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Sanitation Conditions of Street Food Vendors and Their Potential Risk for Foodborne Diseases

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ABSTRACT
This study aims to examine the sanitation conditions of street food vendors and analyze their potential contribution to foodborne disease risks within an urban informal food sector. A qualitative approach was employed using a descriptive case study design, selected to enable an in-depth and contextualized understanding of environmental sanitation and vendor behavior without experimental manipulation. The research was conducted in a densely populated urban area in Indonesia characterized by a high concentration of street food activities, chosen due to its representativeness and public health relevance. A total of fifteen informants were purposively selected, consisting of ten street food vendors, three local health officers, and two consumers, based on their direct involvement and knowledge of sanitation practices. Data were collected through observation, in-depth interviews, and document analysis, and analyzed using thematic techniques. The findings reveal that sanitation conditions are generally inadequate, including limited access to clean water, poor waste management, and inconsistent hygiene practices, which collectively increase the risk of contamination. The study recommends strengthening sanitation infrastructure, enhancing vendor awareness, and implementing risk-based food safety interventions to reduce foodborne disease risks.

INTRODUCTION

Food safety remains a persistent public health concern, particularly in low- and middle-income countries where informal food sectors, such as street food vending, play a vital socioeconomic role. Street food provides affordable, accessible meals for urban populations and supports livelihoods for millions of vendors (Thangluah & Saitluanga, 2025). However, the informal nature of this sector often results in inadequate regulatory oversight, limited access to sanitation infrastructure, and inconsistent hygiene practices (Vanlalnghaka & chhunga, 2025). These conditions create a pathway for microbial contamination, increasing the likelihood of foodborne diseases (Novikova et al., 2023). Recent global estimates indicate that foodborne illnesses continue to impose a substantial burden on healthcare systems and economic productivity, highlighting the urgency of addressing sanitation-related risks in street food environments (Abreu, 2024). Despite growing awareness, disparities persist in the implementation of food safety standards, particularly in densely populated urban areas (Zondi & Magwaza, 2023).

The state of the art in this field reflects a growing body of research examining the relationship between environmental sanitation, vendor hygiene, and food contamination (Saroop, 2025). Previous studies have identified factors such as limited access to clean water, improper waste disposal, and inadequate food handling practices as key determinants of foodborne disease transmission (Dasgupta, 2024). Advances in microbiological testing and risk assessment methods have improved the detection of pathogens in street-vended foods (Joassart-Marcelli et al., 2024). Nevertheless, many existing studies are geographically limited or focus primarily on microbiological outcomes without comprehensively integrating environmental sanitation indicators and behavioral aspects of vendors (Muthhukkannu et

al., 2025). As a result, a holistic understanding of how sanitation conditions interact with vendor practices to influence public health risks remains underdeveloped.

The main problem addressed in this study lies in the insufficient characterization of sanitation conditions among street food vendors and their direct association with potential foodborne disease risks. While regulatory frameworks may exist, their enforcement is often weak (Poudel et al., 2025), and empirical data linking sanitation deficiencies to health outcomes in specific local contexts are scarce (Veremchuk et al., 2023). This gap is particularly evident in rapidly urbanizing regions, where street food vending continues to expand without corresponding improvements in public health infrastructure (Velleman et al., 2023). Consequently, there is a need for context-specific evidence that bridges environmental sanitation, vendor behavior, and health risk assessment.

This research identifies a critical gap in the literature, namely the lack of integrative analyses that combine sanitation condition assessments with risk-based evaluations of foodborne diseases among street food vendors (Vinciguerra et al., 2025). Many prior studies treat sanitation and health outcomes as separate domains, thereby limiting their explanatory power (Gogoi, 2025). Furthermore, there is limited attention to localized socio-environmental dynamics that influence vendor practices, such as access to sanitation facilities, knowledge of hygiene standards, and economic constraints (Vy et al., 2025). Addressing this gap is essential for developing targeted interventions that are both practical and sustainable.

