), while 43.5% represented the corresponding mean non compliance. The highest compliance was observed for the kitchen floor and utensil washing facilities (100%), whereas grease-trap availability and employee lockers recorded 0% compliance. These results indicate that the basic physical environment was partly supported, but several enabling sanitation facilities remained inadequate.

Table 2. Distribution of Kitchen Sanitation Facility Observation Results at Megah Kupi Restaurant, Medan (10 indicators)

No	Observed Components	Compliant	Non Compliant
1	Clean and easy to clean kitchen floor	100%	0%
2	Clean kitchen walls	70%	30%
3	Adequate kitchen ventilation	80%	20%
4	Availability of clean water sources	60%	40%
5	Availability of utensil washing facilities	100%	0%
6	Covered wastewater drainage system	40%	60%
7	Availability of grease trap	0%	100%
8	Availability of covered waste bins	85%	15%
9	Adequate pest and rodent prevention	30%	70%
10	Availability of employee lockers	56.5%	43.5%

The kitchen floor condition achieved the highest compliance rate at 100%, indicating that the floor was clean, level, non slippery, and easy to sanitize, thereby supporting hygienic food processing activities. Washing facilities for cooking utensils and eating equipment were also available and actively used by food handlers. Nevertheless, several sanitation deficiencies were still identified. One major issue involved the quality of water used in the kitchen area. Observations revealed that the water appeared yellowish, resulting in a sanitation compliance level of only 60%. This condition caused yellowish stains and crust deposits around the washing area due to continuous water exposure. These findings indicate that the quality of the clean water supply still requires improvement because it may affect equipment cleanliness and food safety.

Regarding liquid waste management, observations showed that the kitchen did not possess a grease trap system, resulting in 0% compliance for this indicator. Wastewater generated during food preparation activities was directly discharged into an open drainage channel without grease or organic waste filtration. In addition, the wastewater drainage system was inadequately covered, achieving only 40% compliance. Such conditions may contribute to grease accumulation, unpleasant odors, and increased risks of fly and rodent proliferation around the kitchen area.

The findings also demonstrated that pest control measures were not optimally implemented. Approximately 70% of pest prevention indicators did not meet sanitation standards because insect screens, rodent traps, and pest control devices were absent within the kitchen environment. These conditions indicate that the kitchen still possesses biological contamination risks originating from insects and rodents acting as disease vectors. Furthermore, employee lockers were unavailable, resulting in 0% compliance for this indicator. The absence of dedicated storage facilities caused food handlers to place personal belongings near food preparation areas, potentially increasing cross contamination risks. These findings suggest that personal hygiene implementation and workplace sanitation management were still insufficiently optimized.

3. Observation Results of Food Handlers' Behavior

Observations of food-handler behavior covered the ten behavioral indicators listed in Table 3. The mean indicator level compliance was 73.5% (range 20-100%), with the strongest performance observed for apron use and non smoking during work (100% each). The lowest compliance was observed for food cover use during serving (20%) and hair ncover use (40%). Thus, basic personal hygiene practices were relatively better implemented than several protective and serving practices, but behavioral compliance was still inconsistent.

Table 3. Distribution of Food Handler Behavioral Observation Results at Megah Kupa Restaurant, Medan (10 indicators)

No	Observed Components	Compliant	Non Compliant
1	Wearing aprons during work	100%	0%
2	Wearing hair covers	40%	60%
3	Wearing gloves during food serving	75%	25%
4	Washing hands before work	80%	20%
5	Maintaining hand and nail cleanliness	85%	15%
6	Not smoking during work	100%	0%
7	Avoiding talking during food preparation	70%	30%
8	Wearing clean work uniforms	90%	10%
9	Using food covers during serving	20%	80%
10	Avoiding direct hand contact with food	73.5%	26.5%

All food handlers consistently wore aprons during work activities, resulting in 100% compliance for this indicator. Most workers also maintained clean work uniforms and acceptable hand and nail hygiene during food preparation processes. These findings suggest that awareness regarding basic personal hygiene practices was relatively adequate. However, the use of personal protective equipment remained incomplete and inconsistent. Only 40% of food handlers consistently used hair covers, while 60% failed to wear hair protection during work activities. This condition potentially increases physical contamination risks from hair particles during food processing and serving activities.

In addition, glove use during food serving activities reached only 75% compliance. Although several waiters used black disposable gloves while serving meals, observations demonstrated that food cover utilization during meal distribution remained very low, with only 20% compliance. Approximately 80% of meals delivered to consumers were not protected with food covers, thereby increasing exposure risks to dust particles, droplets, and environmental contaminants during serving activities.

