

An Overview of the Public Health Risk Management Model: A Food Safety-Related Study

Dr. Shyam Maurya¹, Ranjit Sandilya²

¹Assistant Professor, Department of Management, Kalinga University, Raipur, India. Email: ku.shyammaurya@kalingauniversity.ac.in
ORCID: 0009-0006-3442-8621

²Department of Management, Kalinga University, Raipur, India

KEYWORDS

Public Health, Risk Management, Food Safety, Health Risk

ABSTRACT

Food Safety (FS) in the Food Market (FM) is an essential aspect of Public Health (PH) since it impacts people of all ages, races, genders, and income levels. Regional and global FM continues to influence the FS and PH. The globalization of Health Risk (HR) is increasing because food supply networks span several nations the research aimed to identify prevalent PH issues associated with FS in the FM. A theoretical analysis employs the population, people's interests, and environment. The study evaluates the FS using the Mixed Methods Appraisal Tool (MMAT). After analyzing 200 full-text papers, seven prevalent PH issues associated with FS in the FM were identified. This study evaluated the literature to identify the FM's predominant PH hazards related to FS. The findings suggest that local and worldwide FM influences PH. Countries must guarantee the security and reliability of the exported food products and meet their national standards.

1. Introduction

Public Health and Food Safety

Food Safety (FS) is a crucial concern that impacts the entire global population [1]. FS has become a significant concern for numerous countries worldwide as they rely more and more on the accessibility and reliability of their food supply. There is a growing global appreciation for the importance of FS. Ensuring that food production is conducted safely is crucial to optimize Public Health (PH) advancements and environmental advantages [2]. Children aged under 5 bear 45% of the burden of foodborne diseases, resulting in 125,000 fatalities annually. Gastrointestinal infections caused by contaminated food are the prevailing ailments, afflicting around 610 million individuals and resulting in 280k deaths annually.

The global aspects of food supply chains are currently posing challenges to FS. Foods on the international marketplace are subject to fraud by several national or global commerce entities, including producers, co-packers, suppliers, and others along the supply chain [10]. FS in the Food Market (FM) is a crucial aspect of PH, as it has a global impact on individuals of all ages, races, genders, and income levels [11]. Local and worldwide FM influences the FS and PH. The globalization of Health Risk (HR) is heightened because food supply networks span several national borders [5]. The research identified prevalent PH concerns associated with FS problems in the FM. This review presents evidence supporting the implementation of risk-based FS measures to enhance FS in the FM [17]. The findings of this analysis can be utilized by healthcare professionals, scholars, and regulators to safeguard the general population against adverse HR from consuming low-quality and unsafe food [6].

Background of the study

The FS regulations are outlined in Decree No. 1062-2008 and are implemented by Supreme Decree No. 034-2008. These regulations aim to safeguard the well-being and health of individuals by adopting a comprehensive and proactive approach across the whole food supply chain [12]. These laws establish the standards and procedures for maintaining cleanliness and FS during the production and processing of food and beverage items intended for human consumption in domestic and global markets [3]. Food manufacturers and suppliers must adhere to international requirements for exported goods [7]. Rejection at the port of entry is justified when there are biological, chemical, or physical risks present and when there is mislabeling of the goods in question [4].

The financial development of a nation is dependent on the importance of PH. Based on the Human Capital Index by the World Bank, the maximum productivity potential of all children born today is estimated to be 59%. The measure is computed on a continuum ranging from 0 to 1, considering optimal physical well-being and unrestricted availability of educational resources [15]. It can be translated as promoting domestic manufacturing, economic well-being, and the overall global financial system [16]. Implementing effective measures to address PH and enhance education is crucial for alleviating poverty and ensuring improved prospects for the next generation [9].

Monitoring foodborne infections is difficult because most cases go unnoticed or unreported to PH authorities, and the true extent of an outbreak is significantly greater [8]. Ministry of Health has released a technical guideline outlining the procedures for researching and managing foodborne infections [14]. This guideline is designed to simplify identifying and monitoring foodborne illnesses and implementing methods to control them [13].