The novelty of this study lies in its comprehensive approach, which simultaneously examines physical sanitation conditions, vendor hygiene practices, and their potential contribution to foodborne disease risks within a unified analytical framework. By integrating observational assessments with risk evaluation models, this research offers a more nuanced understanding of how environmental and behavioral factors converge to influence food safety. Additionally, the study emphasizes context-specific analysis, thereby contributing new empirical insights relevant to urban street food systems in developing settings.

Based on the identified issues, this study formulates the following research questions: to what extent do sanitation conditions among street food vendors meet established hygiene standards; how do these conditions influence the potential risk of foodborne diseases; and what key factors contribute most significantly to contamination risks in street-vended food? These questions guide the analytical direction of the research and ensure alignment with both public health priorities and academic inquiry.

The primary objective of this study is to evaluate the sanitation conditions of street food vendors and analyze their potential contribution to foodborne disease risks. Specifically, the study aims to assess environmental hygiene, identify critical risk factors, and examine the relationship between sanitation practices and potential contamination pathways. In doing so, the research seeks to generate evidence that can inform policy development, improve regulatory frameworks, and support interventions aimed at enhancing food safety in the informal sector.

The significance of this research can be understood from several perspectives. Theoretically, it contributes to the advancement of public health and environmental health literature by offering an integrated model of sanitation and food safety risk. Academically, the study provides a reference for future research, particularly in expanding interdisciplinary approaches that combine environmental assessment and epidemiological analysis. Practically, the findings are expected to assist policymakers, public health authorities, and community stakeholders in designing effective strategies to improve sanitation standards among street food vendors, thereby reducing the incidence of foodborne diseases.

Despite its contributions, this study acknowledges certain limitations. The scope of the research may be constrained by geographical coverage, limiting the generalizability of findings to other regions with different socio-economic and environmental conditions. Additionally, the reliance on observational and cross-sectional data may restrict the ability to establish causal relationships between sanitation conditions and health outcomes (Daeschel et al., 2023). Variability in vendor compliance and reporting accuracy may also influence the robustness of the findings.

Future research is recommended to address these limitations by employing longitudinal designs and incorporating microbiological testing to strengthen causal inferences (Purnamasari & Affandi, 2025). Expanding the study to multiple urban settings would enhance comparative analysis and generalizability. Moreover, integrating behavioral interventions and evaluating their effectiveness over time would provide valuable insights into sustainable improvements in street food sanitation. Through such efforts, a more comprehensive and evidence-based approach to mitigating foodborne disease risks in informal food sectors can be achieved.

LITERATURE REVIEW

The literature on sanitation conditions of street food vendors and their potential contribution to foodborne diseases has expanded significantly over the past decades, reflecting growing global concern regarding food safety in informal sectors (Linares, 2023). Street food vending represents a critical component of urban food systems, particularly in developing countries, where it ensures food accessibility and economic resilience (Brauge et al., 2024). However, the absence of standardized sanitation infrastructure and inconsistent adherence to hygiene practices have been widely recognized as major determinants of microbial contamination (Gichunge et al., 2023). Contemporary studies emphasize that foodborne diseases are often linked not only to contaminated raw materials but also to environmental sanitation, personal hygiene of vendors, and food handling behaviors (Rajkonwar, 2025). Thus, a comprehensive theoretical foundation is essential to understand the multidimensional nature of sanitation-related risks in street food settings.

This study draws upon three principal theoretical frameworks, namely the Environmental Health Theory, the Health Belief Model, and the Food Safety Risk Analysis Framework. The Environmental Health Theory, prominently advanced by John J. Hanlon in 1974 at the University of North Carolina, United States, emphasizes the interaction between environmental conditions and human health outcomes (Asmirah, 2023). Hanlon conceptualized that inadequate sanitation, including poor waste management, lack of clean water, and unsanitary surroundings, significantly increases exposure to pathogenic microorganisms (Romero et al., 2024). Within the context of street food vending, this theory provides a foundation for analyzing how environmental sanitation directly influences the risk of food contamination. The conceptual framework derived from Hanlon's perspective highlights the causal pathway linking environmental hazards, exposure mechanisms, and disease outcomes, thereby reinforcing the importance of sanitation infrastructure in preventing foodborne illnesses.

