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Scoping Review on Knowledge, Attitudes, and Practices of Safety Promotion in Academic Laboratories

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Abstract: This scoping review aims to invistigate safety promotion within academic laboratory environments, with a specific emphasis on culinary academic laboratories. The review aims to detect trends in literature, evaluate safety promotion approaches, and analyze their effects on participants' Knowledge, Attitudes, and Practices (KAP). The evaluation complied with PRISMA-ScR criteria, utilizing Scopus as the principal database, encompassing peer-reviewed articles published from 2014 to 2024. A total of 23 pertinent studies were included following the application of eligibility criteria. The research found twelve unique strategies of safety promotion, encompassing sustainable practices, ergonomic scheduling, health education, and community involvement. The results were classified into KAP outcomes, with several studies indicating enhanced safety knowledge, improved attitudes toward safety procedures, and favorable practical safety results. Notwithstanding the proliferation of literature on safety promotion, considerable deficiencies persist, especially with the distinct hazards present in culinary university laboratories. The evaluation determines that more research is necessary to fill these gaps and establish appropriate safety standards specific to culinary teaching environments.

Keywords: Culinary KAP; Laboratories; Promotion; Safety.

Introduction

The promotion of safety within academic settings, especially in culinary laboratories, is a fundamental component of ensuring a secure and healthy environment for students and instructors participating in practical training (Ayi & Hon, 2018; Dehdashti et al., 2020). Culinary laboratories pose distinctive challenges by merging aspects of both food safety and laboratory safety, thus requiring an integrated and comprehensive safety approach to minimize accidents, contamination, and potential health risks (Wiriyakraikul et al., 2022). Promoting effective safety practices in these settings is not only essential for safeguarding students and instructors during practical sessions, but also for cultivating enduring safety habits that are critical for professional success in the food industry (Jasper & Juliana, 2023). Although safety promotion is widely acknowledged as essential in culinary education, there is still an insufficient understanding of existing safety programs, the methods utilized, and their impact on the knowledge, attitudes, and practices (KAP) of students and staff involved (Asamani, 2020). While existing literature provides some insight into safety measures within culinary education, systematic efforts to map specific safety promotion strategies and comprehensively evaluate their outcomes remain limited (Abbas et al., 2016; Wiriyakraikul et al., 2022). To bridge these gaps, this scoping review aims to explore prevailing trends in safety promotion research, with particular emphasis on the strategies implemented in the domains of food safety and laboratory safety, and their influence on knowledge, attitudes, and practices (KAP) among students and academic staff.

The objectives of this review are to identify trends in the literature related to safety promotion in culinary academic laboratories, assess the strategies employed to

How to Cite:
Example: Susilawati, S., Doyan, A., Muliyadi, L., & Hakim, S. (2019). Growth of tin oxide thin film by aluminum and fluorine doping using spin coating Sol-Gel techniques. *Jurnal Penelitian Pendidikan IPA, 1*(1), 1-4. https://doi.org/10.29303/jppipa.v1i1.264

enhance safety particularly within the contexts of food safety and laboratory safety examine the impact of these strategies on participants' knowledge, attitudes, and practices (KAP), and uncover gaps in the existing body of research (Araneo et al., 2019; Salazar-Escoboza et al., 2020). Given the exploratory nature of these aims, a scoping review is deemed appropriate to provide a comprehensive overview of the current research landscape, highlight areas requiring further investigation, and inform future efforts to strengthen safety promotion practices in culinary educational environments (Lely et al., 2023; Peters et al., 2021; Pollock et al., 2021).

The urgency of this study lies in the critical need to ensure a safe and pedagogically effective environment for culinary students, who are future professionals in the food industry. Culinary laboratories involve complex safety challenges, ranging from physical injuries to foodborne contamination, making the promotion of safety practices essential. However, the current lack of a clear and evidence-based understanding of effective safety strategies hampers the development of sound educational policies and interventions. This review seeks to address this gap by providing a comprehensive overview of existing approaches, thereby informing future efforts to strengthen safety culture in culinary education. This study presents a novel contribution by being among the first scoping reviews to systematically explore safety promotion specifically within culinary academic laboratories. While existing literature has addressed general aspects of occupational safety and food safety, there is a lack of comprehensive analysis that integrates both domains in the context of culinary education. By examining the strategies employed to promote safety and their impact on knowledge, attitudes, and practices (KAP) among students and staff, this review introduces a unique perspective that bridges practical safety concerns with educational outcomes in a specialized learning environment.

Method

This scoping review employed a systematic and comprehensive approach to examine existing literature on safety promotion in laboratory environments, with a specific focus on its relevance to culinary academic laboratories. The review was conducted in accordance with the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) guidelines, ensuring methodological transparency, rigor, and reproducibility (Lely et al., 2023).

The eligibility criteria for the review focused on studies published between 2014 and 2024, using Scopus as the primary database for identifying relevant literature. Only peer-reviewed articles published in English were included to ensure quality and relevance. Studies that were non-peer-reviewed, non-English, or unrelated to laboratory safety promotion were excluded from the review to maintain a consistent focus on high-quality research. Given the challenge in finding literature specifically addressing "knowledge, attitudes, and practices (KAP) of safety promotion in academic laboratories" without yielding results, the search strategy was broadened to include literature related to general safety promotion in laboratory environments, particularly in health contexts.

The search process involved a stepwise broadening of search terms to ensure adequate coverage of the literature. Initial searches using keywords such as "knowledges, AND attitudes, AND practices AND of AND safety AND promotion AND academic AND laboratories" yielded no results, indicating limited direct research on this specific combination of variables. Consequently, the search was expanded to "safety AND promotion AND academic AND laboratories," which resulted in only two articles. A further refinement to "safety AND promotion AND laboratories" generated 182 articles. These articles were manually screened to identify studies most relevant to the review topic, particularly those focused on safety promotion interventions that could be applied to the context of culinary academic laboratories.

The selection process involved a systematic review of titles and abstracts, followed by a full-text review to ensure that the selected studies met the inclusion criteria. The data charting process was carried out using a standardized data extraction form to ensure consistency and accuracy in capturing key information. This process was conducted independently by two reviewers, and any discrepancies were resolved through consensus to ensure reliability.

Data items extracted from the included studies focused on the type of safety promotion interventions, target populations (students and staff), outcomes related to knowledge, attitudes, and practices (KAP), and variations in the educational approaches used. Given the broad focus on laboratory environments, this review captures trends in safety promotion that are applicable to health-related laboratory settings and draws implications specifically for culinary academic laboratories. This approach ensures that insights from more generalized laboratory settings can be effectively translated and adapted to address the unique challenges present in culinary education environments.

Result and Discussion

Trends of Literature on Safety Promotion

The topic of safety promotion has emerged as an increasingly important area of research, as evidenced by the growing number of publications indexed in the Scopus database over recent years. The trends in literature on safety promotion indicate a notable increase in academic interest and scholarly contributions to this field. In 2014, there were only 8 publications addressing safety promotion, which remained consistent through 2015. In 2016, there was a slight increase to 8 documents, followed by a significant rise in 2017 with 14 publications. The number of studies continued to grow steadily, reaching 18 publications in 2018 and maintaining this level into 2019. In 2020, the trend continued with 19 documents, followed by a substantial increase in 2021, where 19 documents were also published. The peak so far was seen in 2022 with 31 documents, reflecting a heightened focus on safety promotion, likely driven by a growing awareness of occupational health and safety standards across various sectors. In 2023, there were 21 publications, while 2024 showed 17 documents, suggesting sustained interest, albeit with slight fluctuations.

