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Strengthening Food Safety Through Health Education: Pamphlet-Based Intervention to Improve Hygiene Sanitation Practices Among Street Food Handlers in Car Free Day Bajra Sandhi Denpasar

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Abstract

Food safety is a critical determinant of public health, with unsafe food contributing to foodborne diseases and long-term health risks, including an increased burden of non-communicable diseases and cancer. Street food, while culturally and economically significant, is particularly vulnerable to contamination due to poor hygiene and sanitation practices among food handlers. This study evaluated the effectiveness of pamphlet-based health education in improving knowledge, attitudes, and hygiene sanitation practices among street food vendors at Car Free Day Bajra Sandhi Denpasar, Indonesia. A pre-experimental one-group pretest–posttest design was conducted involving 64 purposively selected vendors from a total of 328. Data were collected using questionnaires and direct observation, and analyzed using the Wilcoxon Signed Rank Test and N-Gain score. Results showed statistically significant improvements ($p < 0.001$) across all variables. The N-Gain score indicated moderate effectiveness for knowledge (40.47%) and practice (36.94%), and low effectiveness for attitude (17.97%), reflecting that most respondents already held positive attitudes before the intervention. This study demonstrates that pamphlet-based education is a simple, low-cost, and scalable tool to strengthen food safety through improved hygiene practices. By reducing the risks of foodborne illness, such interventions indirectly contribute to lowering exposure to carcinogenic contaminants, aligning with the global health agenda of cancer prevention. Furthermore, sustainable impact requires cross-disciplinary collaboration involving health professionals, local authorities, and community organizations to integrate food safety education into broader cancer prevention and public health strategies.

Keywords: food, sanitation hygiene, food handlers, pamphlets, education, cancer prevention

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INTRODUCTION

Food safety remains a pressing global health issue, directly affecting public well-being and economies worldwide. According to the World Health Organization (WHO), consuming unsafe food leads to approximately 600 million cases of foodborne illnesses and 420,000 deaths annually, with children under five disproportionately impacted (WHO, 2024). Beyond acute sickness and fatalities, unsafe food often harbors chemical and biological contaminants that can contribute to long-term health risks, including certain forms of cancer.

Advancements in research have highlighted the broader implications of foodborne diseases—not only as a short-term hazard but also as a potential contributor to chronic illnesses. For instance, repeated exposure to carcinogenic toxins such as aflatoxins and nitrosamines has been linked to cancers of the liver, stomach, and esophagus (WHO, 2025). Ensuring food safety, therefore, plays a dual role: preventing immediate illness and contributing to cancer prevention

strategies, aligning well with the conference theme of “Cancer as a Global Health Challenge” through cross-disciplinary collaboration and sustainable interventions.”

In low- and middle-income countries, street food represents an important source of nutrition due to its affordability and accessibility. However, these food sources often bypass formal regulatory oversight, increasing the risk of contamination. Recent studies in regions like Nigeria and Malaysia report that, although awareness of basic hygiene exists, consistent practice of critical safety measures—such as wearing gloves or maintaining clean workspaces—is lacking among street vendors (Ibrahim & Adeola, 2024) (Aziz et al., 2023). This disparity between knowledge and practice underlines the importance of effective yet scalable educational interventions.

In Indonesia, this issue takes on particular relevance, especially during community events such as the Car Free Day (CFD) at the Bajra Sandhi

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Monument in Denpasar. Here, hundreds of street food vendors congregate weekly, offering diverse culinary options to both locals and tourists. Yet, preliminary assessments have shown alarming gaps in sanitation measures—ranging from inadequate handwashing to improper storage and limited use of protective gear. These lapses pose immediate risks of foodborne illness and potential long-term exposure to harmful contaminants.

Educational efforts that can be scaled up quickly and affordably are, therefore, essential. Pamphlet-based interventions offer a straightforward and effective solution: they provide concise, targeted health messages that can be distributed widely and revisited by vendors when needed. Studies conducted during Ramadan 2023 in Jakarta demonstrated the efficacy of Information, Education, and Communication (IEC) materials in improving hygiene standards among food vendors (Kusumaratna et al., 2024). Similarly, training efforts targeting street vendors in schools revealed a strong

association between knowledge gained through education and improved food safety practices (Adha et al., 2025). However, such interventions remain under-explored in the specific context of Denpasar's CFD vendors.