The second theoretical foundation is the Health Belief Model (HBM), developed by Irwin M. Rosenstock in 1966 at the U.S. Public Health Service, United States (Saini et al., 2024). This model explains health-related behaviors through individual perceptions of risk, benefits, and barriers (Zergui et al., 2025). Rosenstock argued that individuals are more likely to adopt preventive behaviors when they perceive a high susceptibility to a health threat and believe that specific actions can reduce that risk (Dhar et al., 2023). In the context of street food vendors, the HBM is particularly relevant in understanding hygiene practices, such as handwashing, safe food storage, and utensil cleanliness. The conceptual framework of the HBM includes perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Arora et al., 2024). These components help explain why some vendors adhere to sanitation standards while others do not, despite awareness of potential health risks.

The third theoretical approach is the Food Safety Risk Analysis Framework, formalized by the Codex Alimentarius Commission in 1995 under the joint auspices of the Food and Agriculture Organization (FAO) and the World Health Organization (WHO), headquartered in Rome, Italy, and Geneva, Switzerland, respectively (Sathya & Indradevi, 2024). This framework integrates risk assessment, risk management, and risk communication to systematically evaluate food safety hazards (Tualeka et al., 2024). It provides a structured method for identifying potential contamination points along the food supply chain, including preparation and distribution stages typical of street food vending. The conceptual framework emphasizes hazard identification, exposure assessment, hazard characterization, and risk characterization, enabling a scientific evaluation of foodborne disease risks (Begum et al., 2025).

From the perspective of these three scholars Hanlon, Rosenstock, and the Codex Alimentarius Commission the theoretical integration offers a multidimensional understanding of sanitation and food safety. Hanlon focuses on environmental determinants, Rosenstock emphasizes behavioral drivers, and Codex introduces a systematic risk evaluation approach. Together, these perspectives form a comprehensive conceptual framework in which environmental conditions influence exposure, individual behaviors mediate risk, and structured analysis quantifies potential health outcomes.

The development of these theories has evolved significantly in recent years (Wang et al., 2024). Environmental Health Theory has expanded to incorporate urban health perspectives, particularly in relation to informal settlements and street-based economic activities (Baneshi et al., 2024). Modern studies emphasize the role of climate change, urban density, and infrastructure inequality in shaping sanitation conditions (Hu et al., 2023). Similarly, the Health Belief Model has been refined to include sociocultural and economic determinants, recognizing that behavior is not solely influenced by perception but also by structural constraints (Engida et al., 2025). In parallel, the Food Safety Risk Analysis Framework has integrated advanced technologies such as predictive microbiology and data-driven risk modeling, enhancing its applicability in diverse contexts, including informal food sectors (Engida et al., 2025).

Contemporary applications of these theories demonstrate their relevance to the present study. For instance, recent research combining environmental assessments with behavioral analysis confirms that poor sanitation conditions are often compounded by limited risk perception among vendors (Truong, 2025). Additionally, risk analysis approaches have revealed that critical control points in street food preparation such as water usage, utensil hygiene, and food storage are frequently compromised (Je-Hyuk, 2025). These findings align with the theoretical propositions of Hanlon, Rosenstock, and Codex, thereby validating their continued applicability in addressing food safety challenges.

The integration of these theories is directly relevant to the main problem of this research, namely the inadequate sanitation conditions among street food vendors and their association with foodborne disease risks. Environmental Health Theory explains the structural deficiencies contributing to contamination, the Health Belief Model elucidates behavioral gaps among vendors, and the Food Safety Risk Analysis Framework provides a methodological basis for assessing risk. Together, they address the identified research gap, which lies in the lack of comprehensive analyses that simultaneously consider environmental, behavioral, and risk-based dimensions.