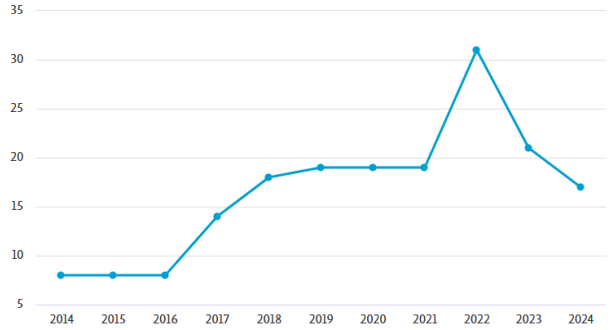

Figure 1 Publication by Year

Overall, these trends reflect an expanding body of knowledge on safety promotion, which encompasses various contexts, including health, laboratory safety, and workplace environments. The growth in literature highlights the increasing recognition of the importance of promoting safety across different settings, particularly in laboratories and academic environments, which is a key focus of this review.

The geographical distribution of literature on safety promotion, as indexed in the Scopus database, reveals a significant variation in contributions across different countries and territories. China leads the list with 68 publications, highlighting its strong focus on research related to safety promotion. The United States follows with 35 documents, reflecting its established commitment to occupational health and safety research. The United Kingdom ranks third with 17 publications, while other major contributors include Canada (10 documents), India (9 documents), and Italy, Sweden, and Switzerland, each with 8 publications. Australia and Brazil each contributed 6 documents, while Belgium, Nepal, and Thailand each produced 5 publications, demonstrating growing interest in safety promotion research in these regions. Japan and Nigeria each contributed 4 publications, and several countries—including the Democratic Republic of Congo, Germany, Indonesia, and the Netherlands—had 3 documents each. Countries like Bangladesh, Denmark, Ethiopia, and others had 2 publications, reflecting smaller but notable contributions to the field. There are also numerous countries with only one publication on safety promotion, such as Argentina, Austria, Cambodia, Cameroon, Colombia, Egypt, Finland, Ghana, Israel, Malaysia, New Zealand, and many others. Additionally, there were 6 documents categorized as "Undefined," indicating that the country or territory of the contributing institutions could not be determined.

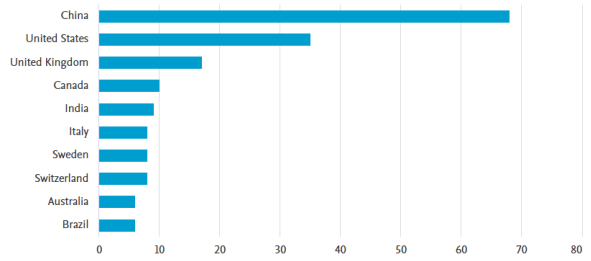

Figure 2 Publication by Year

Those distribution in Figure 2 indicates that research on safety promotion is largely concentrated in a few countries, with China and the United States being the most prolific. However, there is a notable presence of contributions from diverse regions across Asia, Africa, Europe, and the Americas, which underscores the global relevance of safety promotion, particularly in academic and laboratory settings. This variation in contributions highlights different levels of focus on safety-related research across the globe, suggesting the need for greater emphasis and collaboration in regions with fewer publications.

The types of documents related to safety promotion, as indexed in the Scopus database, demonstrate a diversity of formats, reflecting different approaches to disseminating research findings. The majority of the publications are articles, comprising 128 documents, which suggests that empirical research and original studies are the dominant means of exploring safety promotion in laboratory settings. Following this, reviews make up a significant portion, with 28 documents. This indicates an emphasis on synthesizing existing knowledge to provide a comprehensive

overview of the field, identify trends, and highlight gaps in current literature. Conference papers account for 8 documents, indicating that safety promotion is also a topic of interest in academic conferences, where new research findings are presented and discussed among experts. There are 6 book chapters, which suggests that the topic is included in broader academic or professional volumes, providing insights within a larger thematic context. Additionally, there are 3 editorials and 3 notes, which are likely intended to offer expert commentary, reflections, or brief observations on safety promotion. Other document types include books (2 documents), which may provide in-depth coverage of safety promotion topics, and conference reviews (2 documents), which summarize and assess the outcomes of conferences focused on related themes. Finally, there are 2 short surveys, indicating concise studies or preliminary findings that contribute to the body of knowledge in this area.

These distribution as seen in Figure 3 highlights that the literature on safety promotion is predominantly composed of original research articles and reviews, with a smaller but meaningful contribution from conference papers, book chapters, and other document types. This mix of document types helps provide a broad perspective on the field, combining empirical findings with reviews, expert commentaries, and academic discussions, contributing to a well-rounded understanding of safety promotion in laboratory settings.

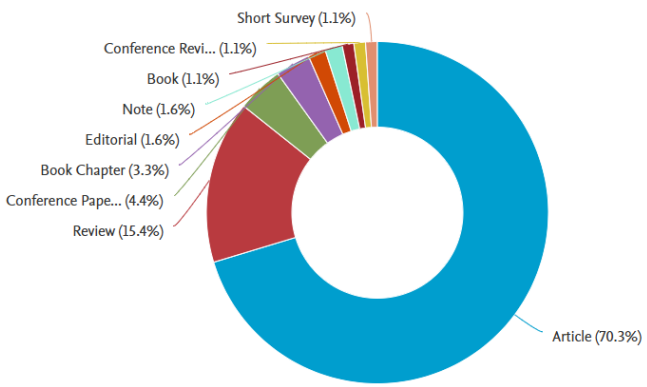

Figure 3. Publication by Document Types

The subject areas of documents related to safety promotion, as indexed in the Scopus database, indicate that this topic spans a wide range of disciplines (Figure 4), reflecting its interdisciplinary nature and the diverse contexts in which safety is relevant. The majority of the publications fall within the field of medicine, with 104 documents, underscoring the importance of safety promotion in medical settings, where ensuring health and safety practices is critical. This strong focus on medicine highlights the emphasis on occupational health, patient safety, and risk management. Other significant subject areas include Biochemistry, Genetics and Molecular Biology and Engineering, each with 20 documents. This suggests that safety promotion is also highly relevant in laboratory environments where complex biological or technical processes are involved, such as research labs and industrial settings. Environmental Science has 17 documents, indicating a focus on safety in relation to environmental health and sustainability. The Social Sciences contribute 12 documents, which reflects an interest in understanding the human, social, and behavioral dimensions of safety promotion. The presence of Energy (11 documents) and Pharmacology, Toxicology and Pharmaceutics (9 documents) indicates the importance of safety protocols in managing risks associated with energy production and handling toxic substances. Agricultural and Biological Sciences and Multidisciplinary research each contribute 8 documents, illustrating the need for safety in diverse experimental and academic settings. Chemical Engineering, Computer Science, Earth and Planetary Sciences, Immunology and Microbiology, and Materials Science each have 7 publications, highlighting the technical and scientific aspects of safety in both laboratory and industrial environments.

