

Evaluating National Readiness for Foodborne Disease Control in Saudi Arabia: A Qualitative Policy Analysis Using WHO's Self-Assessment Tool

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Abstract

Background

Foodborne disease surveillance and response in Saudi Arabia involve multiple authorities, but national readiness has not been comprehensively assessed against the World Health Organization framework.

Methods

We conducted a qualitative analysis of 19 official policies, laws, guidelines, protocols, and circulars retrieved between April and July 2026. Evidence was coded deductively against the WHO three-stage, 16-goal country self-assessment framework and inductively for contextual themes, then triangulated with self-assessment responses from national experts.

Results

Three themes characterised national readiness. Legislation, notification requirements, outbreak-investigation protocols, and defined institutional roles provide substantial foundational capacity. Laboratory-supported and subnational surveillance have strengthened but remain uneven. Policies increasingly reflect One Health and food-chain surveillance, while routine interagency data sharing, interoperable information systems, joint analysis, and formal source-attribution activities remain limited.

Conclusions

Saudi Arabia has strong sector-specific foundations for foodborne disease surveillance and response, but readiness is constrained by uneven implementation and incomplete system integration. Priorities include interoperable multisectoral data governance, strengthened regional laboratory networks, broader event-detection capacity, and routine joint monitoring across the food chain.

Introduction

Foodborne diseases (FBDs) remain a major public health concern worldwide despite substantial advances in food safety legislation, food production technologies, and disease surveillance systems. Unsafe food contaminated with pathogenic microorganisms, parasites, toxins, or hazardous chemicals can cause more than 200 diseases, ranging from acute gastroenteritis to severe neurological disorders, chronic sequelae, cancer, and death (1). According to the World Health Organization (WHO), an estimated 866 million cases of foodborne illness and approximately 1.52 million deaths occurred globally in 2021, resulting from 42 major foodborne hazards, including bacteria, viruses, parasites, and chemical contaminants (2). Children younger than five years bear a disproportionate share of this burden because of their increased biological susceptibility, while low- and middle-income countries experience the highest incidence and mortality rates. Beyond its health consequences, foodborne disease has substantial social and economic impacts through healthcare expenditure, productivity losses, reduced consumer confidence, disruption of food supply chains, and barriers to international trade. The global economic burden associated with foodborne diseases has been estimated at approximately US\$310 billion annually (2).

The true burden of foodborne disease is likely considerably higher than current estimates because surveillance systems frequently underestimate the number of cases. Many affected individuals do not seek medical care, laboratory confirmation is often unavailable, and linking illness to a specific contaminated food source remains methodologically challenging. Consequently, foodborne diseases continue to be substantially underreported in most countries, limiting the ability of policymakers to accurately assess disease burden, identify emerging hazards, allocate resources effectively, and evaluate the impact of food safety interventions (3). Strengthening surveillance and outbreak response systems therefore represents one of the most effective public health strategies for reducing foodborne disease burden and improving national food safety performance.

Effective surveillance extends beyond routine case reporting. Comprehensive foodborne disease surveillance encompasses early detection of outbreaks, laboratory confirmation of pathogens, epidemiological investigation, environmental and food source tracing, rapid implementation of control measures, timely risk communication, and continuous evaluation of system performance. Well-functioning surveillance systems enable health authorities to rapidly identify contamination sources, interrupt disease transmission, minimise the scale of outbreaks, and generate evidence to inform policy and regulatory decisions. In addition, surveillance contributes to maintaining consumer confidence, protecting domestic and international food trade, supporting tourism, strengthening compliance with the International Health Regulations, and improving preparedness for emerging biological and chemical threats (4).

Recognising the growing global burden of foodborne diseases, WHO has prioritised strengthening national food safety systems through the WHO's introductory manual and its country self-assessment tool in Annex 3. The self-assessment tool provides countries with a comprehensive framework to evaluate their preparedness across key system components, including governance and legislation, surveillance systems, laboratory capacity, outbreak investigation, multisectoral coordination, workforce competency, risk communication, emergency preparedness, monitoring, and evaluation. Rather than measuring disease burden alone, the framework enables countries to identify strengths, implementation gaps, and priority areas for capacity development. Importantly, the tool promotes continuous quality improvement by encouraging countries to benchmark existing capacities against internationally recognised standards (5).