Regarding handwashing practices, 80% of food handlers washed their hands before work and after handling raw food materials, while 20% remained inconsistent in performing these

practices. Furthermore, several food handlers were observed talking during food preparation activities, resulting in 30% non compliance for this indicator. Such behavior may increase droplet contamination risks toward processed food products.

4. **Analysis of Health Promotion Based Hygiene Sanitation Practices**

Across the ten facility indicators and ten behavioral indicators, the arithmetic mean of the displayed compliance percentages was 56.5% for kitchen sanitation facilities and 73.5% for food handler behavior. The combined descriptive mean was therefore 65.0%. This value is presented only as a transparent summary of the indicator percentages shown in Tables 1 and 2, not as a validated composite sanitation score. The most important gaps were pest control, grease-trap availability, employee lockers, wastewater drainage coverage, water quality, hair-cover use, and food-cover use during serving.

These findings indicate that hygiene sanitation implementation had not yet reached optimal standards and still required strengthening through health promotion approaches. From a health promotion perspective, inconsistent hygienic practices among food handlers highlight the importance of continuous education and supervision regarding food safety and workplace hygiene behavior. In addition, restaurant management should strengthen monitoring systems related to personal protective equipment use and sanitation facility provision to establish safer and healthier food processing environments. The findings also demonstrate that health promotion based hygiene sanitation practices play an important role in supporting restaurant food safety. Improved awareness among food handlers and adequate sanitation facilities may minimize food contamination risks while enhancing service quality and consumer health protection.

DISCUSSION

1. **Kitchen Physical Conditions and Hygiene Sanitation Facilities**

The physical sanitation findings show that infrastructure support was uneven. The kitchen floor and utensil washing facilities achieved 100% compliance, suggesting that routine cleaning and basic washing activities were already established. However, the mean compliance across the ten facility indicators was only 56.5%, indicating that the presence of some adequate components did not translate into an adequate sanitation system as a whole. This pattern is consistent with the view that food safety depends on an interconnected system of environmental controls rather than on cleanliness of a single surface. WHO [1] and Kim et al. [13] emphasize that sanitation facilities should reduce opportunities for cross-contamination throughout food preparation and handling.

Water quality was one of the notable environmental weaknesses. The observed water appeared yellowish and produced yellowish deposits around the washing area, resulting in only 60% compliance for the corresponding indicator. The observation itself does not establish the chemical or microbiological cause of the discoloration; laboratory testing would be required to determine whether the condition was related to iron, pipe corrosion, or another source. Nevertheless, the visual condition is operationally important because water is used for washing ingredients, utensils, and hands. Kemenkes RI [11] and Zhang et al. [14] underline the importance of safe water in food processing environments. Management should therefore verify water quality through periodic testing and maintain the distribution system rather than relying only on visual inspection.

The absence of employee lockers also represents an enabling-environment problem. Personal belongings were reportedly placed near food preparation areas, creating an avoidable

pathway for physical contamination and poor workplace organization. Ahmed et al. [15] highlighted the role of dedicated personal storage in supporting hygienic food-handling environments. From a health promotion perspective, workers cannot be expected to maintain optimal behavior if the workplace does not provide practical facilities that make the desired behavior easy to perform. A designated locker area should therefore be provided outside food preparation zones and included in routine sanitation inspections.

Pest prevention was another major weakness, with only 30% compliance for the relevant indicator. The absence of insect screens, rodent traps, or other visible control devices suggests that prevention was not sufficiently systematic. Lee and Park [16] and Nurhayati et al. [17] describe insects and rodents as important vectors and contamination pathways in food-processing environments. The finding should therefore be interpreted not simply as a cleanliness issue but as a failure of preventive environmental control. Management needs an integrated pest-management routine covering exclusion, sanitation, waste control, monitoring, and documented corrective action.

Wastewater management also requires priority attention. The grease trap indicator recorded 0% compliance, while wastewater drainage coverage was only 40%. Direct discharge to an open drainage channel can facilitate grease accumulation, odor, blockage, and pest attraction. Chandra et al. [18] and Kemenkes RI [11] support the importance of appropriate wastewater management in commercial kitchens. Installing a grease trap, improving drainage coverage, and establishing a cleaning schedule would address both environmental sanitation and operational risks. These actions also demonstrate that management commitment is an important component of food safety implementation, not merely an infrastructure expenditure.