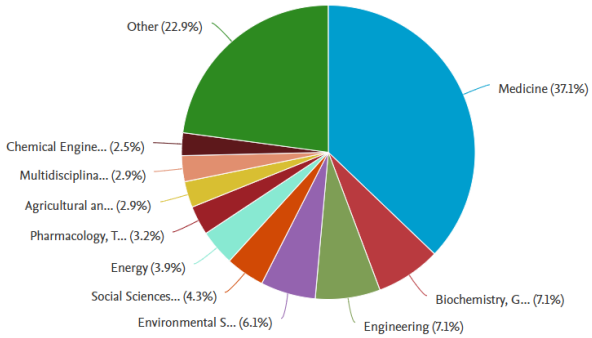

Figure 4. Publication by its Discpline

Other subject areas with notable contributions include Health Professions (5 documents), Arts and Humanities (4 documents), Chemistry (4 documents), Nursing (4 documents), and Veterinary Science (4 documents). This diverse representation demonstrates the broad application of safety promotion, extending from healthcare and laboratory safety to practical and educational environments. Fields like Business, Management and Accounting (3 documents) and Decision Sciences (2 documents) indicate an interest in the management and decision-making processes that underpin safety practices, while Psychology and Neuroscience each contribute 2 documents, likely focusing on the cognitive and behavioral factors influencing safety practices. The presence of a single

document in fields such as Dentistry and Mathematics suggests that safety promotion is also a topic of interest, albeit less prevalent, in these areas. Overall, the breadth of subject areas demonstrates that safety promotion is a critical concern across many disciplines, each contributing unique perspectives on how to enhance and implement effective safety practices, particularly in health, laboratory, and technical contexts.

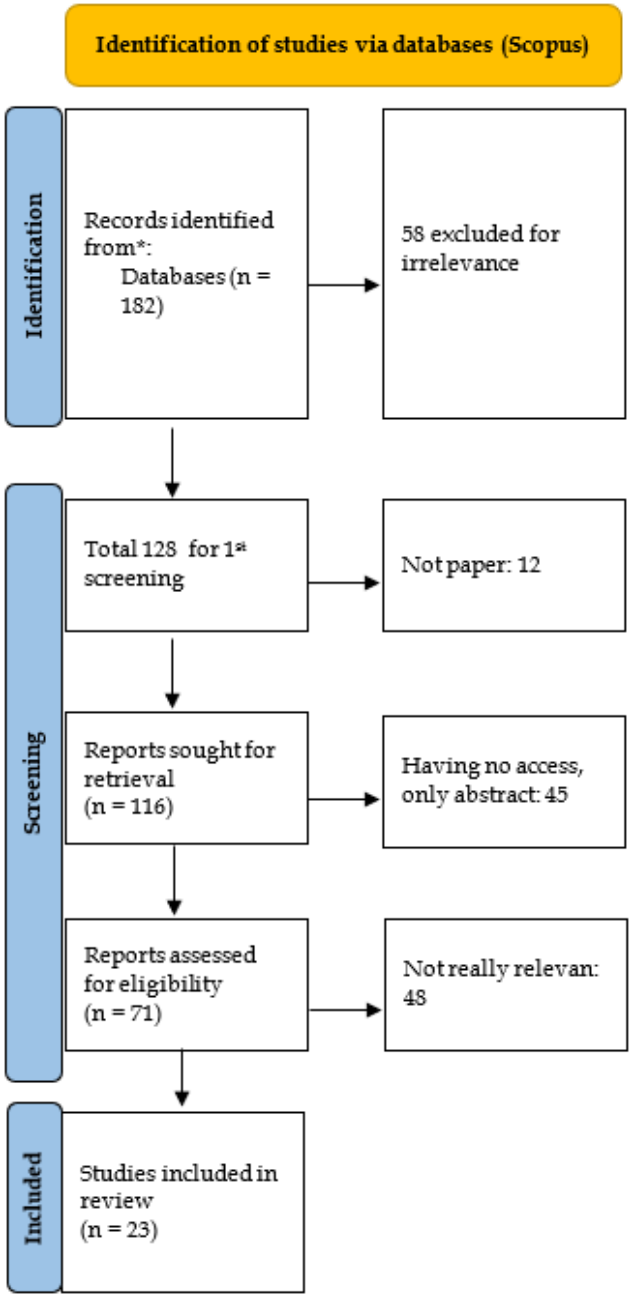

Figure 5. Prisma-SC Screening Process

After observing the trends, the next steps are identifying studies for this scoping review involved a systematic screening and selection of articles from the Scopus database. Initially, a total of 182 records were identified through database searches. During the identification phase, 58 records were excluded as they were deemed irrelevant based on their titles and abstracts, reducing the total to 124 studies for the first screening. During the screening phase, 12 records were excluded because they were not academic papers, but rather other types of publications, such as reports or opinion pieces. This left 116 reports for further assessment. However, 45 of these reports could not be accessed beyond the abstract, which led to their exclusion from further consideration. Consequently, 71 reports remained for the eligibility assessment. The eligibility assessment involved a more in-depth review of the 71 remaining reports. During this phase, an additional 48 records were found to be not sufficiently relevant to the specific context of safety promotion in academic laboratories, particularly those related to culinary environments. As a result, 23 studies were deemed appropriate for inclusion in the final review.

As it could be seen in Figure 5, the scoping review included a detailed analysis of 22 selected studies, each providing unique contributions to the understanding of safety promotion, health interventions, and public health outcomes in various settings. These studies encompass diverse topics, methodologies, and geographic regions, offering a comprehensive overview of how safety practices are implemented across different environments. One prominent theme in the reviewed studies is food safety and its role in promoting sustainable and healthy culinary environments. Klang et al. (2019) investigated environmentally-friendly food tourism in Thailand, focusing on the use of local ingredients to ensure food safety and enhance tourist satisfaction. Similarly, Jasper & Juliana (2023) examined the effects of traditional food processing on the nutritional and safety quality of pumpkin seed flour in Nigeria, finding that traditional methods improved both safety and nutrient density. Xie et al. (2023) explored the factors influencing farmers' participation in food safety governance in rural China, identifying education and political trust as key factors for increasing involvement in food safety efforts.

Healthcare safety emerged as a significant focus, with Rahman et al. (2024) identifying the challenges faced by medical officers in Bangladesh, including inadequate infrastructure and workplace violence. Esmaeili et al. (2024) assessed the chemical health risks faced by workers in metal manufacturing, highlighting the need for improved workplace safety measures due to exposure to harmful metal fumes. Lim et al. (2020) investigated an outbreak of diarrheagenic Escherichia coli (EPEC) in a school in South Korea, pointing to poor food handling as a major contributing factor. Fang et al. (2022) assessed the impact of STABLE technology on the

safety of neonatal transfers, demonstrating significant improvements in vital sign stability and caregiver satisfaction. Curren et al. (2022) discussed the importance of diagnostic stewardship for healthcare-associated infections and antibiotic resistance in the U.S., recommending strategies to improve patient outcomes and reduce diagnostic errors.

Several studies also addressed community-based health interventions. Manaseki-Holland et al. (2021) evaluated a community-based intervention in Gambia that successfully reduced childhood infections by promoting safe food handling practices. Nguyen et al. (2021) documented the rapid response to the COVID-19 pandemic in Vietnam, noting the success of community involvement and strong public health measures. Robinson et al. (2018) assessed the impact of risk-based interventions on piped water quality in rural Nepal, showing a reduction in E. coli contamination levels and improved community hygiene practices.

Environmental health and safety were also key areas of focus. Amin et al. (2013) reviewed wastewater disinfection methods, promoting safer alternatives like advanced oxidation techniques to reduce harmful byproducts. Wittberg et al. (2021) examined a comprehensive WASH intervention in Ethiopia aimed at reducing trachoma transmission, demonstrating the effectiveness of hygiene education and infrastructure improvements in reducing disease prevalence.