2. Methodology

Assessment

The search outcomes from several electronic databases have been transmitted to the Endnote reference manager to eliminate duplicate entries. Two autonomous reviewers evaluated publications based on their titles and abstracts. The assessors examined and assessed full-text papers based on the criteria for inclusion and exclusion. The reviewers convened to reconcile any differences that arose during the evaluation process. The methodical standard of the research included in the analysis was evaluated using the 2018 version of the Mixed Methods Appraisal Tool (MMAT). This method explains each requirement, elucidating the specific details. The ranking of every criterion was determined based on the detailed descriptions provided in the approach. The vast majority of the full-text articles included met the requirements, and all of these papers were determined to be of superior quality.

Data extraction

To mitigate bias, examiners collected data from each article included in the evaluation using mixed approaches to data extraction separately. The data extraction form was tested on a sample of papers chosen at random and adjusted as needed. The two evaluators conducted the eligibility evaluation. Data such as authors, publishing year, research areas, study types, and the primary objectives or messages of the research were collected.

Synthesis

The full-text articles were evaluated using an emergent thematic analysis method to find meaningful topics. These ideas were then categorized into related themes, which overlap. The research amalgamated each thematic element by juxtaposing the discourse and last remarks of the incorporated pieces. Emergent themes were discovered through careful and methodical reading. The process of coding and analyzing the data was improved and made more precise during the examination.

3. Results and discussion

The search yielded 2800 titles and abstracts, with 1800 from PubMed and 1000 from other resources. After eliminating duplicates, the research acquired 2000 title and abstract records. After conducting a review based on the title and abstract, 900 papers were obtained for further evaluation. Out of these, 400 papers were then reviewed to determine their eligibility. Following the specified inclusion criterion, 200 publications were selected for the systematic research assessment (Figure 1).

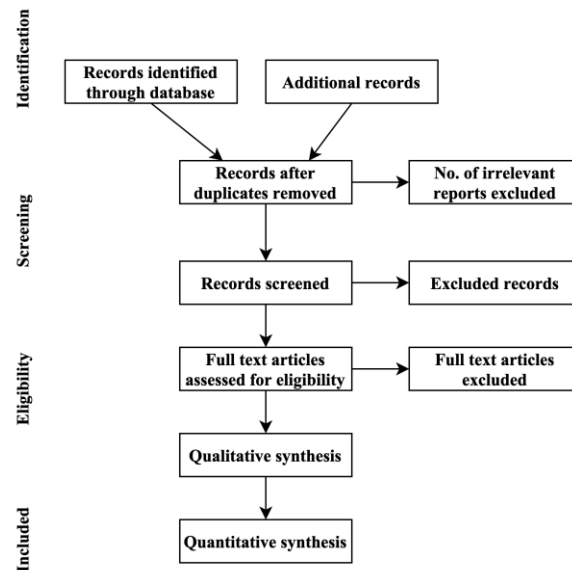


Figure 1. Workflow of the research

FS-related PH risks

After analyzing 200 full-text papers, the research identified seven prevalent PH issues associated with FS in the food industry. The FM was found to have several recognized HR connections to FS, including microbial pollution, chemical contamination, food counterfeiting, exploitation of food additives, mislabeling, genetically modified foods, and expired foods. Of the 50 full-text papers analyzed for microbial pollution of foods, 25 of which account for 64%, were sourced from developing nations. Microbial pollution of foods in the FM is more prevalent as a PH problem in underdeveloped countries than in developed ones. Of the 25 articles on chemical pollution of foods in the FM, twelve were from developing countries. Of the twenty full-text publications retrieved on food contamination, 12 were from developing nations. This suggests that adulterating food is more prevalent in developing nations. 82% of the full-text papers analyzed for the inappropriate use of food additions were from developing countries. This suggests that the misuse of food additives is prevalent in developing countries.