2. Food Handlers' Behavior (Personal Hygiene)

Food handler behavior showed a different pattern from facility conditions. The mean indicator level compliance was 73.5%, but performance varied considerably between behaviors. Apron use and non smoking behavior were fully compliant, whereas hair-cover use was only 40% and food cover use during serving was only 20%. This variation suggests that workers may already recognize visible, routine requirements but are less consistent with practices that require repeated attention during busy service periods. Nuraini et al. [5] and Santos et al. [19] similarly emphasize the importance of personal hygiene and protective measures in reducing contamination risks. The result therefore supports the need for behavior focused supervision rather than relying solely on general sanitation knowledge.

The particularly low use of food covers is important because the control of contamination must continue after preparation until food reaches the consumer. In the observed setting, meals were frequently transported or served without adequate covering, exposing ready to eat food to dust, droplets, and other environmental contaminants. Garcia et al. [20] identifies food covering as an important control during distribution and serving. A practical intervention is to standardize serving procedures through a simple checklist: food must remain covered during transfer, the cover must be clean, and uncovered food should not be left exposed while waiting for delivery to the consumer.

Inconsistent hair cover, glove, handwashing, and food cover practices may reflect a combination of knowledge, habit, workload, supervision, and facility support. Rahmawati et al. [21] and Putri et al. [12] indicate that education alone does not necessarily guarantee compliance. Consequently, health promotion in this setting should move from one-time information delivery toward repeated education, demonstration, observation, feedback, and

reinforcement. Management should also ensure that PPE is readily available at the point of use and that supervisors provide immediate corrective feedback when procedures are not followed.

3. Analysis of Health Promotion Based Hygiene Sanitation Practices

The health promotion perspective helps explain why the observed sanitation gaps persisted despite several basic facilities being available. Using Lawrence Green's framework, knowledge and awareness can function as predisposing factors; availability of clean water, PPE, lockers, covered waste bins, and other facilities as enabling factors; and supervision, workplace rules, feedback, and management support as reinforcing factors. The present findings show weaknesses across all three domains: some required facilities were absent, several behaviors were inconsistent, and routine reinforcement was not documented. Thus, improving compliance requires simultaneous action on the worker, workplace, and management levels.

The difference between facility and behavioral compliance should not be interpreted as evidence that one domain is more important than the other. A restaurant can have clean floors and washing facilities while still experiencing contamination risks when food is served uncovered or PPE is inconsistently used. Conversely, workers may understand hygiene procedures but find them difficult to follow when water quality, drainage, lockers, or pest-control facilities are inadequate. Oliveira et al. [22] similarly emphasizes the interdependence of environmental sanitation and hygienic behavior. The main implication is that health promotion should be embedded in the restaurant's routine management system rather than treated as a separate educational activity.

Routine monitoring is therefore central to sustaining change. Wahyuni et al. [8] notes that sanitation supervision may become overly administrative when it does not include direct observation of behavior. At Megah Kupa, monitoring should use the same indicators applied in this study, allowing management to identify recurring non compliance, assign corrective actions, and review progress periodically. Short refresher sessions, visual reminders at handwashing and serving points, PPE availability, and supervisor feedback can function as reinforcing mechanisms. This approach is consistent with Rahman et al. [9], who emphasizes routine education and supervision as components of food hygiene promotion.

Finally, the findings have implications for service quality and consumer protection. Food hygiene is not only a technical sanitation requirement but also part of a restaurant's quality and safety culture. Kim and Lee [23] reported that stronger food safety culture can support consumer trust and reduce food related complaints. For Megah Kupa Restaurant, the priority is therefore to integrate sanitation infrastructure, standard operating procedures, worker education, and routine supervision into one continuous improvement cycle. Because this study used a descriptive observational design at a single restaurant and did not include microbiological or water quality laboratory testing, the findings should be interpreted as an assessment of observed practices and environmental conditions rather than direct evidence of food contamination or disease occurrence.

CONCLUSION

The observed implementation of hygiene and sanitation practices at Megah Kupa Restaurant, Medan, was not yet optimal. Based on the ten indicators presented in each observation domain, the mean indicator level compliance was 56.5% for kitchen sanitation facilities and 73.5% for food handler behavior, with a combined descriptive mean of 65.0%. The main environmental weaknesses were poor water appearance, incomplete wastewater drainage coverage, absence of a grease trap,

inadequate pest and rodent prevention, and absence of employee lockers. The main behavioral weaknesses were inconsistent use of hair covers and very low use of food covers during serving. These findings demonstrate that food safety requires both adequate enabling facilities and consistent hygienic behavior supported by routine supervision and management commitment.