Occupational health and laboratory safety featured prominently in several studies. Kütter et al. (2023) explored good laboratory practices for zebrafish maintenance in Brazilian research facilities, emphasizing worker safety and standardization. Fernandes et al. (2016) studied the implementation of surgical safety protocols in catheterization laboratories in Brazil, finding that the use of a customized WHO Safe Surgery Checklist enhanced patient safety and interdisciplinary communication Bellanti & Settipane (2016) provided an overview of how lifestyle, science, and health intersect in the context of allergy and immunology, discussing the role of immunotherapy, vitamin D, and lifestyle factors in managing allergic diseases.

Other studies included Härmä et al. (2024), who reviewed the health impacts of working hours, particularly shift and night work, in Scandinavian countries, noting increased risks of cardiovascular diseases and sleep disturbances. Amin et al. (2013) discussed wastewater disinfection techniques and their environmental and human health impacts, recommending advanced hybrid methods. Abena et al. (2020) raised concerns about the off-label use of chloroquine and hydroxychloroquine for COVID-19 treatment in Africa, emphasizing the importance of regulatory oversight. Syahrul et al. (2020) conducted a nested case-control study on foodborne diseases in Surabaya, Indonesia, linking frequent snacking to diarrheagenic E. coli infections. Wittberg et al. (2021) assessed the impact of WASH interventions on trachoma elimination in Ethiopia, showing improved hygiene and reduced disease prevalence.

Additional studies include Asadbeigi & Zhou (2022), who explored quality improvement for diagnosing acute promyelocytic leukemia (APL) in the U.S., finding significant reductions in diagnostic turnaround times. Falahee & Kerry (2022) discussed the integration of social engagement in academic medicine, emphasizing the challenges and strategies needed to enhance community involvement in healthcare practices. Gahukar (2018) reviewed the potential of entomophagy (insect consumption) as a protein source in India, highlighting its nutritional benefits for resource-poor communities.

Table 1. Previous Research

Article Title	Authors	Journal	Population	Context	Concept	Methodology	Outcomes	Key Findings
A Model for Environmentally-Friendly Food Tourism in Ban Koh Klang, Krabi	(Klang et al., 2019)	AJHTL	Community members of Ban Koh Klang; Tourists visiting the area (400 respondents)	Ban Koh Klang community, Krabi province; focused on its tourism resources and culinary potential	Environmentally-friendly food tourism with local ingredient sourcing	Mixed-method: Surveys (400 respondents); interviews with community stakeholders; workshops; laboratory	High tourist satisfaction for activities and environmental efforts; culinary tourism identified as promising; gaps in	Effective local ingredient usage (e.g., pagoda snails, sangyod rice) and environmental practices attract tourists; community's unique identity

Article Title	Authors	Journal	Population	Context	Concept	Methodology	Outcomes	Key Findings
						analysis for food safety	food service quality remain	needs stronger promotion
Challenges faced by medical officers in providing healthcare services at upazila health complexes and district hospitals in Bangladesh	(Rahman et al., 2024)	The Lancet Regional Health - Southeast Asia	51 medical officers from 17 Upazila Health Complexes (UHCs) and 9 District Hospitals (DHs)	Healthcare challenges at primary and secondary levels in Bangladesh	Identifying barriers to effective healthcare delivery and workplace safety for medical officers	Qualitative study using in-depth interviews (IDIs) with 51 medical officers; thematic analysis for data synthesis and interpretation	Challenges include inadequate infrastructure, staff shortages, excessive workloads, workplace violence, and limited access to utilities. Policy challenges and career development limitations also noted.	Workplace safety and resource allocation need improvement; addressing infrastructural, political, and social barriers is critical for sustainable healthcare improvements.
Working Hours and Health – Key Research Topics in the Past and Future	(Härmä et al., 2024)	Scandinavian Journal of Work, Environment & Health	Workers across various industries in Scandinavian countries	Effects of working hours and health, particularly shift work and night shifts	Understanding health impacts and proposing interventions for better work schedules	Analysis of over 220 articles, including systematic reviews and field studies on shift work, working hours, and health	Evidence linking long and night shifts to health risks, including cardiovascular diseases, sleep disturbances, and injuries	Shift and night work pose moderate but widespread health risks. Better schedule design and intervention strategies are crucial.
A Review on Wastewater Disinfection	(Amin et al., 2013)	International Journal of Environmental Health Engineering	Municipal and industrial wastewater treatment plants	Review of wastewater disinfection methods and their impacts on human and environmental health	Analysis of disinfection techniques and byproducts	Review of traditional (chlorination, UV) and innovative (nanotechnology, ozone, ultrasound) methods for wastewater	Identified challenges with byproducts affecting aquatic and human health, and promoted safer alternatives like advanced	Novel hybrid techniques and optimized conventional methods reduce byproducts and improve disinfection efficiency

Article Title	Authors	Journal	Population	Context	Concept	Methodology	Outcomes	Key Findings
						disinfection	oxidation techniques	
Chemical Health Risk Assessment of Exposure to Metal Fumes	(Esmaeili et al., 2024)	International Journal of Environmental Health Engineering	Workers in a metal manufactory with an electric arc furnace	Health risks from exposure to metal fumes in metal manufacturing	Evaluating carcinogenic and noncarcinogenic risks from metal fumes	Cross-sectional analytical study using US-EPA risk assessment methods; air sampling and mass spectrometry analysis	Manganese and iron fumes exceeded TLV-TWA limits; significant noncarcinogenic risks for workers; some carcinogenic risk from chromium	Interventions needed, including better ventilation and technical controls; findings highlight the need for improved workplace safety
Diarrhoeagenic Enteropathogenic Escherichia coli Infection Outbreak Among Elementary School Children	(Lim et al., 2020)	International Journal of Environmental Research and Public Health	Elementary school children and staff in South Korea	EPEC outbreak caused by water-contaminated food items in school settings	Investigation of the outbreak, risk factors, and recommendations to prevent recurrence	Retrospective epidemiological study, laboratory tests, environmental assessments, and statistical analysis	EPEC O139, ONT detected in food and environmental samples; high relative risk of infection from certain food items	Water contamination and poor food handling were the main causes; health education and safe water systems are critical
Chloroquine and Hydroxychloroquine for the Prevention or Treatment of COVID-19 in Africa: Caution for Inappropriate Off-label Use in Healthcare Settings	(Abena et al., 2020)	American Journal of Tropical Medicine and Hygiene	Healthcare workers and patients in African countries	Analysis of chloroquine (CQ) and hydroxychloroquine (HCQ) off-label use for COVID-19	Risks, benefits, and policy recommendations for CQ/HCQ in the African context	Review of published literature, analysis of global clinical trials, and regional healthcare system assessments	Significant risks identified, including drug interactions, toxicity, and ineffective treatment for COVID-19; ongoing trials seek conclusive evidence	Inappropriate use of CQ/HCQ creates public health risks; emphasis on evidence-based treatment and regulatory monitoring systems
Transmission Media of Foodborne	(Syahrul et	International Journal of	Elementary school children in	Investigation of foodborne	Analyzing the impact of	Nested case-control	Established a prediction	Frequent snacking and consumption