Linking food safety to the conference theme—"Cancer as a Global Health Challenge: Cross-Disciplinary Collaboration Towards Comprehensive and Sustainable Management"—underscores the necessity of preventive strategies that bridge disciplines. Food safety education is inherently multifaceted, involving public health, nutrition, education, environmental sciences, and policy. Pamphlet-based programs are not only practical and sustainable but also serve as critical bridges between these sectors. By improving hygiene practices, such interventions reduce immediate disease risk and contribute indirectly to long-term cancer prevention by minimizing exposure to foodborne carcinogens.

Moreover, implementing these interventions in community-heavy events like CFD allows for widespread

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outreach and repeat exposure, enhancing effectiveness. This approach supports comprehensive management—addressing acute public health threats now while laying the groundwork for future disease prevention. Cross-disciplinary involvement—from content creators and health educators to local authorities and community advocates—is essential to ensure materials are context-appropriate, culturally relevant, and sustainably distributed.

In summary, improving food safety through pamphlet-based health education aligns with global health priorities that include disease prevention, cancer risk reduction, and sustainable health promotion. This study seeks to fill a critical gap by evaluating the impact of such interventions among street food handlers in Denpasar. By measuring changes in knowledge, attitudes, and hygiene practices before and after an educational intervention, this research offers empirical insights into the role of low-cost, scalable health education tools in enhancing food safety

and contributing to broader public health objective.

METHOD

This study employed a pre-experimental design with one-group pretest–posttest, which is frequently used in public health research to measure the effectiveness of educational interventions in community settings. The research was conducted at the Car Free Day (CFD) Bajra Sandhi Monument in Denpasar, Bali, a weekly event where hundreds of street food vendors operate, making it an ideal setting for food safety promotion.

The study population comprised 328 food vendors, with 64 participants selected using purposive sampling. Inclusion criteria included being an active food handler at CFD, directly involved in food preparation, aged ≥ 18 years, and willing to participate. Those absent during pretest or posttest were excluded. This sample size was considered adequate based on previous intervention studies with similar designs.

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Participants received pamphlet-based health education focused on hygiene and sanitation. The pamphlet provided concise information on proper handwashing, use of protective equipment, safe food storage, and environmental cleanliness. After distribution, each vendor received a five-minute counseling session from health educators. Pamphlets were designed to be simple, clear, and visually appealing, allowing vendors to review information repeatedly at their convenience. Pamphlets are recognized as an effective, low-cost medium for promoting food safety practices.

Two main tools were used: (1) a structured questionnaire to assess knowledge (20 multiple-choice items) and attitudes (15 Likert-scale items), and (2) an observation checklist to measure practices such as hand hygiene, food storage, and protective equipment use.

Data collection was conducted before and after the intervention. Data were analyzed using SPSS. Differences in pretest and posttest scores were assessed with the Wilcoxon Signed Rank Test. Effectiveness was further measured with the N-Gain score, categorized as low (<30%), moderate (30–70%), or high (>70%). Ethical approval was granted by the Bali Provincial Health Office Ethics Committee. Informed consent was obtained from all participants, and confidentiality was ensured by anonymizing responses.

RESULT

A total of 64 street food handlers participated in the study, with the majority aged between 25–45 years and engaged in food preparation for more than two years. Baseline assessments revealed that knowledge and attitudes were relatively good, but hygiene practices remained inadequate.