Regarding mislabeling, 80% of the full-text publication were from industrialized countries, whereas 49% were from developing nations. Of the six full-text articles acquired for items that have exceeded their use-by dates, four of them, which account for 62% of the total, were from developing nations. It is more prevalent in selling expired food items in developing nations than in developed countries.

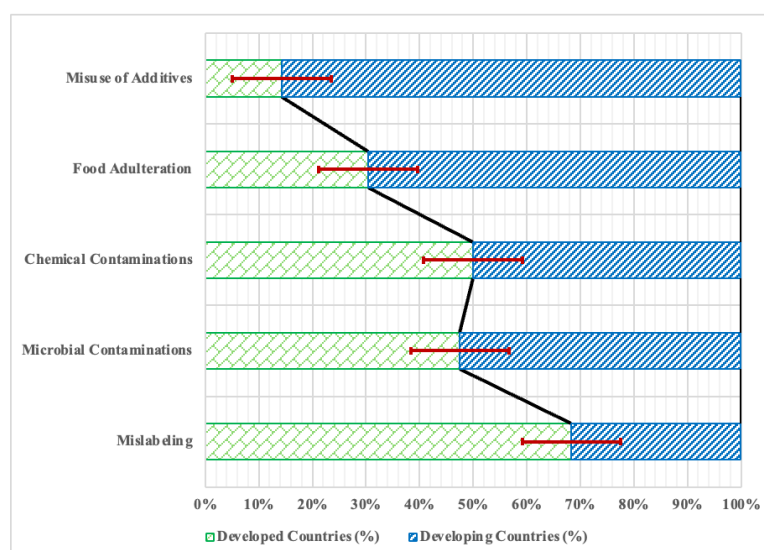


Figure 2. Food quality analysis

Figure 2 compares FS and HR between developed and developing countries. This evaluation comprised

37 publications from rich countries and fifty papers from developing nations. When comparing FS problems in developed nations, it is evident that mislabeling (41%), microbiological contaminations (29%), and chemical pollution (21%) are the most prevalent concerns in the FM. The analysis of FS concerns in developing nations indicates that microbial pollutants (32%), chemical pollutants (21%), food modification (16%), misuse of additives (12%), and mislabeling (19%) are the most prevalent FS problems in the food industry.

Misuse of food additives

This systematic research evaluation found that 14% of the full-text papers demonstrated improper food additions in the FM threaten PH. The full-text articles indicate that certain food colorants and sugar substitutes, such as sunrise yellow FCF, tartrazine, erythromycin, fresh cocaine, ponceau, and saccharin (although their use was restricted by food regulations in some nations), were found to have concentrations that surpassed the allowed amount. The research indicates the consumption of non-permitted pigments and sweeteners, although some are permitted according to food regulations in different nations.

Mislabeling

The misidentification of food items has been identified as a significant PH hazard linked to FS in 24% of the 200 full-text studies reviewed. All 200 studies found that many food specimens gathered from supermarkets, grocery stores, shops, and cafes were biologically determined to be completely different species from what was stated on the product labels. As a result, these specimens were declared mislabeled. Research has shown that seafood is the food item most frequently incorrectly labeled.

Foods past their used-by dates

Out of the full-text articles analyzed, twelve reported the sale of expired or outdated food in various food stores, markets, and eateries. This practice is causing significant PH and ecological issues.

Limitation

The research exclusively depended on Internet databases to search for relevant publications. The study excluded articles that are only available in print format. The study hypothesized that obtaining physical copies would get access to more pertinent articles.

4. Conclusion and future scope

This systematic study identified prevalent FS hazards in the FM that threaten PH. The findings suggest that local and worldwide FM has substantial influences on PH. The globalization of FMs amplifies the spread of HR since the food supply chains traverse several international boundaries. Hence, it is imperative to establish efficient national food control mechanisms to safeguard the health and well-being of the general population. Nations must adopt and execute food control methods based on assessing and managing risks. Countries must ensure the security and quality of the exported food products and that imported food products meet their national standards. Food manufacturers and retailers must adhere to the national FS guidelines and prioritize safeguarding their customers' well-being.