Article Title	Authors	Journal	Population	Context	Concept	Methodology	Outcomes	Key Findings
Diseases as an Index Prediction of Diarrheagenic Escherichia coli	al., 2020)	Environmental Research and Public Health	Surabaya, Indonesia	diseases (FBDs) caused by E. coli in schools	snacking frequency and food risk on FBD incidence	study with stool sample testing and logistic regression for prediction model formulation	model identifying snacking frequency and food risk as key variables for DEC presence	of high-risk food strongly linked to DEC incidence. Recommendations for improved hygiene and food safety were made.
Effects on Childhood Infections of Promoting Safe and Hygienic Complementary-Food Handling Practices	(Manaseki-Holland et al., 2021)	PLOS Medicine	Mothers and children aged 6-24 months in rural Gambia	Food safety and hygiene in complementary feeding practices	Community-based interventions to improve food hygiene and reduce child infections	Cluster-randomized controlled trial with village-level interventions, including performing arts and public meetings	Improved hygiene practices, reduced diarrhoea rates (by up to 60%), and hospital admissions, sustained changes over 32 months	Interventions were low-cost, culturally embedded, and effective; demonstrated sustainability with minimal follow-up
In the interest of public safety: Rapid response to the COVID-19 epidemic in Vietnam	(Nguyen et al., 2021)	BMJ Global Health	General population and public health officials in Vietnam	Strategies and responses to control the COVID-19 epidemic in Vietnam	Effective public health measures, rapid response, and community engagement	Case studies of outbreaks, review of policies, and strategic response analysis	Achieved low transmission rates, early containment of outbreaks, and comprehensive community involvement	Early preparedness, political commitment, and strong public health measures were critical to success.
WASH Upgrades for Health in Amhara (WUHA): Study Protocol for a Cluster-Randomised Trial in Ethiopia	(Wittberg et al., 2021)	BMJ Open	Rural communities in the Amhara region of Ethiopia	Comprehensive WASH interventions targeting trachoma elimination	Evaluation of a full WASH package's impact on ocular chlamydia and trachoma	Cluster-randomised trial involving hygiene education, water point construction, household latrines, and school hygiene curriculum	Improved facial cleanliness, reduced prevalence of ocular chlamydia among children aged 0–5 years, and better hygiene behaviors sustained	Comprehensive WASH interventions effectively reduce trachoma transmission when implemented with community involvement and education.

Article Title	Authors	Journal	Population	Context	Concept	Methodology	Outcomes	Key Findings
							over 7 years	
Effect Analysis of In-Hospital Transfer Care Based on STABLE Technology in Critically Ill Newborns	(Fang et al., 2022)	Evidence-Based Complementary and Alternative Medicine	Critically ill neonates in NICU transfers at a Shanghai hospital	Application of STABLE technique in neonatal in-hospital transfers	Safe and effective transfer care using STABLE parameters: sugar, temperature, airway, blood pressure, lab work, emotional support	Retrospective study comparing conventional methods vs. STABLE technology for 180 neonates; statistical evaluation of vital signs, accident rates, and satisfaction	Lower accident rates, more stable vital signs (blood glucose, temperature, respiration), higher family satisfaction scores	Implementation of STABLE significantly improves neonatal transfer safety, stabilizes critical parameters, and enhances caregiver satisfaction.
Advancing Diagnostic Stewardship for Healthcare-Associated Infections, Antibiotic Resistance, and Sepsis	(Curren et al., 2022)	Clinical Infectious Diseases	Healthcare professionals and institutions in the US	Enhancing diagnostic stewardship to combat antibiotic resistance and improve sepsis management	Optimizing diagnostic processes and integrating stewardship into healthcare systems	Summary of a CDC-hosted meeting; discussions on challenges, strategies, and interventions for diagnostic stewardship	Highlighted the importance of integrating diagnostic stewardship into EHR systems, reducing diagnostic errors, and leveraging biomarkers for sepsis	Implementing diagnostic stewardship improves patient outcomes, reduces antibiotic misuse, and promotes collaboration among healthcare providers.
Interdisciplinary Quality Improvement for Acute Promyelocytic Leukemia (APL)	(Asadbeigi & Zhou, 2022)	American Journal of Clinical Pathology	Acute leukemia patients and pathology staff in a U.S. medical institution	Diagnostic turnaround times (TAT) for APL cases using the EPIDEM model for quality improvement	Improving diagnostic accuracy and efficiency using molecular and cytogenetic tools	Retrospective study of 687 PCR orders and 33 PML-RARA tests over nine years; applied EPIDEM model for workflow enhancement and data analysis	Reduced TAT for APL diagnosis from 4.48 days to 0.64 days; enhanced interdisciplinary communication, optimized workflows	EPIDEM model implementation decreased delays in critical diagnostics, improving treatment outcomes and laboratory efficiency.

Article Title	Authors	Journal	Population	Context	Concept	Methodology	Outcomes	Key Findings
Embracing Social Engagement in Academic Medicine: Ongoing Challenges and How to Move Forward	(Falahee & Kerry, 2022)	Journal of General Internal Medicine	Academic medical institutions, faculty, and community health stakeholders	Integration of social engagement into academic medical practices and policies	Promoting community-engaged scholarship and systemic changes in academic medicine	Perspective article reviewing historical barriers, case studies, and recommendations for institutional restructuring	Highlighted the need for systemic funding shifts, faculty recognition for community work, and incorporation of social determinants in academic practices	Recognized social engagement as critical for advancing health and academic reform; barriers include traditional priorities and limited recognition systems
Good Practices in the Rearing and Maintenance of Zebrafish (Danio rerio) in Brazilian Laboratories	(Kütter et al., 2023)	Brazilian Animal Science Journal	Zebrafish facilities in Brazil; researchers and technical staff	Implementing Good Laboratory Practices (GLP) for zebrafish maintenance and research facilities	GLP guidelines emphasizing animal welfare, worker safety, and environmental impact	Review of WHO GLP standards and national regulations; recommendations for facility design, personnel training, and standardized procedures	Improved animal welfare, enhanced safety for workers, and better standardization of research protocols	Adoption of GLP ensures ethical research, improves reproducibility, and aligns practices with international standards for animal research.
Influence of Traditional Food Processing Systems on Food Safety, Chemical Compositions, and Functional Properties of Pumpkin (Cucurbita pepo L) Seed Flour	(Jasper & Julian a, 2023)	Journal of Nutrition and Food Security	Pumpkin seeds (Cucurbita pepo L); Local communities in Nigeria	Effects of traditional processing on nutritional and safety quality of pumpkin seed flour	Comparison of raw, germinated, and sand toasted pumpkin seed flour	Experimental study analyzing proximate, mineral, anti-nutritional, and functional properties using standard food testing methods	Improved protein, mineral content, and reduced anti-nutritional factors; microbial safety met international standards	Traditional methods enhanced nutrient density, food safety, and functionality of pumpkin seed flour. Recommended for rural and emergency nutrition programs.
A Study on the Influencing Factors and Related Paths of Farmers'	(Xie et al., 2023)	Scientific Reports	Farmers in rural China	Exploring factors influencing participation in food	Identifying key drivers and barriers to farmers'	DEMATEL-ISM-MICMAC model analyzing 20	Education level and village cadre status are foundatio	Addressing core barriers, like lack of information and education,