The WHO framework is closely aligned with the One Health approach, which recognises the interconnected health of humans, animals, food systems, and the environment. Foodborne hazards frequently originate at the human-animal-environment interface, requiring coordinated action among public health authorities, veterinary services, agriculture, environmental health agencies, food regulatory authorities, and laboratories (6). The Food and Agriculture Organization (FAO), WHO, the World Organisation for Animal Health (WOAH), and the United Nations Environment Programme (UNEP) have all emphasised that One Health collaboration is essential for preventing foodborne diseases, strengthening antimicrobial resistance surveillance, improving food chain traceability, and responding effectively to emerging food safety threats (7).

Saudi Arabia presents a particularly important setting in which to evaluate foodborne disease preparedness. The country has undergone rapid demographic, economic, and regulatory transformation during the past decade, accompanied by substantial changes in food production, importation, urbanisation, and consumer behaviour. Due to its arid climate and limited agricultural productivity, Saudi Arabia relies heavily on imported food, with approximately 80% of its food demand met through international imports. While this reliance helps ensure national food security, it also increases the complexity of food safety governance by expanding the volume and diversity of imported food products and supply chains. Consequently, imported food presents additional challenges for food safety regulation, disease surveillance, and risk management, with potential implications for the national economy, food security, nutrition, and public health (8). Furthermore, Saudi Arabia hosts millions of pilgrims annually during Hajj and Umrah, creating unique public health challenges that require highly coordinated surveillance and outbreak response systems capable of rapidly detecting, investigating, and controlling foodborne disease outbreaks (9).

Foodborne disease prevention and response in Saudi Arabia involve multiple governmental organisations operating within a shared governance framework. The Ministry of Health is responsible for disease surveillance, public health response, and healthcare management, while the Saudi Food and Drug Authority regulates food safety standards, oversees food inspections, manages food recalls, and supervises imported food products (10, 11). The Ministry of Environment, Water and Agriculture contributes to food safety through agricultural regulation, veterinary public health, and animal disease control, whereas municipal authorities undertake food establishment inspections and environmental health enforcement (12, 13). Considerable progress has been made through regulatory reforms associated with Saudi Vision 2030; however, effective implementation depends upon sustained multisectoral coordination, adequate workforce capacity, laboratory infrastructure, timely reporting, and continuous evaluation of system performance (14).

Although Saudi Arabia has established numerous laws, regulations, guidelines, and operational protocols addressing food safety and foodborne disease outbreak response, evidence regarding the overall readiness of the national surveillance and response system remains limited. Previous studies have primarily focused on food safety legislation, regulatory structures, or specific aspects of outbreak management (15, 16), while no study has comprehensively evaluated national preparedness using the WHO Country Self-Assessment Tool. Consequently, there is limited evidence regarding the extent to which existing policies collectively address the core capacities recommended by WHO or identify areas requiring further strengthening.

Therefore, this study aimed to evaluate Saudi Arabia's readiness for foodborne disease surveillance and outbreak response using the WHO Country Self-Assessment Tool through qualitative policy document analysis and expert assessment. By systematically examining national policy documents against internationally recognised standards, this study identifies existing strengths, implementation gaps, and opportunities to strengthen foodborne disease preparedness. The findings will provide evidence to support policymakers, strengthen multisectoral collaboration, and inform future policy development to enhance national food safety systems and protect population health.

Methods

Document retrieval

A qualitative document analysis was conducted to identify and evaluate national policies, legislation, guidelines, protocols, and other official documents related to foodborne disease outbreak (FBDO) surveillance and response in Saudi Arabia. Document retrieval was undertaken between April 2026 and July 2026 using a systematic search strategy.

Documents were identified through official government websites, including the Ministry of Health (MOH), Saudi Food and Drug Authority (SFDA), Public Health Authority (Weqaya), Ministry of Environment, Water and Agriculture (MEWA), Ministry of Municipalities and Housing (MOMAH). Additional documents were obtained through consultation with subject matter experts, and official documents provided by national stakeholders.

