

Food Laws of Pakistan: Current Flaws and Strategic Future Reforms

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Abstract: Food safety is a serious public health issue in Pakistan, where a substantial portion of the population is exposed to perilous food due to insufficient regulatory mechanisms, poor hygiene practices, and limited public awareness. Foodborne illnesses remain widespread despite existing policies, reflecting structural weaknesses in the food safety framework. This study adopts a qualitative analytical approach, reviewing current literature, policy documents, and institutional reports from national and international food safety agencies. Findings reveal major flaws in the current framework, including fragmented authority among multiple regulatory bodies, insufficient enforcement of standards, outdated laws, and limited training for food handlers. The lack of coordination between federal and provincial institutions further undermines the effectiveness of food safety governance. Additionally, consumer education on safe food practices remains minimal. To address these challenges, the study proposes a series of strategic reforms: establishing a centralized national food safety authority, modernizing legal and regulatory frameworks, investing in capacity-building initiatives, and implementing community-level awareness campaigns. Integrating digital technologies for traceability and inspection, as well as international collaboration, can further enhance food safety standards. A reformed, unified, and transparent food safety system is vital for protecting public health in Pakistan. Strategic policy action and stakeholder engagement are essential for building a resilient and future-ready framework. By prioritizing reform and investing in institutional resilience, the country can safeguard public health, improve food quality, and boost its position in global markets. This article highlights the flaws in the current framework and a strategic vision for reforming food safety governance in Pakistan.

Keywords: Food Laws; Public Health Laws; Food Standards; Legal Policy Reforms; Regulatory Framework; Pakistan

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1. Introduction

Ensuring robust food safety standards has grown increasingly complex in recent decades, influenced by a web of interdependent variables. While advancements in science and technology, such as innovative agricultural practices, precision analytical tools, and enhanced preservation methods, have mitigated numerous hazards, modern interventions like the pervasive use of synthetic chemicals and additives have inadvertently introduced novel risks across global food supply chains. These challenges are further compounded by demographic shifts, economic volatility, expanding media influence, and heightened consumer awareness, all of which reshape food safety dynamics (Nguyen and Li 2022). As a multidisciplinary field, food safety integrates scientific principles to minimize foodborne illnesses through systematic risk management from production to consumption. This involves interventions at every stage: from household hygiene practices to advanced molecular techniques, such as arsenic mitigation in rice. Contamination arises from biotic (e.g., pathogenic bacteria, fungi) and abiotic sources (e.g., chemical residues, environmental pollutants). Environmental contamination during production, such as soil degradation, irrigation with contaminated water, or improper storage and transport, poses significant risks. At the farm level, non-sanitized equipment, pesticide runoff into irrigation systems, and accidental chemical mixing can render crops unsafe. For instance, washing produce with pesticide-contaminated water introduces toxic residues into the food chain, jeopardizing human health (Nerin et al. 2016).

Thus, adequate food safety requires integrated management systems that address hazards proactively across the entire supply chain, balancing technological innovation with rigorous risk assessment to safeguard public health in an evolving global landscape (Marriott 2018). The World Health Organization (WHO) outlines five foundational principles for food safety: (1) preventing pathogen transfer from humans, animals, or pests to food; (2) segregating raw and cooked foods to avoid cross-contamination; (3) applying adequate thermal processing (time/temperature) to eliminate pathogens; (4) maintaining proper storage temperatures; and

(5) utilizing uncontaminated water and raw materials. Current practices in Pakistan, however, demonstrate limited alignment with these evidence-based guidelines, highlighting systemic gaps in food safety protocols (WHO 2022).

Pakistan lacks a cohesive, formally documented national food safety policy, despite the significant public health burden of foodborne illnesses. Existing legislation primarily addresses production, distribution, and supply chain logistics, reflecting a reactive rather than preventive approach. Challenges mirror those of other developing nations, including fragmented regulatory mandates, insufficient technical expertise, and limited adoption of advanced food safety technologies (Akhtar 2015). Multiple oversight entities operate within Pakistan's food safety landscape, often relying on international frameworks such as the Codex Alimentarius Commission (jointly administered by FAO and WHO) to establish standards for labeling, packaging, additives, pesticide residues, and imported goods (FAO/WHO 2022). Benchmarks from the U.S. Food and Drug Administration (FDA) and U.S. Department of Agriculture (USDA) are adopted for specific products. This reliance on external standards underscores the need for localized, science-driven policies tailored to Pakistan's agricultural practices, supply chain vulnerabilities, and socioeconomic context to strengthen food safety systems holistically (Zhang 2024).