Furthermore, these theoretical frameworks inform the formulation of the research problem by identifying key variables such as sanitation infrastructure, vendor behavior, and contamination risk. They also support the research objectives by providing analytical tools to assess sanitation conditions and evaluate their impact on food safety. From a theoretical standpoint, the study contributes to the integration of multidisciplinary approaches, while practically, it offers insights for improving sanitation policies and interventions. Academically, it enriches the literature by bridging gaps between environmental health, behavioral science, and risk analysis.

In conclusion, the literature review demonstrates that the combination of Environmental Health Theory, the Health Belief Model, and the Food Safety Risk Analysis Framework provides a robust foundation for analyzing sanitation conditions and their implications for foodborne diseases. The perspectives of Hanlon, Rosenstock, and the Codex Alimentarius Commission collectively address the complexity of the research problem by linking environmental factors, human behavior, and risk assessment. This integrated approach highlights the existing research gap and supports the novelty of the study, which lies in its comprehensive examination of sanitation and food safety within street food contexts. Ultimately, the theoretical synthesis underpins the research questions, objectives, and anticipated contributions, ensuring both scientific rigor and practical relevance.

RESEARCH METHODS

This study employs a qualitative research approach to comprehensively examine the sanitation conditions of street food vendors and their potential contribution to foodborne disease risks. A qualitative method is considered most appropriate because the research seeks to explore complex, context-dependent phenomena that cannot be fully captured through numerical measurement alone

(Sharma, 2024). Sanitation practices, vendor behavior, environmental conditions, and risk perception are inherently multidimensional and socially embedded, requiring in-depth understanding through direct observation and interaction (Wabinga & Acosta, 2025). By adopting a qualitative paradigm, this study is able to generate rich, descriptive data that illuminate the interplay between environmental hygiene and behavioral practices within real-life street food settings.

The research design applied in this study is a descriptive qualitative case study. This design is selected because it allows for an intensive, holistic examination of sanitation conditions within a specific context, namely street food vending environments in an urban area (Mulyodarsono & Kristopo, 2024). The case study approach facilitates the integration of multiple data sources, including observation, in-depth interviews, and document analysis, thereby enhancing the credibility and depth of findings (Rahman et al., 2025). The descriptive orientation ensures that the study remains grounded in empirical realities, focusing on accurately portraying sanitation practices, environmental conditions, and potential contamination pathways without imposing experimental manipulation. This design is particularly suitable for identifying patterns, understanding contextual influences, and generating insights that can inform public health interventions.

The research was conducted in a densely populated urban area characterized by a high concentration of street food vendors, specifically in a metropolitan setting in Indonesia. The selected location represents a typical urban environment where informal food sectors thrive due to high demand for affordable and accessible meals (Singh et al., 2024). The area is known for its diverse range of street food offerings, varying levels of sanitation infrastructure, and significant daily consumer traffic. The choice of this location is based on several considerations, including its representativeness of urban street food ecosystems, the observable variability in sanitation practices, and the potential public health implications associated with high population density. Additionally, accessibility and feasibility of conducting field observations and interviews contributed to the selection of this site.

In qualitative research, the focus is placed on informants rather than statistical respondents (Singh et al., 2024). Therefore, this study utilizes purposive sampling to select individuals who possess relevant knowledge and experience related to street food sanitation (Widjajanti et al., 2024). A total of fifteen informants were involved in the study, consisting of street food vendors, local health officers, and consumers. The inclusion of multiple stakeholder perspectives enhances the comprehensiveness of the analysis and allows for triangulation of data (Satin, 2024). Each informant was assigned a pseudonym to ensure confidentiality and ethical compliance (Utama et al., 2025).

The primary informants include ten street food vendors, identified by pseudonyms such as Vendor A, Vendor B, Vendor C, Vendor D, Vendor E, Vendor F, Vendor G, Vendor H, Vendor I, and Vendor J. These vendors represent a range of food types, including cooked meals, beverages, and ready-to-eat snacks. The selection criteria for these vendors include length of operation (minimum one year), frequency of daily transactions, and willingness to participate in the study (Musifu et al., 2023). These criteria ensure that the selected vendors have sufficient experience and exposure to sanitation practices in street food operations. The vendors' roles as food handlers make them central to understanding hygiene practices, environmental conditions, and potential contamination risks.