Eligible documents included legislation, regulations, strategic plans, national guidelines, standard operating procedures, technical manuals, surveillance protocols, outbreak investigation guidance, laboratory guidelines, and official circulars that addressed one or more components of foodborne disease prevention, surveillance, laboratory capacity, outbreak investigation, multisectoral coordination, food chain surveillance, or emergency response. Documents unrelated to foodborne disease surveillance or those lacking policy or operational relevance were excluded.

Duplicate documents and superseded versions were removed, with the most recent version retained unless historical documents were necessary to understand policy development.

Document analysis

We employed qualitative content analysis within a constructivist paradigm to examine how foodborne disease outbreak (FBDO) surveillance and response policies are represented across national policy documents. A constructivist approach was adopted to acknowledge that policy documents reflect socially and institutionally constructed understandings of food safety governance and public health practice. The analysis was guided by the World Health Organization (WHO) *country self-assessment tool in Annex 3 of the WHO introductory manual*, which served as the analytical framework. The framework

comprises three stages and 16 strategic goals covering governance, surveillance, laboratory systems, outbreak investigation, integrated food chain surveillance, multisectoral collaboration, risk assessment, workforce development, communication, and emergency preparedness (5) (Appendix 1).

Each document was read in full, and relevant information was extracted into a structured data extraction matrix. Data were coded deductively according to the WHO framework, while allowing inductive coding to identify policy elements, implementation practices, and contextual factors that were not explicitly represented within the framework. Documents were compared across sectors to identify areas of convergence, complementarity, and implementation gaps.

The first author (AA), who has expertise in foodborne disease policies and qualitative research, conducted the primary analysis of the policy documents. The coding framework, interpretation of findings, and emerging themes were subsequently reviewed and refined through regular discussions with the co-authors to ensure analytical rigour and consensus.

To enhance the credibility of the findings and complement the document analysis, the first author consulted three national experts, one each from the Ministry of Health (MOH), municipal authorities, and the Saudi Food and Drug Authority (SFDA), to clarify information related to their respective institutions that could not be determined from the reviewed documents. The relevant sections of the WHO Country Self-Assessment Tool were subsequently completed by the first author based on the experts' responses. The findings were then synthesised into overarching themes reflecting the strengths, implementation gaps, and opportunities for strengthening Saudi Arabia's foodborne disease outbreak surveillance and response system. The Standards for Reporting Qualitative Research (SRQR) checklist was used to guide the reporting of the study and enhance the transparency and rigour of the qualitative methodology (17) (Appendix 2).

Regarding ethical approval, this study involved the analysis of publicly available policy documents and did not involve identifiable personal data; therefore, ethical approval was not required.

Results

The country self-assessment and policy document analysis included 19 national policy documents from relevant government ministries and authorities (Table 1), providing the basis for evaluating Saudi Arabia's foodborne disease outbreak surveillance and response system. Overall, the findings showed that Saudi Arabia has established several core capacities for foodborne disease outbreak surveillance and response. However, implementation varied across system levels and sectors. The findings were organised into three themes corresponding to the three stages of the WHO Country Self-Assessment Tool.

Table 1
National policy documents related to foodborne disease outbreak surveillance and response identified for analysis.

No.	English Title	Arabic Title	Description	Issuing organization
1	Comprehensive Botulism Poisoning Management Protocol in Acute Care Settings (35)	البروتوكول الشامل لإدارة التسمم البوتوليزي في المرافق الصحية الحادة (35)	Clinical guideline describing the diagnosis, treatment, antitoxin administration, respiratory support, and management of suspected and confirmed botulism cases.	Ministry of Health
2	Food Law (30)	قانون الغذاء	The primary Saudi Food Law establishing legal requirements for food safety, food handling, regulatory responsibilities, and enforcement.	Bureau of Experts at the Council of Ministers
3	Guidelines for Clostridium botulinum (Botulism) (27)	الخطوات الإرشادية لمرض البوتوليزم (Clostridium botulinum) (27)	Public health guideline describing epidemiology, case definition, incubation period, symptoms, diagnosis, laboratory confirmation, treatment, and reporting of botulism.	Ministry of Health
4	Implementing Regulations of the Agriculture Law (12)	اللائحة التنفيذية لقانون الزراعة (12)	Executive regulations governing agricultural activities, animal and plant health, food production, biosecurity, and environmental protection.	Ministry of Environment, Water and Agriculture
5	Major Foodborne Organisms (28)	الكائنات الحية الدقيقة الغذائية الرئيسية (28)	Reference guide comparing common foodborne pathogens, incubation periods, symptoms, duration of illness, and common food sources.	Ministry of Health
6	General Health Requirements for Food Preparation and Food Service Establishments (24)	المتطلبات الصحية العامة لمؤسسات إعداد الطعام ومؤسسات خدمة الطعام (24)	Technical regulation specifying structural, operational, hygiene, sanitation, and food safety requirements for food establishments.	Ministry of Municipalities and Housing