Pakistan has formally committed to aligning with the World Trade Organization's (WTO) Sanitary and Phytosanitary Measures Agreement since 1995. However, systemic deficiencies persist in its SPS framework, which requires modernization to meet international benchmarks for food safety, animal health, and phytosanitary protocols. Empirical data highlights widespread noncompliance: a study by Pakistan's Agricultural Research Council revealed that 26% of plant-based food samples exceeded permissible limits for pesticides or aflatoxins. Annually, over 25 consignments of Pakistani agricultural exports are rejected by EU authorities due to SPS violations. Additionally, Pakistan suspended seafood exports to the EU due to persistent failures to meet food safety criteria, underscoring systemic inefficiencies (Akhtar 2015).

These lapses expose domestic consumers to health risks, compromise farmer livelihoods, and erode export competitiveness. Enforcement remains fragmented despite involvement from multiple agencies, including the Plant Protection and Quarantine Department, Pakistan Council of Scientific and Industrial Research (PCSIIR), and the National Institute of Health (NIH). Regulatory overlap and insufficient interagency coordination effectively hinder the implementation of Codex Alimentarius and WTO-aligned standards. Paradoxically, the proliferation of oversight bodies has not translated to improved outcomes, with food safety and security metrics remaining suboptimal. Urgent reforms are needed to integrate advanced monitoring technologies, strengthen laboratory capacity for residue analysis, and harmonize protocols across federal and provincial jurisdictions. Prioritizing risk-based inspections, traceability systems, and stakeholder training could mitigate contamination risks while restoring international market confidence in Pakistani exports (Hassan et al. 2023).

2. Food safety Issues and Challenges in Pakistan

Contamination through foodborne pathogens presents a significant challenge worldwide, impacting developing nations with subpar sanitation and hygiene practices that exacerbate outbreaks and economies globally. Adopting robust food safety strategies is critical to curbing associated financial losses. For instance, the United States faces an annual expenditure of approximately \$7 billion to uphold food safety regulations (Hussain and Dawson 2013). Meanwhile, Pakistan grapples with an escalating public health crisis, compounding social and economic pressures. The nation's healthcare costs skyrocketed from 24.28 billion rupees in 2000-2001 to 384.57 billion rupees by 2017-2018, reflecting a staggering rise that strains fiscal resources. Aligned with the United Nations' Sustainable Development Goals (SDGs), member states are tasked with integrating 17 overarching objectives, including 169 targets, into national policies. SDG 3 (health and well-being) and SDG 6 (clean water and sanitation) are pivotal to addressing Pakistan's health challenges. Prioritizing these goals could mark a transformative step in reducing the country's public health burden and fostering sustainable socioeconomic progress (Ali et al. 2025).

The rapid growth of globalization and urban development has significantly amplified global food demand. To safeguard public health, implementing robust food safety practices is essential. Targeted education campaigns are critical for raising awareness among street vendors, households, and food businesses about contamination risks, sanitation practices, and strategies to minimize foodborne hazards. Internationally, food safety emerged as a priority during the 1995 Uruguay Round trade negotiations, prompting the establishment of regulations spanning production, processing, and consumption. In Pakistan, Punjab province led the way by introducing the Punjab Food Authority Act in 2011, later adopted by Khyber Pakhtunkhwa (KPK) in 2014. These frameworks regulate over 104 food items across nine categories, emphasizing standardized quality (Rana et al. 2022).

Beyond national priorities, food safety is a prerequisite for international trade, particularly for exporting raw or processed goods. The ISO sets global benchmarks based in Geneva, which has 162 member countries. Major importers like the U.S., EU, and Gulf nations mandate ISO certification for food trade compliance. Aligning with international norms, Pakistan has adopted ISO 22070 standards and formulated 8,857 national standards, harmonizing with the Codex Alimentarius Commission and World Health Organization (WHO) guidelines to strengthen food safety systems and trade credibility (Jin ShaoSheng et al. 2019).

Social behavior and activities significantly impact food safety and the menace of foodborne illnesses. Feeding a global population of 9 billion poses a key challenge today. Epidemiological studies are vital to understanding the links between unsafe food practices, disease, and death. Developed nations have reduced food-related health problems through effective safety approaches. Food safety is not only a public health concern but also carries significant social and economic circumstances, emphasizing the need for global awareness and responsible food handling practices (Akhtar et al. 2014).