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Picture 1. Percentage Graph of
Knowledge, Attitude, and Practice
Levels in the Good Category Before
and After

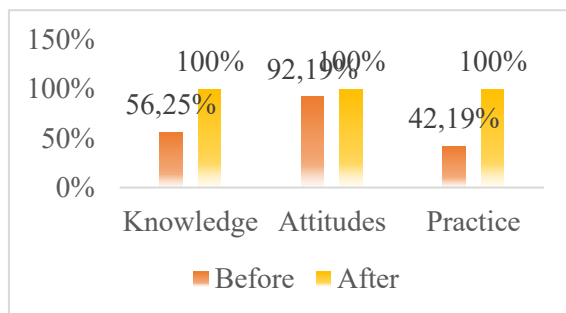


Table 1. Changes in Knowledge,
Attitudes, and Practice (n=64)

Variable	Pre test (Good %)	Post test (Good %)	p-value	N-Gain (%)	Effectiveness
Knowledge	56, 3%	92, 2%	<0, 001	40, 47%	Moderate
Attitudes	92, 2%	98, 4%	<0, 001	17, 97%	Low
Practices	42, 2%	79, 7%	<0, 001	36, 94%	Moderate

The Wilcoxon Signed Rank Test indicated significant improvements ($p < 0.001$) in knowledge, attitudes, and practices. The N-Gain score analysis revealed moderate effectiveness in improving knowledge (40.47%) and practices (36.94%), while attitudes showed a low N-Gain (17.97%). Despite the low gain, posttest results still reflected high levels of positive attitudes

Before the intervention, 56.25% of respondents demonstrated good knowledge, 92.19% had positive attitudes, and only 42.19% reported good hygiene practices. After the pamphlet-based counseling, there were substantial increases across all domain.

among respondents. These findings indicate that pamphlet-based health education was particularly effective in addressing knowledge gaps and promoting improvements in hygiene practices, although attitudes had already been favorable at baseline.

The largest improvement was observed in knowledge, suggesting that pamphlets effectively delivered new information and corrected misconceptions regarding hygiene and sanitation. Practices also showed meaningful gains, indicating that information provided in pamphlets was translated into behavior changes, such as improved handwashing and safer food storage.

By contrast, the small increase in attitudes reflects a ceiling effect, as most vendors already expressed favorable

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views on hygiene before the intervention. This finding highlights the importance of pairing attitude reinforcement with practical demonstrations to ensure sustainable changes in practice. Overall, the results confirm that pamphlet-based education can significantly enhance food safety behavior among street food handlers, particularly in contexts where resources for intensive training are limited.

DISCUSSION

The findings of this study affirm that a pamphlet-based health education intervention effectively enhanced both *knowledge* and *hygiene practices* among street food handlers at Car Free Day (CFD) Bajra Sandhi in Denpasar. The observed improvement in *knowledge* (N-Gain = 40%) and *practices* (= 37%) aligns with similar interventions employing print or educational media in informal food sectors. For instance, Setyani et al., 2022 demonstrated that using pocketbooks in the Angkringan vendor community in Yogyakarta led to

significant increases in food safety scores ($p < 0.05$). This corroborates our finding that simple and repeatable educational tools can catalyze behavior change in environments where structured training is often unfeasible.

The relatively low gain in attitudes (= 18%) likely reflects a ceiling effect, since most participants already held positive views on food hygiene at baseline. Similar outcomes have been reported in other studies, such as Kusumaratna et al., 2024, who found that while IEC interventions during Ramadan effectively improved food safety practices, shifts in attitudes were limited because vendors already recognized the importance of hygiene prior to the program. This suggests that deeply ingrained attitudes are less amenable to short-term interventions, and more interactive or sustained educational strategies may be required to produce measurable changes. Nevertheless, reinforcing existing positive attitudes remains essential to sustain long-term hygienic practices.

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This study adds to the growing body of evidence that pamphlet or pocketbook interventions can be particularly impactful in resource-constrained urban settings. The strategy's affordability, portability, and clarity render it suitable for rapid deployment in transient markets like CFD. Kusumaratna et al., 2024 similarly reported that IEC materials distributed to food vendors during Ramadan significantly improved hygiene compliance. Our findings therefore underscore the potential of such low-cost educational campaigns to bridge gaps in institutional capacity and reach vulnerable vendor populations effectively.