Additional informants include three local health officers, referred to as Officer K, Officer L, and Officer M, who are responsible for monitoring food safety and sanitation in the study area. These informants were selected based on their professional expertise and direct involvement in public health oversight (Manalu et al., 2025). Their insights provide an institutional perspective on sanitation regulations, enforcement challenges, and public health risks associated with street food vending. Furthermore, two consumers, identified as Consumer N and Consumer O, were included to capture user perceptions regarding hygiene and food safety. The inclusion of consumers adds a demand-side perspective, highlighting expectations and awareness of sanitation standards.

Data collection was conducted through three primary techniques: non-participant observation, in-depth semi-structured interviews, and document analysis. Observations were carried out to directly assess sanitation conditions, including cleanliness of food preparation areas, availability of clean water, waste management practices, and personal hygiene of vendors. This method allows for the capture of

actual practices rather than relying solely on self-reported data (Hidayah & Mathari, 2023). In-depth interviews were conducted using a semi-structured guide, enabling flexibility to explore emerging themes while maintaining consistency across informants (Shahen, 2024). The interviews focused on topics such as hygiene practices, knowledge of food safety, perceived risks, and challenges in maintaining sanitation standards. Document analysis involved reviewing local health regulations, inspection reports, and relevant policy documents to contextualize the findings within existing regulatory frameworks (Mariyono et al., 2025).

To ensure the validity and reliability of qualitative data, this study employs several strategies, including data triangulation, source triangulation, and member checking (Anwa & Karno, 2024). Data triangulation is achieved by combining multiple data collection methods, while source triangulation involves gathering information from different categories of informants. Member checking is conducted by sharing preliminary findings with selected informants to verify the accuracy and credibility of interpretations (Gayatri & Lukman, 2024). Additionally, the researcher maintains a detailed audit trail documenting data collection and analysis processes to enhance transparency (Aeni et al., 2025).

Data analysis in this study follows a thematic analysis approach (Nugroho & Arif, 2025). The process begins with data reduction, in which raw data from observations and interviews are transcribed, organized, and coded (Lyngwa & Sahoo, 2025). Codes are then grouped into categories based on similarities and patterns. These categories are further developed into broader themes that reflect key aspects of sanitation conditions and foodborne disease risks. The analysis is iterative, involving continuous comparison between data sources to refine themes and ensure consistency. The use of thematic analysis allows for the identification of recurring patterns and the development of meaningful interpretations grounded in empirical data.

The technique for drawing conclusions in this study is based on an inductive reasoning approach (Kakaza & Naude, 2025). Conclusions are derived from the systematic analysis of qualitative data, moving from specific observations to broader generalizations (Nst & Nanda, 2023). The researcher continuously compares findings across different data sources to identify converging evidence and validate interpretations. This process ensures that conclusions are not based on isolated observations but are supported by consistent patterns across multiple informants and data collection methods. The final conclusions are formulated by linking the identified themes to the research objectives, theoretical frameworks, and existing literature, thereby ensuring coherence and analytical rigor.

Ethical considerations are carefully addressed throughout the research process. Informed consent is obtained from all informants prior to data collection, and confidentiality is maintained through the use of pseudonyms (Nst & Nanda, 2023). The study also ensures that participation is voluntary and that informants have the right to withdraw at any stage (Jeyapaul, 2024). These ethical practices are essential for maintaining trust and integrity in qualitative research.

Overall, the chosen methodology provides a robust framework for exploring sanitation conditions among street food vendors and their potential implications for foodborne diseases. The qualitative case study design enables an in-depth understanding of contextual factors, while purposive sampling ensures the inclusion of relevant and knowledgeable informants. The combination of observation, interviews, and document analysis enhances data richness and validity, and the use of thematic analysis and inductive reasoning supports the development of well-grounded conclusions. Through this methodological approach, the study aims to generate meaningful insights that contribute to both academic discourse and practical efforts to improve food safety in informal food sectors.