2.1 Microbiological Issues of Foods

Bacterial, viral, and parasitic pathogens, including *Escherichia coli*, *Shigella spp.*, *Campylobacter jejuni*, *Salmonella spp.*, *Vibrio cholerae*, and protozoan parasites such as *Giardia lamblia*, *Entamoeba histolytica*, and *Cryptosporidium spp.*, predominantly cause foodborne illnesses in regions such as Pakistan. Viral agents like rotavirus, hepatitis A, enteroviruses, and caliciviruses further exacerbate the burden of gastrointestinal diseases, with diarrheal syndromes representing the most prevalent manifestation and a significant public health burden, particularly among pediatric populations (Soofi et al. 2011).

Inadequate food handling practices represent a critical risk factor, with studies attributing 97% of foodborne illnesses to lapses in food preparation and storage. For instance, microbiological analyses of street-vended fruit salads (locally termed fruit chats) in Pakistan revealed high microbial loads of *Enterobacter spp.*, *E. coli*, *Klebsiella spp.*, *Salmonella spp.*, *Staphylococcus aureus*, and *S. epidermidis*, primarily due to unsanitary exposure during vending. Similarly, traditional dairy products such as khoya and burfi have shown elevated levels of pathogenic bacteria, including *S. aureus* and *E. coli*, linked to outbreaks requiring hospitalization (Farzana et al. 2009). Food vending in high-traffic public spaces, such as bus and train stations, poses additional risks. Perishable items like pulses, ground meat dishes, and chickpeas, often stored at non-compliant temperatures, exhibit elevated bacterial contamination. *Clostridium perfringens*, a Gram-positive, spore-forming anaerobe associated with histotoxic and gastrointestinal diseases, is frequently isolated from these products under suboptimal storage conditions. These findings underscore the urgent need for stringent temperature control, improved hygiene protocols, and regulatory oversight to mitigate foodborne disease transmission in vulnerable populations (Zhang and Shao 2024).

2.2 Pesticides Residues in Foods

While effective in pest management and crop yield enhancement, pesticides' widespread and often indiscriminate application poses critical challenges to food safety and public health due to their bio accumulative potential and non-target toxicity. Residues from these agrochemicals permeate food systems and aquatic environments, ultimately entering human bloodstreams through consumption. Despite documented risks, pesticide usage continues to escalate, particularly in developing nations, creating a paradoxical scenario where agricultural gains are offset by rising morbidity linked to chronic exposure (Punniyakotti et al. 2024). It is emphasized that pesticide overuse persists despite inflated production costs, with residual accumulation in vegetables reaching hazardous levels. These compounds' environmental persistence and bioavailability are governed by physicochemical properties such as volatility, solubility, octanol-water partition coefficients, and hydrolytic stability, which dictate their ecosystem mobility (Kaushik et al. 2009).

Growing public awareness, amplified by digital media proliferation, has heightened global scrutiny of pesticide impacts on health and trade compliance. In Pakistan, empirical studies reveal alarming pesticide concentrations in food matrices and groundwater, particularly in the agricultural regions of Punjab and Sindh. Cotton field laborers face elevated risks of chronic conditions due to direct exposure, underscoring systemic regulatory failures. To mitigate these risks, robust monitoring frameworks, transparent reporting mechanisms, and stringent enforcement of environmental legislation are imperative. Implementing integrated pest management strategies and adopting residue surveillance protocols aligned with international standards could reduce exposure pathways while maintaining agricultural productivity. Such measures are vital to reconciling food security objectives with long-term ecological and public health preservation (Abbas et al. 2024).

3. Food Safety Agencies and Authorities

In Pakistan, a network of regulatory institutions governs food safety to uphold public health by ensuring compliance with national and international standards. These entities establish protocols, monitor adherence, and mitigate contamination risks across the food production continuum. Core organizations include the Pakistan Standards and Quality Control Authority (PSQCA), provincial regulators such as the Punjab Food Authority and Khyber Pakhtunkhwa Food Safety & Halal Food Authority, and the Ministry of National Food Security and Research (MNFSR), which collectively oversee policy formulation and implementation (Khan et al. 2020).

The Pakistan Food Safety Authority (PFSA), operational under the Food Safety Act (2011), is the central regulatory body tasked with harmonizing food safety practices nationwide. Its mandate includes enforcing hygienic standards, conducting risk-based inspections of food establishments, and facilitating public education on safe handling practices. Through laboratory surveillance and systematic monitoring, the PFSA addresses hazards from agricultural production to retail distribution, aligning protocols with global benchmarks such as Codex Alimentarius. This integrated approach aims to reduce pathogen exposure, enhance traceability, and ensure the nutritional quality of consumables, thereby strengthening both domestic health outcomes and export competitiveness (Dogar and Yaqoob 2023).