Article Title	Authors	Journal	Population	Context	Concept	Methodology	Outcomes	Key Findings
Participation in Food Safety Governance				safety governance	involvement in food safety	influencing factors across family, participation, and environmental dimensions	nal drivers; participation is influenced by risk perception, political trust, and government supervision	can significantly enhance farmers' involvement in food safety governance
Assessing the Impact of a Risk-Based Intervention on Piped Water Quality in Rural Communities	(Robinson et al., 2018)	International Journal of Environmental Research and Public Health	Rural communities in Mid-Western Nepal	Implementation of risk-based water safety strategy for rural piped water schemes	Community-led interventions in water safety and hygiene promotion	Controlled before-and-after study involving water quality testing, community training, and monitoring	Significant reduction in E. coli contamination levels in intervention areas, improved community practices, and partial achievement of WHO standards	Risk-based interventions improved water safety but highlighted gaps in achieving universal safe water access. Community involvement was critical.
Progress and Challenges in Measles and Rubella Elimination in the WHO European Region	(Muscat et al., 2024)	Vaccine	Member States of the WHO European Region	Strategies and progress in eliminating measles and rubella within the WHO European Region	Evaluation of immunization programs, surveillance systems, and elimination verification processes	Data analysis of measles and rubella cases, immunization coverage, outbreak characteristics, and surveillance quality from 53 countries	Reduced measles and rubella cases by over 80% in most countries; however, gaps in vaccination and surveillance persist in vulnerable populations	Multisectoral approaches and tailored strategies are critical for addressing immunity gaps, enhancing surveillance, and achieving elimination goals.
Entomophagy for Nutritional Security in India: Potential and Promotion	(Gahukar, 2018)	Current Science	Tribal communities in India	Promotion of edible insects as an alternative protein source and	Exploring the benefits, risks, and promotion strategies	Review of existing data on edible insects, nutritional	Edible insects provide high protein, vitamins,	Entomophagy can enhance food security in India, but cultural

Article Title	Authors	Journal	Population	Context	Concept	Methodology	Outcomes	Key Findings
				its impact on nutritional security	for entomophagy in India	profiling, surveys in tribal communities, and regulatory frameworks	and minerals; potential for improved nutrition in resource-poor families	acceptance and safety regulations are crucial for wider adoption.
Surgical Safety in Catheterization Laboratory	(Reich et al., 2019)	Revista Gaúcha de Enfermagem	Patients and healthcare teams in catheterization labs in Brazil	Implementation of surgical safety protocols in high-complexity settings	Adapting and applying WHO Safe Surgery Checklist to catheterization labs	Experience-based study on checklist implementation over six years in a teaching hospital, evaluating safety outcomes	Enhanced patient safety, better interdisciplinary communication, improved care documentation, and reduced adverse events	The customized checklist successfully addressed the needs of catheterization labs and supported institutional safety goals
Science, Lifestyle, and Human Health: Challenging Trilogy for the Allergist/Immunologist	(Bellanti & Settipane, 2016)	Allergy and Asthma Proceedings	Allergy/immunology patients, clinicians, and researchers	Interplay between science, lifestyle factors, and allergic diseases	Exploring scientific advancements, behavioral modifications, and therapeutic approaches	Editorial review summarizing research articles on technology, immunotherapy, vitamin D, asthma treatment, and lifestyle effects	Advancements in immunotherapy, the role of vitamin D in allergies, impacts of smoking/obesity on asthma, and management strategies were discussed	Comprehensive overview of innovations and challenges in allergy/immunology, with actionable insights for patient care improvement.

Muscat et al. (2024) analyzed progress and challenges in measles and rubella elimination in the WHO European Region, finding significant reductions in disease incidence but persistent gaps in vaccination coverage. Lastly, Esmaeili et al. (2024) focused on implementing surgical safety protocols in catheterization laboratories in Brazil, showing improvements in safety outcomes and interdisciplinary teamwork. These 22 studies provide a diverse range of perspectives on safety promotion, public health interventions, and community engagement across different contexts. Despite the diversity in focus areas, the common theme among these studies is the emphasis on improving safety outcomes, whether through better hygiene practices, community involvement, or regulatory measures. These findings contribute valuable insights into safety promotion practices that can be adapted and applied in culinary academic laboratories, as well as other public health and occupational safety settings.

Methods of Safety Promotion

It was discovered that there are 12 methods used to promote safety in the reviewed studies, each targeting unique contexts to ensure health and wellbeing as seen in Table 2. First method for promoting is

environmentally-friendly practices and food safety testing, as demonstrated by Klang et al. (2019). It utilized a mixed-method approach to assess culinary practices in Ban Koh Klang, Thailand. Surveys with tourists and community members, workshops with stakeholders, and laboratory testing were combined to evaluate satisfaction levels and ensure the safety of local ingredients like pagoda snails and sangyod rice. The second method, workplace safety measures, was highlighted in studies by Esmaeili et al. (2024); Rahman et al. (2024) employed qualitative interviews with medical officers to explore recurring challenges such as inadequate infrastructure and security in healthcare settings in Bangladesh, while Esmaeili et al. used cross-sectional analysis with air sampling and mass spectrometry to evaluate occupational risks related to exposure to metal fumes in manufacturing settings. The third method, ergonomic shift scheduling and recovery time management, was used by Härmä et al. (2024), who conducted a systematic review of more than 220 studies to understand the health impacts of shift work. They proposed ergonomic scheduling models aimed at reducing cardiovascular risks and ensuring adequate recovery time for workers.

Disinfection in wastewater treatment plants was studied by Amin et al. (2013), who compared chlorination, UV radiation, and advanced disinfection techniques. Laboratory experiments evaluated microbial counts, chemical byproducts, and environmental toxicity to determine the safety and efficacy of each method. Health education and hygiene practices were another key method of safety promotion used by multiple studies. Lim et al. (2020) conducted a retrospective study on an EPEC outbreak in a South Korean school, combining lab tests and interviews to evaluate hygiene practices. Syahrul et al. (2020) utilized a nested case-control design to analyze stool samples and establish a link between dietary habits and E. coli infections. Manaseki-Holland et al. (2021) implemented community-based interventions using performing arts to educate about food hygiene, while Wittberg et al. (2021); Robinson et al. (2018) focused on WASH interventions and community-led training programs to improve hygiene in Ethiopia and Nepal, respectively.

The sixth method, safe drug distribution and evidence-based practices, was explored by Abena et al. (2020) and Curren et al. (2022). Abena et al. reviewed global clinical trials and healthcare focus groups to evaluate off-label chloroquine use, whereas Curren et al. leveraged findings from a CDC-hosted meeting to propose integrating diagnostic stewardship into EHR systems. Community engagement and health awareness campaigns formed the seventh method of promoting safety. Nguyen et al. (2021) documented Vietnam's response to COVID-19 using qualitative analyses of public health data. Xie et al. (2023) employed DEMATEL-ISM-MICMAC modeling to understand factors affecting farmers' involvement in food safety, while Fernandes et al. (2016) assessed vaccination and surveillance efforts in the WHO European Region to evaluate the effectiveness of public health campaigns. Specialized protocols for safety were implemented by Fang et al. (2022), Kütter et al. (2023); Reich et al. (2019). Fang et al. analyzed neonatal transfer care using the STABLE technique to improve safety outcomes. Reich et al. implemented the WHO Safe Surgery Checklist to enhance safety in catheterization labs, and Kütter et al. reviewed adherence to Good Laboratory Practices (GLP) for zebrafish facilities in Brazil.

Staff training and engagement strategies were applied by Asadbeigi & Zhou (2022); Falahee & Kerry (2022). Asadbeigi and Zhou utilized the EPIDEM model to optimize workflows for leukemia diagnostics, while Falahee and Kerry reviewed faculty engagement programs aimed at promoting community health initiatives in academic medicine. Traditional food processing techniques were the tenth method, with Jasper & Juliana (2023) focusing on the safety and nutritional quality of pumpkin seed flour processed using traditional methods. Their study highlighted the benefits of germination and sand-toasting on reducing anti-nutritional factors. Ensuring food safety and processing techniques was studied by Gahukar (2018), who reviewed the nutritional value of edible insects as an alternative protein source. Gahukar conducted surveys in tribal communities to assess perceptions and barriers to entomophagy adoption. The twelfth method, technological and behavioral interventions, was described by Bellanti & Settipane (2016), who summarized research on asthma and allergy interventions, including clinical trials on immunotherapy and behavioral changes like smoking cessation. The study also reviewed advancements in inhaler designs to improve drug efficacy.