RESULTS AND DISCUSSION

The findings of this study reveal a complex and interrelated set of sanitation challenges among street food vendors, which significantly contribute to the potential risk of foodborne diseases. Based on qualitative data obtained through observation, in-depth interviews, and document analysis, the results demonstrate that sanitation conditions remain inconsistent and, in many cases, below acceptable public health standards. These findings directly address the main research problem, namely the inadequate sanitation conditions among street food vendors and their implications for food safety. The analysis

shows that environmental sanitation, vendor hygiene practices, and risk awareness collectively shape the level of exposure to foodborne pathogens.

Field observations indicate that a considerable proportion of vendors operate in environments lacking basic sanitation infrastructure (Shaltout, 2024). Limited access to clean water was a recurring issue, with several vendors relying on stored water that was reused multiple times for washing utensils. Waste management practices were also found to be suboptimal, as food residues and garbage were often disposed of in open containers near food preparation areas. These conditions align with the Environmental Health Theory proposed by John J. Hanlon, which emphasizes the direct relationship between environmental sanitation and disease transmission (Erick et al., 2023). The findings confirm that unsanitary surroundings increase the likelihood of microbial contamination, particularly in high-density urban settings (Egorova et al., 2025). The implementation of this theory is evident in the observed causal pathway linking environmental exposure to potential health risks.

In terms of personal hygiene practices, the study found significant variability among vendors. While some vendors demonstrated awareness of hygiene standards, such as using gloves or washing hands before food preparation, others exhibited practices that could facilitate contamination, including handling food and money simultaneously without handwashing. These behaviors reflect the constructs of the Health Belief Model developed by Irwin M. Rosenstock, particularly in relation to perceived susceptibility and perceived barriers (Shahid et al., 2025). Vendors who perceived a lower risk of foodborne diseases were less likely to adopt preventive measures, often citing time constraints and limited resources as barriers (Mohammed et al., 2023). This finding highlights the importance of behavioral factors in shaping sanitation practices and supports the relevance of the Health Belief Model in explaining variations in hygiene behavior.

Furthermore, the application of the Food Safety Risk Analysis Framework developed by the Codex Alimentarius Commission provides a structured lens for interpreting the findings (Khalim & Dewi, 2024). The study identified several critical control points where contamination risks are heightened, including water usage, food storage, and utensil cleanliness. Hazard identification revealed the presence of potential biological contaminants, while exposure assessment indicated frequent opportunities for cross-contamination. These results underscore the importance of systematic risk evaluation in understanding food safety challenges in informal sectors.

To enhance clarity and organization of the findings, the following table summarizes the key results derived from the study:

Aspect of Sanitation	Observed Condition	Associated Risk	Theoretical Link
Water Supply	Limited access to clean running water; reuse of water	Increased microbial contamination	Environmental Health Theory
Waste Management	Open disposal near food areas	Attraction of vectors and pathogens	Environmental Health Theory
Personal Hygiene	Inconsistent handwashing; no protective equipment	Cross-contamination	Health Belief Model
Food Handling	Simultaneous handling of food and money	Transmission of pathogens	Health Belief Model
Food Storage	Exposure to open air and dust	Contamination risk	Risk Analysis Framework
Utensil Cleanliness	Inadequate washing practices	Bacterial growth	Risk Analysis Framework

These findings also illuminate the research gap identified in previous studies, particularly the lack of integrated analysis combining environmental, behavioral, and risk-based perspectives (Zaitseva et al., 2024). By simultaneously applying the three theoretical frameworks, this study provides a more

comprehensive understanding of sanitation conditions and their implications. The gap is addressed through the integration of empirical observations with theoretical constructs, demonstrating how environmental deficiencies and behavioral factors converge to increase foodborne disease risks. The implementation of this integrated approach offers a novel contribution to the literature, reinforcing the study's originality.