The Pakistan Food Safety Authority (PFSA) executes its mandate through five strategic pillars, first by regulatory enforcement, where food safety protocols are systematically enforced in compliance with standards across production, processing, and distribution sectors to align practices with national and international benchmarks. Next is pathogen mitigation, in which contaminant surveillance systems are implemented to prevent adulterants, microbial hazards, and chemical residues from entering the food chain, thereby reducing foodborne disease incidence. Third is stakeholder capacity building to deliver targeted educational campaigns to enhance hygiene literacy among consumers, vendors, and industry personnel through workshops, digital platforms, and community outreach. Fourth is quality optimization, which advances market-ready foods' nutritional integrity and organoleptic properties via standardized processing guidelines and post-market surveillance. The last is integrated governance to strengthen interagency and cross-sectoral partnerships to harmonize policy implementation, leveraging synergies between public health agencies, academia, and industry stakeholders (Maqsood 2022).

4. Food Laws and Regulations in Pakistan

As a developing country, Pakistan has faced multiple challenges in various fields, such as the food sector, healthcare system, education, and economy. The increasing population demands safe and healthy food, and food laws and regulations in Pakistan are planned to guarantee food products' safety, quality, and hygiene. Governed by organizations like the Pakistan Standards and Quality Control Authority (PSQCA) and the Punjab Food Authority (PFA), these laws aim to ensure consumer health and endorse fair practices in the food industry. Four key laws address food safety, with three directly targeting food safety issues. The fourth, the Pakistan Standards and Quality Control Authority Act, supports food safety indirectly by ensuring quality standards and regulatory compliance across the food industry. A comprehensive overview of these laws is given below, and major laws of food safety and quality management in Pakistan and their matrices are highlighted in Table 1.

4.1 The Pure Food Ordinance, 1960

The Pure Food Ordinance regulates the preparation, production, and sale of food to ensure its safety and authenticity. Recognized by all provinces and some northern regions with minor modifications, it aims to prevent food adulteration. The law prohibits mixing, coloring, staining, or powdering food in ways that violate official standards or pose health risks. It also governs the use of various food additives and ingredients, including flavoring agents, stabilizers, preservatives, antioxidants, colorants, anti-caking agents, and metals, to ensure consumer protection and uphold food quality standards (Maqsood 2022).

Additionally, misbranded food is forbidden from being sold, manufactured, or exchanged for human use if flawed, objectionable, or harmful to health. This law also deals with food labeling and includes preventive measures for packing and storage (Khan et al. 2020). The ordinance comprises 5 Parts divided into 38 sections. Sections 4-10 forbid the sale of particular food, like selling mixed food; selling, manufacturing, and importing or exporting unhygienic food; selling or manufacturing impure or misbranded food; etc. The competent authority shall approve a license for the production, storage and sale of products as provided in section 11. The government may appoint inspectors or public analysts for this ordinance for any definite food or commonly for all foods as provided in Part III. The remaining parts encompass penal provisions and provisions of miscellaneous nature (FAOLEX Database 2003). This law covers four primary criteria to ensure food safety and consumer health:

- 1) It bans the production, preparation, and processing of such food which may be harmful for human consumption, i.e., food that can cause food poisoning.
- 2) It deauthorize the import, export, or sale of contaminated food.
- 3) Establishes and ensures specific hygiene standards
- 4) Delivers laboratory analysis and inspection of food samples.

However, in cantonment areas, this ordinance is not applicable because these areas follow the cantonment pure food act from 1966. The rules are very similar in both laws, and no variations have been found. Furthermore, the legislation is not consistent in all sectors. The consents for the same felony vary among jurisdictions, and the legislation is silent on the compensation of consumer damage (Sabreen 2021).

4.2 Pakistan Pure Food Laws (PFL), 1963

The current legal framework governing food quality and safety in the country is structured around the PFL. It classifies 104 food products into nine categories, ensuring standardized regulations for consumer protection, food labeling, quality control, and safety compliance. The food items include drinks, fruits and vegetables, grains and cereals, spices, sweeteners, starchy meals, and miscellaneous food. It also contains milk and milk products. These regulations cover using raw food additives, preservatives, synthetic colors, and permissible levels of heavy metals (Sabreen 2021).