Table 2. Methods for Safety Promotion

Method of Promotion	References
Environmentally-Friendly Practices and Food Safety Testing	Klang et al. (2019)
Workplace Safety Measures	Esmaeili et al. (2024); Rahman et al. (2024)
Ergonomic Shift Scheduling and Recovery Time Management	Härmä et al. (2024)
Disinfection in Wastewater Treatment Plants	Amin et al. (2014)

Method of Promotion	References
Health Education and Hygiene Practices	Lim et al. (2020), Syahrul et al. (2020), Manaseki-Holland et al. (2021), Wittberg et al. (2021), Robinson et al. (2018)
Safe Drug Distribution and Evidence-Based Practices	Abena et al. (2020), Curren et al. (2022)
Community Engagement and Health Awareness Campaigns	Nguyen et al. (2021), Xie et al. (2023), Datta et al. (2018)
Specialized Protocols for Safety	Fang et al. (2023), Reich et al. (2019), Kütter et al. (2023)
Staff Training and Engagement Strategies	Asadbeigi & Zhou (2022), Falahee & Kerry (2022)
Traditional Food Processing Techniques	Jasper & Juliana (2023)
Ensuring Food Safety and Processing Techniques	Gahukar (2018)
Technological and Behavioral Interventions	Bellanti & Settipane (2016)

Outcome of Safety Promotion on KAP

Those outcome in Table 3 are classified to KAP. First, for the K- knowledge. The studies that focused on increasing knowledge showed positive outcomes in different contexts. Falahee & Kerry (2022) enhanced faculty knowledge about the social determinants of health by involving academic medicine in community-engaged scholarship, thereby promoting more impactful institutional practices and research collaborations. Similarly, Xie et al. (2023) investigated factors driving farmers' participation in food safety governance, finding that education and political trust significantly improved their knowledge and attitudes toward food safety practices, leading to greater active engagement. Gahukar (2018) addressed nutritional security by advocating for entomophagy as an alternative protein source. This study showcased the nutritional benefits of edible insects, increasing awareness about insects as a viable, sustainable solution for addressing malnutrition and food security issues.

Table 3. Outcomes of Safety Promotion on KAP

Category	Outcome	References
Knowledge (K)	Knowledge and engagement with social determinants of health	(Falahee & Kerry, 2022)
	Knowledge and attitudes	(Xie et al., 2023)
	Improved nutritional security	(Gahukar, 2018)
Attitudes (A)	Improved confidence in food safety through testing	(Klang et al., 2019)
	The absence of specialized training and infrastructure led to stress and demotivation	(Rahman et al., 2024)
	Elevated health risks from exposure to heavy metal fumes	(Esmaeili et al., 2024)
	Adverse health outcomes	(Abena et al., 2020)
Practices (P)	Reduced fatigue, fewer injuries, and improved recovery	(Härmä et al., 2024)
	Reduction of harmful pathogens and byproducts	(Amin et al., 2013)
	Reduced infection rates	(Lim et al., 2020)
	Reduced DEC presence	(Syahrul et al., 2020)
	Reduced diarrhoea cases, improved food handling hygiene, and sustained adoption of practices	(Manaseki-Holland et al., 2021)
	Reductions in COVID-19 transmission rates and community-wide compliance	(Nguyen et al., 2021)
	Reductions in ocular chlamydia prevalence and improved hygiene practices	(Wittberg et al., 2021)
	Reduced accident rates, improved physiological stability, and high satisfaction	(Fang et al., 2022)
	Reduced diagnostic errors, optimized antibiotic use, and improved clinical outcomes	(Curren et al., 2022)
	Reduction in diagnostic delays, increased clinician satisfaction, and better interdisciplinary collaboration	(Asadbeigi & Zhou, 2022)
	Safety and reduced risks for technical staff	(Kütter et al., 2023)
	Reduced toxic elements, and enhanced functional properties	(Jasper & Juliana, 2023)
	Improved hygiene practices and significant reductions in waterborne contaminants	(Robinson et al., 2018)
	Significant decline in disease cases, improved vaccination coverage, and enhanced surveillance	(Fernandes et al., 2016)
	Improved safety outcomes, better team communication, and enhanced procedural compliance	(Reich et al., 2019)

Category	Outcome	References
	Improved clinical outcomes through immunotherapy, smoking cessation programs, and personalized asthma treatments	(Bellanti & Settipane, 2016)

Second focuses in A-attitudes. The studies under the Attitudes (A) category provided insights into how safety measures and risk awareness affect individual and community mindsets. Klang et al. (2019) found that sourcing local ingredients and ensuring food safety through testing in Ban Koh Klang increased confidence in food safety among tourists. On the contrary, Rahman et al. (2024) demonstrated that a lack of specialized training and infrastructure in healthcare settings led to stress and demotivation among staff, showing the need for systemic improvements. Esmaeili et al. (2024) highlighted the elevated health risks faced by industrial workers exposed to metal fumes, which influenced their perception of workplace safety and the necessity for enhanced preventive measures. Similarly, Abena et al. (2020) revealed adverse health outcomes due to the off-label use of chloroquine during COVID-19, which contributed to negative attitudes towards non-evidence-based medical practices, emphasizing the importance of regulatory oversight.

The last one is P- practices. Most of the studies reviewed fell under the Practices (P) category, highlighting various interventions and their practical impacts on communities and individuals. Härmä et al. (2024) improved workplace safety by implementing ergonomic shift scheduling, reducing fatigue, injuries, and improving recovery times. Amin et al. (2013) evaluated advanced wastewater treatment techniques that led to a reduction of harmful pathogens and byproducts, contributing to safer water management practices. Lim et al. (2020) linked improved hygiene practices to a reduction in infection rates in South Korean schools, while Syahrul et al. (2020) showed how better food safety and hygiene education decreased diarrheagenic E. coli (DEC) presence in schoolchildren.

Manaseki-Holland et al. (2021) reported a reduction in diarrhea cases through community-led hygiene initiatives in Gambia, with improved food handling practices being sustained over 32 months. Nguyen et al. (2021) documented how early lockdowns and mass communication campaigns in Vietnam led to reduced COVID-19 transmission rates and increased compliance with safety measures. Wittberg et al. (2021) demonstrated that WASH interventions in Ethiopia contributed to reductions in ocular chlamydia prevalence and improved hygiene practices among children.

Fang et al. (2022) applied the STABLE technique for neonatal transfers, leading to reduced accident rates, improved physiological stability, and higher caregiver satisfaction. Curren et al. (2022) used diagnostic stewardship to optimize antibiotic use and reduce diagnostic errors, thereby improving clinical outcomes. Asadbeigi & Zhou (2022) implemented the EPIDEM model, resulting in reduced diagnostic delays, increased clinician satisfaction, and enhanced interdisciplinary collaboration in leukemia diagnostics. Kütter et al. (2023) promoted safety for technical staff through adherence to Good Laboratory Practices (GLP), minimizing occupational hazards in zebrafish facilities.