Table 1
(continued).

No.	English Title	Arabic Title	Description	Issuing organization
7	Circular on Collecting Samples from Food Establishments and Food Handlers (19)	دائرة الصحة العامة مركز مكافحة الأمراض مركز مراقبة الأغذية	Ministry circular explaining procedures for collecting environmental and human samples during food safety investigations.	Ministry of Health
8	Circular No. 234126 (36)	234126 رقم المراسلة	Official Ministry of Health circular outlining reporting requirements, coordination mechanisms, and operational procedures related to food safety incidents.	Ministry of Health
9	Rules and Protocols Applied in Food Establishments During Food Poisoning or Suspected Cases (11)	الهيئة العامة للغذاء والدواء مركز مكافحة الأمراض مركز مراقبة الأغذية	Operational protocol outlining actions required by food establishments and regulatory authorities when food poisoning is suspected or confirmed, including HACCP-based corrective actions and outbreak management.	Saudi Food and Drug Authority
10	Implementing Regulations of the Food Law (23)	الهيئة العامة للغذاء والدواء مركز مكافحة الأمراض	Executive regulations detailing implementation of the Food Law, including licensing, inspection, food control measures, and compliance requirements.	Saudi Food and Drug Authority
11	Four-Committee Circular (20)	الهيئة العامة للغذاء والدواء	Official document defining the roles and coordination mechanisms of the four-sector committee responsible for environmental sampling and foodborne outbreak investigations.	Ministry of Health

Theme 1. Established foundational surveillance and outbreak response capacity

Stage one findings demonstrated that Saudi Arabia has established a comprehensive framework for the surveillance and investigation of foodborne disease outbreaks, supported by legislation, standardized reporting procedures, investigation protocols, and clearly defined institutional responsibilities. The Ministry of Health operates an indicator-based surveillance system through the Health Electronic Surveillance Network (HESN), which receives notifications from healthcare facilities and supports routine analysis of surveillance data for outbreak detection (10). In parallel, event-based surveillance allows suspected outbreaks to be identified through multiple reporting pathways, including healthcare facilities, municipalities, the Saudi Food and Drug Authority (SFDA), food establishments, and public complaints (10, 11, 13).

The national reporting guideline for foodborne disease outbreaks provides standardized case definitions, reporting timelines, and responsibilities across the health system. The guideline requires immediate notification of suspected outbreaks, followed by reporting within 24 hours to the national Food Safety Program, with additional monthly and zero-reporting requirements to ensure continuous surveillance even when no outbreaks occur (10, 18, 19). It also specifies standardized outbreak investigation procedures, including case interviews, epidemiological investigations, laboratory sampling, environmental inspections, and submission of final outbreak reports within predefined timelines.

The document review also identified well-developed outbreak investigation procedures. Multidisciplinary investigation teams undertake descriptive epidemiological investigations using standard case definitions, construct epidemic curves and line lists, collect clinical and food samples, perform environmental inspections, and implement immediate control measures (20, 21). Guidance documents further require investigations to identify contributing environmental factors and food handling practices that may have facilitated transmission, demonstrating that epidemiological and environmental investigations are conducted simultaneously rather than independently (19, 22).