In relation to the research questions, the findings provide clear answers. First, sanitation conditions among street food vendors are generally inadequate and do not consistently meet established hygiene standards. Second, these conditions significantly influence the potential risk of foodborne diseases through multiple contamination pathways. Third, the most critical factors contributing to risk include lack of clean water, poor waste management, inadequate personal hygiene, and unsafe food handling practices. Each of these findings is supported by the theoretical frameworks employed, demonstrating the coherence between empirical data and conceptual analysis.

The study's objectives are also achieved through these findings. The evaluation of sanitation conditions reveals specific environmental and behavioral deficiencies, while the identification of risk factors highlights key areas for intervention. The relationship between sanitation practices and contamination risk is clearly established, providing evidence that can inform public health strategies. From the perspective of Environmental Health Theory, the findings emphasize the need for improved sanitation infrastructure. From the Health Belief Model, they highlight the importance of enhancing risk perception and behavioral change among vendors. From the Risk Analysis Framework, they demonstrate the value of systematic hazard identification and control.

The benefits of this research are evident across theoretical, practical, and academic dimensions. Theoretically, the study contributes to the integration of multiple frameworks, offering a holistic model for analyzing food safety in informal sectors. Practically, the findings provide actionable insights for policymakers and public health practitioners, particularly in designing targeted interventions to improve sanitation conditions. Academically, the study enriches existing literature by addressing previously identified gaps and providing context-specific evidence. The implementation of these benefits is grounded in the alignment between theory and empirical findings, ensuring both relevance and applicability.

The discussion of findings further strengthens the connection between this study and previous research. Earlier studies have consistently reported that poor sanitation conditions are a major contributor to foodborne diseases in street food settings. The current findings corroborate these results, particularly in relation to water quality, waste management, and hygiene practices. However, this study extends previous research by integrating behavioral and risk analysis perspectives, thereby providing a more comprehensive understanding of the issue. This advancement addresses the identified research gap and supports the novelty of the study.

In terms of the main problem, the findings confirm that inadequate sanitation conditions remain a significant public health concern. Previous research has highlighted similar issues, but often in isolation (Luthfi et al., 2025). By combining multiple dimensions, this study demonstrates how environmental and behavioral factors interact to exacerbate risks. This integrated perspective provides a more nuanced understanding of the problem and offers a stronger basis for intervention.

The discussion of the research gap also reveals important insights. While earlier studies have identified sanitation deficiencies, they have not fully explored the underlying behavioral and risk-related factors (Ramadhani et al., 2024). The current findings address this limitation by incorporating the Health Belief Model and Risk Analysis Framework, thereby providing a more comprehensive explanation. This contribution is particularly important for developing effective interventions, as it highlights the need to address both structural and behavioral determinants.

The alignment between the findings and research questions further demonstrates the coherence of the study. Previous studies have posed similar questions but have often focused on specific aspects, such as microbiological contamination or vendor knowledge (Wojciechowska, 2024). This study

expands the scope by addressing multiple dimensions simultaneously, thereby providing a more holistic answer to the research questions.

The study's objectives are also reinforced through comparison with previous research. Earlier studies have emphasized the importance of sanitation in preventing foodborne diseases, but have often lacked detailed analysis of specific risk factors (Chisanza & Hamza, 2024). The current findings provide a more detailed and context-specific understanding, thereby enhancing the practical relevance of the research.

Finally, the benefits of the study are consistent with findings from previous research, which have highlighted the importance of integrating theory and practice in addressing public health challenges (Adley & Ryan, 2025). By combining Environmental Health Theory, the Health Belief Model, and the Risk Analysis Framework, this study offers a comprehensive approach that can inform both policy and practice. The theoretical contribution lies in the integration of multiple frameworks, while the practical contribution lies in the identification of actionable risk factors. Academically, the study provides a valuable reference for future research, particularly in expanding interdisciplinary approaches to food safety.

In conclusion, the findings of this study provide a comprehensive and theoretically grounded understanding of sanitation conditions among street food vendors and their potential contribution to foodborne diseases. By addressing the main problem, research gap, research questions, objectives, and benefits, and by linking these elements to established theoretical frameworks and previous research, the study offers a robust and meaningful contribution to the field of public health.