Jasper & Juliana (2023) showcased that traditional food processing improved pumpkin seed flour by reducing toxic elements and enhancing its functional properties, ensuring microbial safety. Robinson et al. (2018) used community-led water interventions in Nepal, which led to significant reductions in waterborne contaminants and improved hygiene behaviors. Fernandes et al. (2016) assessed mass vaccination campaigns that led to a decline in measles and rubella cases, improved vaccination coverage, and enhanced disease surveillance in the WHO European Region. Reich et al. (2019) implemented a Safe Surgery Checklist, which resulted in improved safety outcomes, better team communication, and procedural compliance in catheterization labs. Lastly, Bellanti & Settipane (2016) improved clinical outcomes through asthma and allergy interventions, including immunotherapy, smoking cessation programs, and personalized treatment plans, emphasizing the value of integrated medical and behavioral approaches in enhancing patient health.

Discussion

The trends in literature on safety promotion indicate a growing recognition of its importance across diverse contexts, reflected in the increasing number of publications indexed in Scopus over the years. Starting with only 8 publications in 2014, the number rose steadily, peaking at 31 publications in 2022, highlighting heightened interest likely driven by global awareness of occupational health and safety standards. This trend emphasizes the expanding body of research focused on promoting safety in various settings, including laboratories and workplaces, which are key areas of interest for this review. Geographical analysis reveals that China and the United States lead in contributions, with significant input from other regions such as the United Kingdom, Canada, and India, indicating a broad global interest in safety promotion. Document types reveal a predominance of original research articles and reviews, underscoring the reliance on empirical research

to explore safety promotion. Additionally, the interdisciplinary nature of safety promotion is reflected in the subject areas of these publications, spanning fields like medicine, engineering, environmental science, and social sciences, demonstrating its relevance across multiple disciplines. This growing body of literature highlights both the opportunities and challenges associated with enhancing safety practices in diverse environments, emphasizing the importance of systematic screening and selection to identify relevant contributions for this scoping review.

The scoping review identified twelve distinct methods used to promote safety, each targeting specific contexts to enhance health and wellbeing. These methods are summarized in Table 2. The first method involves environmentally-friendly practices and food safety testing, demonstrated by Klang et al. (2019) in Ban Koh Klang, Thailand, which combined surveys, workshops, and laboratory testing. Workplace safety measures were highlighted in studies by Esmaeili et al. (2024); Rahman et al. (2024), focusing on healthcare challenges and occupational risk assessment, respectively. Ergonomic shift scheduling and recovery time management was explored by Härmä et al. (2024), who reviewed studies to propose safer work schedules. Disinfection in wastewater treatment plants was examined by Amin et al. (2013),, who compared different disinfection techniques to assess safety efficacy. Health education and hygiene practices were promoted in multiple studies, including Lim et al. (2020) and Manaseki-Holland et al. (2021), focusing on school outbreaks and community-based interventions. Safe drug distribution and evidence-based practices were reviewed by Curren et al. (2022); Abena et al. (2020), emphasizing regulatory oversight and diagnostic stewardship. Community engagement and health awareness campaigns included initiatives like Vietnam's COVID-19 response (Nguyen et al., 2021) and food safety governance in rural China (Xie et al., 2023). Specialized protocols for safety were implemented by Fang et al. (2022); Kütter et al. (2023); Reich et al. (2019), targeting neonatal transfer, surgical safety, and laboratory practices. Staff training and engagement strategies were discussed by Asadbeigi & Zhou (2022); Falahee & Kerry (2022), focusing on diagnostics and academic community health initiatives. Traditional food processing techniques were evaluated by Jasper & Juliana (2023), while ensuring food safety and processing techniques was explored by Gahukar (2018) through the study of edible insects. Finally, technological and behavioral interventions were reviewed by Bellanti & Settipane (2016), who focused on asthma and allergy treatment advancements. These varied methods highlight the comprehensive approaches needed to promote safety across diverse environments, emphasizing the importance of context-specific interventions.

The outcomes of safety promotion interventions, as categorized in Table 3, reveal a range of impacts on Knowledge (K), Attitudes (A), and Practices (P), highlighting the multifaceted influence of these initiatives. In terms of Knowledge, studies by Falahee & Kerry (2022); Gahukar (2018); Xie et al. (2023) demonstrated positive outcomes by increasing understanding of social determinants of health, food safety governance, and nutritional security through entomophagy, respectively. These studies contributed significantly to enhancing awareness and knowledge across diverse contexts, from academic settings to rural food practices. For Attitudes, the research focused on how safety measures affected community and individual mindsets. Klang et al. (2019) showed increased public confidence in food safety due to local ingredient sourcing, whereas Esmaeili et al. (2024); Rahman et al. (2024) highlighted negative attitudes resulting from inadequate workplace conditions and exposure risks. These findings underline the importance of effective safety interventions to foster positive attitudes and minimize health risks. Finally, Practices (P) accounted for the majority of the outcomes, emphasizing the practical changes and safety improvements resulting from various interventions. Härmä et al. (2024), Amin et al. (2013), and others demonstrated significant reductions in occupational fatigue, infection rates, and harmful contaminants through well-implemented safety practices. Community-led initiatives, like those described by Manaseki-Holland et al. (2021) and Robinson et al. (2018), showcased sustained improvements in hygiene practices, while medical interventions, such as the use of the STABLE technique (Fang et al., 2022) and Safe Surgery (Reich et al., 2019), resulted in enhanced clinical and procedural outcomes. These studies collectively illustrate how safety promotion has led to enhanced knowledge, shifts in attitudes, and improved practices, underscoring the need for targeted interventions to ensure health and wellbeing across different environments.

It was discovered that despite the growing body of literature on safety promotion, there are notable gaps in the study of safety in the context of academic laboratories, especially in culinary labs. The majority of the reviewed studies focused on general safety practices, occupational health, and community-based interventions, leaving a limited body of research specifically addressing safety protocols within culinary academic environments. Culinary laboratories present unique risks, including the use of sharp instruments, hot surfaces, and food safety hazards, which require distinct

safety measures compared to other academic or industrial laboratories. However, the findings reveal that much of the existing research concentrates on broader contexts like healthcare, environmental hygiene, and industrial safety, without adequately tailoring the analysis or interventions to the specific needs of culinary settings.

Furthermore, while there is considerable emphasis on traditional laboratory environments in medical and scientific disciplines, safety promotion in culinary academic settings remains largely unexplored. This gap underscores the need for more targeted research that focuses on developing, implementing, and evaluating specific safety interventions for culinary laboratories. Such research could enhance the understanding of how best to prevent accidents and promote safe food-handling practices among students and staff in these specialized environments. Future studies should therefore prioritize filling this gap by exploring effective safety promotion strategies tailored to the culinary academic context, potentially improving safety culture and practices in these educational settings.

Conclusion

In conclusion, the scoping review of safety promotion in academic and laboratory settings highlights several key findings related to trends, methods, outcomes, and research gaps. The increasing trend in the number of studies on safety promotion indicates a growing awareness and emphasis on occupational health and safety across various disciplines. The review identified twelve distinct methods used to promote safety, ranging from environmentally-friendly practices and ergonomic shift scheduling to health education, community engagement, and technological interventions. The outcomes of these safety promotion initiatives were categorized into Knowledge (K), Attitudes (A), and Practices (P), demonstrating a broad impact on enhancing safety awareness, influencing attitudes towards risk, and implementing effective safety practices. However, significant gaps remain, particularly regarding the limited research focus on safety promotion in culinary academic laboratories, which presents unique risks and challenges not fully addressed by current studies. Addressing these gaps through targeted research could provide valuable insights into ensuring the safety and wellbeing of individuals in specialized educational environments.

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