Roles and responsibilities during outbreaks are distributed across several government agencies. The Ministry of Health, through the Public Health Authority, leads epidemiological surveillance and public health response, municipalities conduct inspections of food establishments and implement enforcement measures, while the Saudi Food and Drug Authority is responsible for food recalls, food manufacturing oversight, laboratory investigations, and regulatory action (20). Additional protocols issued by the SFDA require food businesses to immediately notify the appropriate authority whenever food products are suspected of causing illness, initiate product recalls, preserve evidence for investigation, and cooperate fully with regulatory authorities during outbreak investigations (11, 23).

Existing policy documents further demonstrate ongoing refinement of outbreak investigation responsibilities. A Ministry of Health circular transferred responsibility for environmental sampling during outbreak investigations from Ministry of Health personnel to municipal authorities, while maintaining the Ministry's responsibility for epidemiological investigation and examination of food handlers (19). This document illustrates continued clarification of institutional responsibilities and efforts to reduce duplication between agencies during outbreak response.

Despite these strengths, important coordination challenges remain. Surveillance information continues to be managed through separate information systems within the Ministry of Health, municipalities, and the SFDA, limiting interoperability across agencies (11, 20, 24). Although mechanisms exist for information exchange during outbreak investigations, routine sharing of surveillance information appears to rely largely on administrative communication rather than integrated electronic platforms. Furthermore, surveillance bulletins and performance monitoring are primarily coordinated nationally, with less evidence of standardized feedback mechanisms across regional health clusters. In addition, while the Ministry of Environment, Water and Agriculture has an important role in preventing foodborne disease through animal health, agricultural, and food production oversight, it does not have a primary role in foodborne outbreak investigation or response, highlighting the need for effective coordination between prevention and public health response functions (25, 26).

Theme 2. Strengthened but uneven laboratory-based and subnational surveillance capacity

Stage two findings demonstrated that laboratory-supported surveillance is underpinned by standardized laboratory procedures, nationally coordinated reporting mechanisms, and increasingly formalized investigation protocols (10, 13, 23). Laboratory confirmation forms an essential component of outbreak investigations, with standardized procedures for clinical specimen collection, food sampling, laboratory testing, antimicrobial susceptibility testing where appropriate, and laboratory reporting (21, 27). Disease-specific guidelines, such as the botulism investigation guideline, further define the types of specimens to be collected, sampling procedures, transport requirements, and laboratory testing protocols, promoting consistency in laboratory investigations across outbreaks (27, 28). Laboratory information systems interface with HESN to support epidemiological investigations and laboratory confirmation of foodborne pathogens.

The reporting guideline specifies laboratory requirements alongside epidemiological investigations, including coordinated collection of clinical specimens, food samples, environmental samples, and water samples when appropriate (19, 20, 22). Laboratory findings are incorporated into outbreak investigation reports and contribute to source identification, implementation of control measures, and completion of final outbreak investigations.

National guidance also demonstrates substantial investment in standardisation of outbreak investigations. Detailed operational guidance defines outbreak case definitions, reporting thresholds, emergency notification procedures, investigation timelines, specimen management, and reporting responsibilities across healthcare facilities, health clusters, and the Ministry of Health (10). These procedures improve consistency of surveillance activities across subnational levels and strengthen laboratory-supported surveillance capacity.

Event-based surveillance capacity is further strengthened through national reporting channels, media monitoring, and verification of information circulating through social media or other informal sources, increasing the sensitivity of the surveillance system for detecting unusual events (18, 23).

Despite these strengths, the reviewed documents did not provide evidence of training programmes targeting non-health stakeholders, such as media personnel, community leaders, or other community-based actors, to recognise and report potential foodborne disease events. Consequently, event detection remains largely dependent on reports generated within the formal health sector and government agencies, potentially limiting the early identification of foodborne disease events originating in the community (10, 11, 24).

Additional regulatory documents reinforce preparedness within the food industry. Recent SFDA guidance requires food establishments to appoint trained food safety managers with competencies in Hazard Analysis and Critical Control Points (HACCP), food safety management systems, incident reporting, product traceability, recall procedures, staff training, and communication with regulatory authorities (29). These requirements strengthen preparedness within food businesses and improve their capacity to participate effectively in outbreak investigations.