In the broader context of public health and cancer prevention, improving food safety through enhanced sanitation practices contributes to minimizing exposure to long-term carcinogenic risks. As highlighted earlier, contaminants like aflatoxins and nitrosamines in poorly managed street food pose chronic disease threats. Thus, empowering vendors through pamphlet-

based education becomes part of a preventive strategy aligning with cross-disciplinary goals: merging environmental health, education, nutrition, and oncology into a cohesive public health response.

Furthermore, the findings echo the importance of cross-sectoral collaboration advocated in global health frameworks. Effective food safety promotion among street vendors requires cooperation between health educators (designing content), local authorities (facilitating outreach), and vendors themselves (practicing protocols). This community-integrated approach aligns with models where local empowerment, rather than top-down regulation, leads to sustainable behavior change (Harianto & Ardani, 2021).

However, the study's one-group pretest-posttest design lacks a control group, limiting causal interpretation. External influences, such as increased public awareness or concurrent inspections, could also affect outcomes. Future research should consider randomized controlled designs or mixed-

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methods approaches to strengthen validity. In addition, this study assessed short-term effects only. Long-term follow-up is necessary to evaluate the intervention's durability and behavioral maintenance.

The sustainability of behavior change could be bolstered by periodic reinforcement and integrating interactive components—such as live demonstrations, audiovisual media, or peer-led mentoring. For example, combining pamphlets with nutrition education booklets and visual storytelling has shown greater impact among adolescent populations (Said et al., 2020). For street vendors, incorporating storytelling or pictorial checklists may enhance engagement and retention.

Another challenge is scalability. While CFD Denpasar offers a focal point, replicating this intervention across diverse urban settings requires infrastructure, training materials, and stakeholder coordination. The Indonesian government's pilot of risk-based food inspection (RBFi) across

multiple districts between 2022–2023 demonstrates that structured frameworks can be scaled when backed by policy and training (WHO, 2023). Pamphlet-based education could be integrated seamlessly into such frameworks, combining preventive education with formal inspections for comprehensive food safety management.

Lastly, this intervention must be culturally sensitive and contextually tailored. Pamphlet messages designed for Denpasar vendors should reflect local languages, common practices, and visual styles. Collaborative development with community representatives enhances acceptance and effectiveness. Past research indicates that posters and pamphlets are far more effective when co-designed with the target community (Setyani et al., 2022).

CONCLUSION

This study demonstrated that pamphlet-based health education is an effective intervention to improve food safety-related knowledge and hygiene sanitation practices among street food

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handlers at Car Free Day Bajra Sandhi Denpasar. The findings showed statistically significant improvements across all measured variables—knowledge, attitudes, and practices—following the intervention. The N-Gain score analysis indicated moderate effectiveness in knowledge (40.47%) and practice (36.94%), while attitudes showed only a low increase (17.97%), likely due to already high baseline levels.

The most substantial improvement was observed in knowledge, underscoring the value of pamphlets as a low-cost, accessible, and reusable medium for health communication. The observed improvement in hygiene practices further highlights the potential of simple educational interventions to foster behavioral changes that reduce the risks of foodborne diseases. While changes in attitudes were modest, the consistently positive results reaffirm the importance of continuous reinforcement to sustain motivation and long-term practice adherence.

From a broader perspective, strengthening food safety through health education also contributes to the prevention of chronic health risks, including cancers associated with prolonged exposure to food contaminants. By equipping food handlers with practical skills and knowledge, community-based interventions can reduce both immediate and long-term disease burdens. These findings align with the principle of cross-disciplinary collaboration emphasized in global health strategies, integrating public health education, environmental health, and disease prevention efforts into a sustainable framework.

In conclusion, pamphlet-based counseling should be considered as part of routine food safety promotion programs, particularly in informal food sectors where resources for training and supervision are limited. For sustainable impact, pamphlet interventions could be combined with other approaches, such as interactive training, audiovisual media, and regular monitoring by local health authorities. Expanding these strategies

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beyond CFD Denpasar to other urban centers has the potential to significantly strengthen food safety practices nationwide and contribute to the long-term resilience of public health systems.

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