Reference

- [1] Suhani, I., Sahab, S., Srivastava, V., & Singh, R. P. (2021). Impact of cadmium pollution on food safety and human health. *Current opinion in toxicology*, 27, 1-7.
- [2] Budd, J., Miller, B. S., Manning, E. M., Lampos, V., Zhuang, M., Edelstein, M., ... & McKendry, R. A. (2020). Digital technologies in the public health response to COVID-19. *Nature medicine*, 26(8), 1183-1192.
- [3] Srinivasa Rao, M., Praveen Kumar, S., & Srinivasa Rao, K. (2023). Classification of Medical Plants Based on

- Hybridization of Machine Learning Algorithms. *Indian Journal of Information Sources and Services*, 13(2), 14–21.
- [4] Connor, J., Madhavan, S., Mokashi, M., Amanuel, H., Johnson, N. R., Pace, L. E., & Bartz, D. (2020). Health risks and outcomes that disproportionately affect women during the Covid-19 pandemic: A review. *Social science & medicine*, 266, 113364.
- [5] Thooyamani K.P., et.al Data mining a boon: Predictive system for university topper women in academia, *World Applied Sciences Journal*, V-29, I-14, PP:86-90, 2014.
- [6] Stephen, K. V. K., Mathivanan, V., Manalang, A. R., Udinookkaran, P., De Vera, R. P. N., Shaikh, M. T., & Al-Harthy, F. R. A. (2023). IOT-Based Generic Health Monitoring with Cardiac Classification Using Edge Computing. *Journal of Internet Services and Information Security*, 13(2), 128-145.
- [7] Raman, A., Suhartanto, D., & Shaharun, M.H.B. (2023). Delightful Customer Experience: An Antecedent for Profitability and Sustainable Growth of Airline Businesses.
- [8] Sofiene, M., Souhir, C., Yousef, A., & Abdulrahman, A. (2023). Blockchain Technology in Enhancing Health Care Ecosystem for Sustainable Development. *Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications*, 14(3), 240-252.
- [9] Rob, V. O. S., & Cattaneo, A. (2021). Poverty reduction through the development of inclusive food value chains. *Journal of Integrative Agriculture*, 20(4), 964-978.
- [10] Juma, J., Mdodo, R.M., & Gichoya, D. (2023). Multiplier Design using Machine Learning Algorithms for Energy Efficiency. *Journal of VLSI Circuits and Systems*, 5(1), 28-34.
- [11] Adekunle, B., & Filson, G. (2020). Understanding halal food market: Resolving asymmetric information. *Food ethics*, 5(1), 13.
- [12] Pržulj, N., & Tunguz, V. (2022). Significance of Harvest Residues in Sustainable Management of Arable Land I. Decomposition of Harvest Residues. *Archives for Technical Sciences*, 1(26), 61–70.
- [13] Prashanth, B. Arasu, R. & Karunanithy, D. (2024). Perceptual Study on Higher Level Digitalization Among Managers in the Logistics Industry. *The Journal of Distribution Science*, 22(1), 25-36.
- [14] Faour-Klingbeil, D., & CD Todd, E. (2020). Prevention and control of foodborne diseases in Middle-East North African countries: Review of national control systems. *International Journal of Environmental Research and Public Health*, 17(1), 70.
- [15] Ramachandaran, S. D., Ng, H., Rajermani, R., & Raman, A. (2023). Factors Influencing Consumer's Adoption of Electric Cars in Malaysia. *TEM Journal*, 12(4), 2603.
- [16] Yilmaz, S., & Demirhan, S. A. (2020). Age, growth parameters and food composition of Invasive Red Lionfish (*Pterois volitans* L., 1758) in İskenderun Bay. *Natural and Engineering Sciences*, 5(2), 82-91.
- [17] Nagaraj, S. (2021). Role of consumer health consciousness, food safety & attitude on organic food purchase in an emerging market: A serial mediation model—*Journal of Retailing and Consumer Services*, 59, 102423.