Nevertheless, implementation remains uneven. The assessment identified variability in laboratory capacity across regions, with specialised diagnostic testing concentrated within national reference laboratories. Advanced laboratory investigations, including *Clostridium botulinum* toxin testing and serotyping of foodborne bacterial pathogens such as *Salmonella* and *Shigella*, are currently available primarily at the Public Health Authority reference laboratory (27, 28). Consequently, peripheral and regional laboratories often rely on specimen referral to the national reference laboratory, which may delay confirmatory diagnosis and comprehensive characterisation of foodborne pathogens during outbreak investigations. Similarly, collaboration between laboratories, food safety authorities, municipalities, and healthcare providers was not consistently supported by integrated information systems, reducing opportunities for routine joint analysis of surveillance data. Evaluation of surveillance performance also appears to remain primarily Ministry of Health-led rather than being undertaken jointly across all agencies involved in foodborne disease surveillance.

Theme 3. Movement towards integrated food chain surveillance, but limited system integration

Stage three findings showed increasing adoption of a One Health approach through policies spanning public health, food safety, agriculture, veterinary health, and environmental monitoring. The Saudi Food and Drug Authority (SFDA) plays a central role in food chain surveillance and food safety governance in Saudi Arabia. Policy documents demonstrate that the SFDA is responsible for regulating food safety across the food supply chain through food standards, inspection and regulatory oversight of food manufacturers and importers, food recall systems, traceability requirements, risk assessment, laboratory coordination, and surveillance of food products (11, 23, 30). These responsibilities position the SFDA as the lead authority for ensuring food safety from production to consumption and coordinating regulatory actions when foodborne hazards are identified.

Policy documents from the Ministry of Environment, Water and Agriculture establish surveillance systems for animal diseases, risk assessment, outbreak preparedness, environmental monitoring, emergency response, and reporting of transboundary diseases. Veterinary surveillance includes continuous monitoring of animal diseases, environmental hazards affecting livestock, laboratory investigations, emergency preparedness, and communication with international organisations where required (12, 25, 26). Similarly, agricultural guidance extends surveillance upstream into primary food production. National guidance promotes good agricultural practices, systematic sampling of agricultural products, monitoring of microbiological, chemical and physical hazards, traceability systems, cleaning and sanitation procedures, documentation requirements, and standardized sampling throughout the production chain (26). These measures strengthen preventive surveillance before food reaches consumers and contribute to risk reduction across the food supply chain.

The review also identified comprehensive regulatory mechanisms supporting food chain investigations. Guidance from municipalities links epidemiological investigations with environmental inspections, laboratory evidence, inspection findings, and enforcement actions, including closure of food establishments and application of sanctions according to standardized investigation procedures (13, 24). Together, the SFDA, municipalities, the Ministry of Health, and the Ministry of Environment, Water and Agriculture form the principal agencies involved in foodborne disease prevention, food safety surveillance, and outbreak

response, each contributing complementary responsibilities across the food chain. This demonstrates strong integration between surveillance findings and regulatory response once outbreaks have been detected.

However, despite these extensive sector-specific systems, the country self-assessment indicated that integrated food chain surveillance remains only partially developed. Public health, veterinary, agricultural, municipal, and food regulatory agencies continue to operate largely independent surveillance systems designed for sector-specific purposes. Routine sharing of surveillance datasets, integrated databases, automated exchange of laboratory information, joint epidemiological analyses, and formal source attribution activities remain limited (10–12, 24). Consequently, surveillance activities are coordinated during outbreak response but are less integrated during routine surveillance and prevention.

Overall, the documentary evidence suggests that Saudi Arabia possesses strong legislative, technical, and institutional capacity across individual sectors of the food chain. The remaining challenge is not the absence of surveillance capacity but the limited interoperability between systems and the need for stronger governance mechanisms that support routine multisectoral data sharing, joint risk assessment, integrated analytics, and fully operational One Health surveillance across the entire food chain.