CONCLUSION

The findings of this study lead to a comprehensive conclusion that sanitation conditions among street food vendors remain a critical determinant of food safety and a significant contributor to the potential risk of foodborne diseases. Drawing from the results and discussion, it is evident that the observed sanitation practices are generally inadequate and inconsistent, thereby creating multiple pathways for microbial contamination. Environmental factors, such as limited access to clean water, improper waste disposal, and unsanitary food preparation areas, were found to directly increase exposure to harmful pathogens. These findings reinforce the central premise of Environmental Health Theory, which posits that poor environmental conditions significantly elevate health risks. The study demonstrates that the physical environment in which street food is prepared and sold plays a decisive role in shaping the safety of the food consumed by the public.

In addition to environmental deficiencies, the study highlights the crucial role of vendor behavior in determining sanitation outcomes. The discussion reveals that hygiene practices among vendors vary widely, with some demonstrating basic awareness of food safety measures, while others exhibit behaviors that increase contamination risks, such as inadequate handwashing and unsafe food handling. This variation is closely linked to the constructs of the Health Belief Model, particularly in relation to perceived susceptibility and perceived barriers. Vendors who do not perceive foodborne diseases as an immediate threat tend to neglect preventive measures, often due to time constraints, economic limitations, or lack of access to proper facilities. Consequently, behavioral factors act as a mediating variable between environmental conditions and actual health risks.

Furthermore, the application of the Food Safety Risk Analysis Framework within the study provides a structured understanding of how contamination occurs at different stages of food handling. The identification of critical control points—such as water usage, utensil cleanliness, and food storage—demonstrates that risks are not isolated but rather cumulative across multiple stages of food preparation and distribution. The findings confirm that inadequate control at any of these points can significantly increase the likelihood of foodborne illness. This reinforces the importance of systematic risk assessment in identifying vulnerabilities and prioritizing interventions within informal food sectors.

The integration of these three theoretical perspectives—Environmental Health Theory, the Health Belief Model, and the Food Safety Risk Analysis Framework—enables a holistic interpretation of the research findings. The results and discussion collectively show that sanitation-related risks are

not solely the result of environmental shortcomings but are also shaped by behavioral practices and the absence of structured risk management. This multidimensional understanding represents a key contribution of the study, as it bridges gaps identified in previous research that often examined these factors in isolation.

From the perspective of the main research problem, the study conclusively demonstrates that inadequate sanitation conditions among street food vendors are a persistent and significant public health concern. The discussion confirms that these conditions are directly associated with increased risks of foodborne diseases, particularly in densely populated urban areas where street food consumption is high. The research gap identified at the outset namely the lack of integrated analysis combining environmental, behavioral, and risk-based approaches has been effectively addressed through the study's methodological and theoretical framework. This integration constitutes the novelty of the research, providing a more comprehensive and context-sensitive understanding of sanitation and food safety.

The study also successfully answers the research questions by demonstrating that sanitation conditions are generally substandard, that these conditions significantly influence contamination risks, and that key contributing factors include inadequate infrastructure, poor hygiene practices, and weak risk control mechanisms. In achieving its objectives, the research provides empirical evidence linking sanitation practices to food safety outcomes, thereby offering a solid foundation for both policy development and practical intervention.

In terms of implications, the study underscores the need for coordinated efforts to improve sanitation infrastructure, enhance vendor education, and implement effective risk management strategies. The findings suggest that interventions should not only focus on improving physical conditions but also address behavioral change through targeted awareness programs. Additionally, the adoption of risk-based approaches can help identify priority areas for intervention and optimize resource allocation.

Overall, the conclusion drawn from the results and discussion highlights that improving sanitation conditions among street food vendors requires a multidimensional strategy that integrates environmental improvements, behavioral interventions, and systematic risk management. Such an approach is essential for reducing the burden of foodborne diseases and ensuring safer food systems within informal urban sectors.

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