4.3 Pakistan Hotels and Restaurant Act, 1976

This act covers all hotels and restaurants in Pakistan and aims to manage and regulate hotel and restaurant pricing and service standards. Section 22(2) prohibits the sale of food and beverages that are either infected, improperly prepared, or served using unhygienic utensils. Any individual who sells infected food or drink, or serves them in unclean utensils, commits a crime. The act neither expressly specifies the right of consumers to file a complaint nor prohibits anybody from filing a complaint. Furthermore, like other food regulations, it does not allow for consumer compensation for damage (Saqib and Nazir 2020).

4.4 The Pakistan Standards and Quality Control Authority (PSQCA) Act, 1996

The Pakistan Standards and Quality Control Authority is part of the Ministry of Science and Technology. The national standardization body ensures the PSQCA executes its responsibilities and tasks. The PSQCA is a member of the International Organization for Standardization (ISO), the top body for developing and employing international standards.

PSQCA plays a key role as:

- Ensures consumer safety and health through standard measures.
- Establish the process to conformity assessment compliant with national and international standards.
- National and international organizations institutions such as Codex Alimentarius, ISO, and World Trade Organization (WTO).

5. Provincial Food Authorities in Pakistan

Provincial food authorities have been established in Pakistan to guarantee the safety of processed foods. These authorities are performing more efficiently than the national Food and Agriculture Department. The Punjab Food Authority (PFA) was the first to be established, mainly due to the efforts of the Pakistan Society of Food Scientists and Technologists (PSFST). It is now the most active and has extended across almost all districts in Punjab. Recently, similar authorities have been set up in Sindh and Khyber Pakhtunkhwa (KPK), but they are still in the early stages and not yet fully active or as effective as PFA.

The Punjab Food Authority was established in 2011 in Lahore, under the Punjab Food Authority Act, and serves as the province's chief agency for food safety, quality control, and regulation. It has since introduced numerous recent legislative measures to strengthen food standards and ensure public health across Punjab. The Punjab Food Authority Act was revised in 2015 through the Punjab Food Authority (Amendment) Ordinance 2015. The PFA fulfills numerous responsibilities under the Act 2011, including ensuring food safety, hygiene, regulation, and public health protection.

- They have to inspect the actions of different industries dealing with food production, to ensure the supply of safe food for the end users.
- They have to sustain standards and create new rules for various types of food commodities, food additives and packaging.
- The PFA maintain the standards of their testing laboratories and have to upgrade their procedures and equipment according to new rules & technology.

- They play a substantial role in organizing the training sessions for the people and stakeholders.

To trace the production lines of different food and sanitation measures of the industry (PFA 2018). Different forms of approaches are used by PFA to impose the standards discussed in the PFA act of 2011. The following are the methods:

- Sending notice to the stakeholder.
- By fining the industry.
- Seize a definite product or the entire industry.
- Recall in the food product light of Laws.

Table 1. Main laws of food safety and quality management in Pakistan and their matrices

Law/Rules	Subject	Objective	Penalty
Pakistan standard and quality control, 1996	Food adulteration management.	Examination and testing of the product regarding quality and features during use and for import & export.	First offense, 1 year prison, and minimal fine of 150 €. For second time offense, 1 year prison, and 250 € fine.
Pure food ordinance, 1960	Production and sale of foods in the provinces.	Maintenance of purity of the food and prohibiting distribution of adulterated foodstuffs for human consumption.	For first offence with severe detention for one year and with fine ranging from 1 to 10 €. For second offence with laborious custody which shall not be less than 3 months and not be more than 2 years and with fine of 2.5 to 50 €.
Pakistan penal code, 1860	Maintaining quality standards and selling harmful food or drink.	Any kind of adulteration in food merchandise, or drinkables, proposed to be consumed or adulterants applied in raw products, to be used in final food stuff.	Either captivity of six months or fine which any extend to 0.5 € or with both.
Paddy and rice (control) order, 1981	Regulation of paddy and rice and rice-based products.	Transport of Paddy by any resources of transport within non-scheduled area except under special situations.	Core Attributes of Commodities.
Punjab sugar (licensing control) order, 1972	Regulation of sugar amount and price control.	Regulation of holding stocks of sugar.	For first felony, releases of show cause notice. Subsequent offence, termination of license.
Punjab meat (control) order, 1978	Sale, processing or store for sale of meat in Punjab.	License granting for the sale and purchase of meat and meat-based products.	For first offence, releases of show cause notice. Subsequent offence, dissolution of license.

5.1 Offences under the PFA

Chapter IV of the Act outlines several offenses and their respective penalties, illuminating several substantial violations deemed important under the legislation's enforcement provisions.