Discussion

This analysis indicates that Saudi Arabia has developed substantial formal capacity for foodborne disease surveillance and response but has not yet achieved routine integration across the food chain. The reviewed policies describe established notification pathways, outbreak-investigation protocols, institutional responsibilities, and food-sector controls. At the same time, laboratory capacity, subnational implementation, interoperability, and multisectoral use of surveillance data remain uneven. This pattern reflects strong foundational capacity alongside incomplete system integration under the WHO framework (5). Read against the three stages of the self-assessment tool, national readiness is therefore uneven rather than uniformly weak: most stage-one requirements are addressed in policy, stage-two requirements are met in principle but delivered unevenly across regions, and stage-three requirements have been initiated but not consolidated. The distinction that matters for policy is between documented capacity, which a document-based assessment can demonstrate, and functional capability, which it cannot.

That distinction is central to interpreting these findings. Policy documents are instruments of intent: they assign mandates, define procedures, and set timelines, but they cannot demonstrate that notifications are submitted within the stated windows, that specimens are collected and transported as specified, or that final outbreak reports are completed, analysed, and acted upon. Legal and procedural completeness can coexist with limited operational performance, and the WHO tool is designed to prompt that reflection rather than to certify compliance (5). The value of a document-based assessment is consequently diagnostic: it shows where the architecture is complete, where it is silent, and which silences are consequential. In this analysis the silences clustered in three areas routine cross-sector data exchange, decentralised laboratory characterisation, and formal source attribution each of which corresponds to a stage-three capability under the WHO framework. These findings extend earlier analyses describing Saudi food-safety governance as multiagency and fragmented (15, 16). The present review suggests that fragmentation persists less because responsibilities are absent than because sector-specific information systems and performance-management arrangements are not routinely connected. Coordination appears strongest after an outbreak is recognised, when existing mandates trigger joint action, and weakest during routine prevention, cross-sector analysis, and source attribution. The existence of policies and protocols therefore demonstrates formal readiness, but not necessarily consistent implementation or operational effectiveness. These observations are also broadly consistent with the 2017 Joint External Evaluation of Saudi Arabia's International Health Regulations core capacities, which described a functioning national food safety system with a clear division of responsibility between the Ministry of Health for acute foodborne events and the Saudi Food and Drug Authority for routine food safety risk management (31). What the present analysis adds, almost a decade later, is evidence that the policy base has expanded substantially in the interval particularly in the standardisation of outbreak investigation, the obligations placed on food businesses, and agricultural and veterinary oversight while the binding constraint has shifted from clarity of mandate to interoperability between systems.

The immediate policy priority is to translate existing sectoral strengths into a shared operating model. A formal multisectoral governance mechanism could define data ownership, a minimum common dataset, shared case and event definitions, exchange standards, and timelines for routine and emergency information sharing among health, food-regulatory, municipal, agricultural, veterinary, and laboratory authorities. Joint risk assessment and regular cross-sector performance review would support earlier identification of emerging hazards and clearer feedback to regional services. Laboratory preparedness could be strengthened by clarifying referral pathways and turnaround-time targets, maintaining surge capacity, and expanding regionally appropriate testing where feasible. Event-based surveillance could also be broadened through training and accessible reporting pathways for non-health actors.

The European experience illustrates what makes such integration durable, not as a template to be copied but as a demonstration of the mechanisms involved. Member States operate under a legal obligation to collect comparable data on zoonoses, zoonotic agents, and foodborne outbreaks, to submit them annually against a common data model, and to have them analysed jointly by the food safety and public health agencies in a single published One Health report (32). Three features of that arrangement are transferable. Integration is mandated rather than voluntary; it rests on harmonised definitions and a shared reporting format rather than on ad hoc data requests; and it generates a recurring joint analytical product that gives every contributing agency a visible return on the effort of supplying data. Saudi Arabia already holds the constituent datasets across the Ministry of Health, the Public Health Authority, the Saudi Food and Drug Authority, the Ministry of Environment, Water and Agriculture, and municipal authorities. A national annual One Health foodborne disease report, jointly authored and based on an agreed minimum dataset, would be a concrete and comparatively inexpensive mechanism for converting existing sectoral capacity into integrated surveillance, and would create the standing forum in which shared case definitions, exchange standards, and data-governance rules could be negotiated and maintained.