RECOMMENDATIONS

Restaurant management should: (1) install and routinely maintain a grease trap and improve wastewater drainage coverage; (2) verify kitchen water quality through periodic testing and correct the source of discoloration; (3) establish an integrated pest-control program with monitoring records; (4) provide employee lockers outside food preparation areas; (5) ensure continuous availability and mandatory use of appropriate PPE, particularly hair covers and gloves where required; (6) standardize food serving procedures so ready to eat meals remain covered until delivered to consumers; and (7) conduct brief, periodic hygiene and food safety refreshers accompanied by direct supervision, feedback, and documentation of corrective actions. Future studies should consider laboratory examination of water and food samples and include more than one restaurant to strengthen the evidence regarding contamination risks and generalizability.

REFERENCES

1. World Health Organization. Foodborne diseases. Geneva: WHO; 2024.
2. Badan Pusat Statistik Indonesia. Indonesia food and beverage service statistics 2024. Jakarta: BPS RI; 2024.
3. World Health Organization Indonesia. Managing food safety in traditional food markets. Jakarta: WHO Indonesia; 2024.
4. Badan Pengawas Obat dan Makanan Republik Indonesia. Implementation of hygiene and sanitation in ready to eat food industries. Jakarta: BPOM RI; 2023.
5. Nuraini R, Fitriani D, Lestari P. Relationship between food handlers' behavior and hygiene sanitation practices in food processing. *Jurnal Kesehatan Lingkungan Indonesia*. 2022;21(2):115-123.
6. Sari D, Rahmawati I. Kitchen sanitation facilities and bacterial contamination in ready-to-eat foods. *Jurnal Sanitasi Lingkungan*. 2021;18(3):201-210.
7. Notoatmodjo S. Health promotion and health behavior. Jakarta: Rineka Cipta; 2018.
8. Wahyuni E, Pratama H, Kurniawan R. Hygiene sanitation supervision in restaurants and food stalls in urban areas. *Media Kesehatan Lingkungan Indonesia*. 2023;22(1):55-64.
9. Rahman F, Yusuf A, Hasanah N. Health promotion strategy and food hygiene compliance among restaurant workers. *Journal of Public Health Research*. 2024;13(1):44-53.
10. Notoatmodjo S. Health research methodology. Jakarta: Rineka Cipta; 2023.
11. Kementerian Kesehatan Republik Indonesia. Guidelines for food hygiene sanitation and catering services. Jakarta: Ministry of Health of the Republic of Indonesia; 2023.
12. Putri A, Siregar M, Harahap N. Knowledge of hygiene sanitation among food handlers in the culinary industry. *Jurnal Kesehatan Masyarakat*. 2021;15(1):45-53.
13. Kim H, Park J, Lee S. Kitchen sanitation and food safety practices in urban restaurants. *Journal of Food Safety*. 2024;44(1):1-10.
14. Zhang W, Liu Y, Chen H. Water quality and microbial contamination risk in food processing areas. *Environmental Health Perspectives*. 2023;131(7):77001.
15. Ahmed R, Khan M, Yusuf A. Personal hygiene facilities and food safety practices among food handlers. *International Journal of Environmental Health Research*. 2024;34(2):145-154.

16. Lee Y, Park K. Rodent and insect control in food processing areas. *International Journal of Food Microbiology*. 2023;388:110102.
17. Nurhayati D, Sari M, Putra H. Environmental sanitation and food contamination risk in restaurants. *Jurnal Kesehatan Lingkungan Indonesia*. 2024;23(1):44-53.
18. Chandra P, Lee S, Wong T. Wastewater management and grease trap implementation in commercial kitchens. *Journal of Environmental Sanitation*. 2023;19(1):55-63.
19. Santos P, Rivera M, Cruz L. Use of personal protective equipment among food handlers and food contamination risk. *International Journal of Food Safety*. 2024;12(3):201-210.
20. Garcia M, Lopez R, Fernandez J. Food cover usage and food safety practices in restaurant services. *Food Protection Trends*. 2023;43(4):221-229.
21. Rahmawati I, Hasanah N, Putri A. Food handler compliance toward hygiene sanitation practices. *Media Kesehatan Masyarakat Indonesia*. 2024;20(2):98-106.
22. Oliveira R, Santos M, Pereira A. Relationship between environmental sanitation and hygienic behavior among food handlers. *International Journal of Environmental Health Research*. 2023;33(6):589-601.
23. Kim J, Lee H. Food safety culture and consumer trust in modern restaurants. *Journal of Food Protection*. 2025;88(2):155-164.
24. Sugiyono. *Quantitative, qualitative, and R&D research methods*. Bandung: Alfabeta; 2023.