Selling Food Against Law (S.22(1)): This provision covers most wrongdoings. Anyone who sells or offers adulterated or non-compliant food shall face detention ranging from 1 to 6 months and a fine between 100,000 PKR and 1000000 rupees. This aims to confirm food safety and protect public health through severe penalties.

Substandard or Misbranded Food (S.23): Any person who prepares substandard or misbranded food shall be accountable to captivity for 1-6 months and fined 1 lac-10 lac rupees.

False Advertisement & False Labeling: Sections 25 and 26 of the Act propose punishments for the offenses, including imprisonment ranging from 6 months to 1 year. Moreover, fines between 10 lac and 20 lac rupees, and in some cases 5 lac and 10 lac rupees, may be imposed depending on the nature and severity of the offense.

Failure to Comply (S.27): Failure to obey any order or notice issued by the Punjab Food Authority (PFA) or a Food Safety Officer (FSO) without a valid reason may result in imprisonment for up to 3 months and a fine of up to 500,000 rupees, as per the applicable food safety regulations and laws.

Obstruction (S.31): Any individual, including a food operator or subordinate, who hinders a PFA officer in performing their responsibilities can face imprisonment for up to 6 months, a fine of up to 5000 rupees, or both, under Section 31. Likewise, illegitimate intrusion with seized property is punishable in the same manner. In a repeat offense, the offender may be fined up to 2 lac rupees or may face dissolution of their food license, as per Section 34. Moreover, the court may order the PFA to publicly disclose details like names, locations, nature of the offense, or penalties through any medium to inform the public. In addition, the food operator may be held accountable for covering the cost of such publication (Mahmood 2017).

6. Ensuring Food Safety

Globally, an estimated 2.4 billion individuals face exposure to unsafe food annually, resulting in over 600 million illnesses and 420,000 fatalities linked to foodborne pathogens, as per the World Health Organization (WHO 2022). Ensuring food safety is

a critical determinant of public health and socioeconomic stability, as uncontaminated food supplies reduce morbidity, enhance workforce productivity, and foster regional economic resilience. This necessitates a dual framework combining evidence-based scientific protocols (e.g., hazard analysis, microbial monitoring) and equitable regulatory enforcement mechanisms. Emerging technologies, such as blockchain traceability and AI-driven contamination detection, require adaptive policymaking to safeguard food integrity across increasingly complex supply chains (Naseem and Rizwan 2025).

Rising socioeconomic development correlates with heightened consumer demand for food quality assurance, driven by awareness of contaminants like heavy metals, pesticide residues, and zoonotic pathogens. Regulatory bodies are tasked with validating product authenticity, exemplified by stringent labeling standards: 100% virgin olive oil" must exhibit chemical profiles (e.g., fatty acid ratios, sterol content) consistent with Codex Alimentarius specifications, allowing only trace, naturally occurring compounds (Thorsen et al. 2025).

Food safety failures arise from multifactorial risks, including bio-accumulative toxicants (e.g., dioxins, aflatoxins), inadequate hygiene practices, and environmental cross-contamination. Historical precedents underscore systemic vulnerabilities, such as Japan's Minamata disease (methylmercury poisoning via seafood), Iraq's 1971 grain fungicide disaster (methylmercury-treated seed grain), and U.S. outbreaks of Salmonella and E. coli O157:H7 linked to lax agricultural oversight. These incidents highlight the imperative for preemptive risk mitigation, leveraging genomic surveillance, and international harmonization of safety standards to prevent future crises (Tola 2025).

Ensuring a safe and sustainable food supply necessitates the integration of evidence-based scientific frameworks and equitable regulatory enforcement. To adapt to evolving risks, legislative bodies must periodically update regulatory protocols to safeguard food integrity, ensuring products meet safety and nutritional benchmarks for public health. National regulatory agencies, such as the U.S. Food and Drug Administration (FDA), operate under a tripartite mandate of public education to disseminate scientifically validated nutritional data and compositional transparency for consumer empowerment (Komala et al. 2023). Regulatory Oversight to implement and monitor compliance with food safety standards across production, processing, and distribution networks. Risk mitigation to systematically identify and mitigate contaminants while prosecuting deceptive practices through supply chain surveillance and analytics (Webb 2015).

Following legislative ratification, multisectoral compliance is critical, encompassing all ancillary industries from production and labeling to logistics and retail distribution. Agencies like the FDA are empowered with jurisdictional authority to draft adaptive regulations, mobilize interdisciplinary expertise, and deploy advanced monitoring technologies. This holistic approach ensures alignment with public health objectives, fostering trust in food systems through transparency, accountability, and continuous improvement (Kaplinsky and Morris 2018).

Effective governance of food safety systems requires multisectoral agencies to be equipped with jurisdictional authority and operational resources to execute a tripartite mandate: (1) public education on foodborne hazards, (2) enforcement of safety protocols, and (3) eradication of supply chain risks (WHO 2022). Beyond primary regulators like the FDA, synergistic collaboration with entities such as the Environmental Protection Agency (EPA) tasked with regulating potable water standards, air quality, and soil integrity, and the Department of Agriculture (USDA), which oversees agricultural biosecurity and nutritional programs, is critical. Cross-functional coordination with agencies like Immigration and Customs Enforcement further strengthens the interdiction of illicit or adulterated imports. Interoperable databases and real-time data sharing across these entities are essential for unified risk mitigation (Johnson 2010).

Regulatory frameworks must be anchored in empirical science to ensure equitable enforcement. Risk assessment methodologies, including hazard identification, exposure modeling, and dose-response analysis, provide quantitative foundations for establishing toxicological thresholds and contaminant limits (Almaary 2023). For instance, probabilistic risk models integrate epidemiological data, exposure pathways, and toxicokinetics to estimate population-level health impacts, guiding policies on pesticide residues or microbial tolerances. Such evidence-based protocols enable dynamic adaptation to threats, ensuring food safety standards evolve with advancements in analytical toxicology and supply chain complexity. By prioritizing scientific rigor in policy design and fostering interagency collaboration, nations can systematically reduce foodborne hazards while maintaining public trust in regulatory ecosystems (Evans 2008).

7. Food Safety Legislations in Pakistan

Several food safety laws and rules are currently in place in Pakistan to ensure food and consumer safety. The main acts are the West Pakistan Pure Food Ordinance, 1960, and the Cantonments Pure Food Act, 1966. As mentioned above, these rules assure food safety throughout food preparation, like production, processing, shipping, storage, and client sales. Local authorities assured the enactment of these ordinances. Though these legislations faced numerous condemnations, consumers are not compensated when they are harmed by low-quality food products. Food and drink adulteration is part of the section of consumer compensation in the Pakistan Penal Code, but it is not the mentioned problem (Khaliq et al. 2014).

In contrast, the Indian Food Safety and Standards Act, from 2006, in Article 65 has independently resolved the matter of compensation (India Ministry of Law 2006). Street food culture is flourishing in Pakistan, providing a low-cost business facility for various low- and middle-income families. Despite this fact, the food safety of street stalls is not satisfactorily addressed and needs proper attention and enforcement from relevant authorities. Even though most street food sellers find their food stuff to be reasonable and popular selections, there is always a hazard that customers might have health complications. Several studies in developing nations highlight poor food hygiene standards in these products (Iqbal et al. 2010).

Street food is often contaminated due to poor hygiene practices, with major sources of contamination including the use of raw ingredients, polluted water, dirty utensils, infected food handlers, and insufficient cooking or reheating. A study conducted in Pakistan on the microbiology of street-sold juices found the presence of yeast, moulds, and E. coli in all tested samples (Hussain et al. 2008). The World Health Organization (WHO) recommends that countries implement practical regulations to control and improve the safety of street-vended food. One such approach is the mandatory registration of street vendors, along with regular health check-ups to detect infectious diseases. Research shows that many street food handlers have limited knowledge of food safety practices.

In Pakistan, although the Hotels and Restaurants Act mandates the registration of formal food establishments and imposes fines for non-compliance, a comprehensive safety framework for street food is still lacking. Mandatory registration ensures that food handlers possess valid medical fitness certificates and adhere to basic hygiene standards. Strengthening such regulations and awareness can significantly improve the safety of street foods and protect public health (Khan et al. 2020).

Food safety legislation in Pakistan includes the Pakistan Pure Food Laws, the Punjab Food Authority Act, and the Pakistan Standards and Quality Control Authority Act. These aims to control food quality, hygiene, and consumer protection. However, implementation remains weak due to limited infrastructure, corruption, overlapping jurisdictions, and a lack of trained personnel. Coordination between federal and provincial bodies is often poor, leading to inconsistent implementation. Public awareness of food safety standards is also low, decreasing accountability for vendors and producers. While the legal framework exists, effective enforcement and reform are urgently needed.

8. Global Food Safety Laws and Regulations

Global food safety laws aim to protect public health and ensure fair food trade. The Codex Alimentarius, established by the FAO and WHO, sets international food standards. ISO 22000 provides a global framework for food safety management systems across the supply chain. HACCP (Hazard Analysis and Critical Control Points) identifies and controls potential hazards in food production. The European Food Safety Authority (EFSA) offers scientific advice on food-related risks within the EU. Together, these frameworks harmonize food safety practices worldwide, enhance consumer protection, and support international trade by ensuring consistent standards across countries and industries. Figure 1 illuminates the international food laws on food safety and ensuring hygiene and quality.



Figure 1. International Food Laws and Regulations Ensuring Food Safety

9. Food Safety Legislations in the United Kingdom

International Food Safety legislation aims to ensure public health by establishing global standards for the production, handling, and distribution of food. It promotes harmonized regulations, fosters international cooperation, and seeks to avert foodborne illnesses, safeguard trade, and improve worldwide consumer confidence in food safety. Food safety legislation in the United Kingdom (UK) ensures that food is safe, hygienic, and properly labeled, protecting public health and consumer interests throughout the food supply chain.

9.1 Food Standards Act 1999

The Food Standards Act 1999 is the main piece of UK legislation that established the Food Standards Agency (FSA). The prime goal of the Act is to guard public health in relation to food and ensure that end users have access to correct information about the food they eat. The FSA confirms that food businesses operate to high levels of safety and hygiene and directs food policy.

9.2 Food Safety Act 1990

The Food Safety Act 1990 is a vital piece of legislation in the UK that sets out the framework for food safety and consumer protection. Its main aim is to ensure that all food sold or prepared for consumption is safe, nutritious, and correctly labelled. It defines the policy on how to attain the goal of safe food production, distribution and consumption

9.3 The Food Safety Order 1991

The Food Safety (General Food Hygiene) Regulations 1991 aim to ensure food safety through proper hygiene practices in food preparation, handling, and sale.

9.4 General Food Law

General Food Law warrants protection for human health and consumer interests concerning food. It enforces traceability, holds food businesses accountable, and ensures compliance with European Union (EU) food safety standards, predominantly under Regulation (EC) No 178/2002, which sets the foundation for food safety, transparency, and consumer protection across the EU (Taylor 2025).

10. Comparison of National Food Laws with other Countries Food Laws

Pakistani food laws, governed by bodies like the PFA, often lack consistent enforcement, modern infrastructure, and transparency, leading to widespread food adulteration and hygiene issues. A key drawback in Pakistan is inadequate training for inspectors and limited lab testing capacity (Akhtar 2015). In contrast, the UK food laws, regulated by the FSA, are more rigorous, science-

based, and strictly enforced, ensuring higher consumer protection. Meanwhile, the UK faces criticism over bureaucratic delays and the high cost of compliance for small businesses. Moreover, Indian food laws are more comprehensive and strictly enforced through the Food Safety and Standards Authority of India (FSSAI). They cover labeling, hygiene, additives, and safety standards effectively. Regular inspections, stronger regulatory frameworks, and better international compliance make Indian food laws more robust than Pakistani food regulations (Dhara et al. 2021). Overall, Pakistan's food laws need modernization and stronger implementation to meet global standards seen in countries like the UK.

11. International Best Practices and their Adaptability in Pakistan

International best practices on food safety, such as HACCP (Hazard Analysis and Critical Control Points), ISO 22000, and Codex Alimentarius guidelines, ensure food hygiene, quality, and safety throughout the supply chain. These frameworks are essential for decreasing foodborne illnesses and enhancing consumer trust. In Pakistan, adopting these standards remains challenging due to inadequate infrastructure, lack of awareness, and weak enforcement. However, with targeted training, regulatory reforms, and investment in food safety systems, these practices can effectively adapt to local conditions, improving public health and boosting export potential for Pakistani food products.

12. Conclusions

Future perspectives on national laws accentuate the need for better enforcement, modernization, and alignment with international safety standards. Current faults include weak regulatory implementation, lack of standardized labeling, and limited oversight of food adulteration. Moreover, insufficient training of inspection staff also hinders progress. Moving forward, digital traceability systems, stricter penalties, and enhanced public awareness can drive improvement. Partnerships with global agencies and introducing science-based policies will help ensure safer food. To build trust and protect public health, Pakistan must prioritize transparency, hygiene monitoring, and capacity building across all levels of its food regulatory framework. In conclusion, national food laws aim to ensure food safety and quality, but enforcement remains feeble. Insufficient infrastructure, corruption, and lack of awareness hamper implementation. Though regulatory bodies exist, poor coordination and outdated standards lessen efficiency. Strengthening monitoring, updating regulations, and improving public education are vital to protect consumer health and safety.

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