Laboratory capacity warrants particular emphasis because laboratory characterisation is the pivot on which the remaining stage-two and stage-three capabilities turn. Concentrating confirmatory testing botulinum toxin detection, Salmonella and Shigella serotyping, and comparable specialised assays

within a single national reference laboratory is a defensible and widely used design, but it makes turnaround dependent on specimen transport and creates a single point of failure during large or geographically dispersed events. Two complementary responses are available. The first is to define a tiered laboratory network explicitly in policy, in which regional laboratories retain responsibility for isolation, preliminary identification, and antimicrobial susceptibility testing, with mandatory referral of isolates rather than only of specimens, supported by published turnaround-time targets, reliable transport arrangements, and defined surge provisions. The second is to develop national capacity for genomic characterisation of foodborne pathogens. PulseNet International has set out a vision for standardised whole-genome sequencing, using whole-genome multilocus sequence typing, as the basis for real-time foodborne disease surveillance in place of pulsed-field gel electrophoresis and multilocus variable-number tandem repeat analysis (33). Sequencing does more than improve subtyping resolution: it places human, food, animal, and environmental isolates within a single comparison framework and simultaneously yields antimicrobial resistance determinants and virulence markers. For a country that imports the majority of its food, the capacity to compare national isolates against international databases is of particular strategic value, because it allows domestic clusters to be recognised as part of multinational events and contaminated commodities to be identified before the domestic burden accumulates.

The absence of formal source attribution is a related and consequential gap, because attribution is what converts surveillance output into preventive policy. Without it, control measures remain largely reactive, and the relative contribution of particular commodities, production stages, or supply routes to the national foodborne disease burden is unknown, which makes risk-based targeting of inspection, sampling, and import control difficult either to justify or to evaluate. Established approaches include microbiological subtyping combined with integrated surveillance, systematic analysis of outbreak investigation data, comparative exposure assessment, meta-analysis of case-control studies, and structured expert elicitation, the last of which WHO adopted precisely because it remains feasible where routine surveillance and sampling data are sparse (34). A pragmatic sequence for Saudi Arabia would begin with secondary analysis of the outbreak investigation reports already generated under existing national guidance a dataset that is created but, on the evidence reviewed here, not analysed in aggregate supplemented by structured expert elicitation, and would move towards subtyping-based attribution as genomic capacity develops. Given the reliance on imported food, attribution should distinguish domestic from imported sources so that regulatory effort can be directed accordingly (8, 15).

Broadening event-based surveillance beyond the formal health sector also merits attention. The reviewed documents provided no evidence of structured engagement with non-health actors, yet the earliest signals of a foodborne event frequently arise in catering establishments, schools, workplaces, and residential facilities, and increasingly in consumer complaints and social media traffic. Practical measures include accessible and clearly publicised reporting channels for consumers and food handlers, defined triage and verification procedures for informal signals, and short awareness modules for community and municipal actors specifying what to report and to whom. This capability is not merely desirable in the Saudi context. The annual Hajj and Umrah gatherings concentrate very large numbers of people, shared catering, and rapid population turnover within a confined area and period, so that detection delays translate quickly into geographically dispersed international exposure and demand a sensitivity that facility-based notification alone is unlikely to provide (9).

Sustaining these changes depends on workforce and evaluation arrangements that span sectors. Joint outbreak simulation exercises and structured after-action reviews are comparatively inexpensive and have the useful property of exposing interoperability failures incompatible case definitions, unclear escalation thresholds, delays in laboratory referral under controlled conditions rather than during a live event, while building the working relationships on which cross-agency action depends. Evaluation should likewise become multisectoral. A small set of jointly owned indicators, such as the interval from first case to notification, the proportion of reported outbreaks with laboratory confirmation, the proportion with an identified food vehicle, laboratory turnaround time by tier, and the proportion of investigations completed within the stated timelines, would allow performance to be compared across agencies and regions and would supply the structured feedback to regional health clusters that the reviewed documents did not consistently describe.

Sequencing of these measures matters for feasibility. In the short term the most tractable actions are administrative rather than technical: establishing a standing multisectoral coordination mechanism with a defined secretariat and meeting cycle, agreeing shared case and event definitions and a minimum common dataset, publishing laboratory referral pathways and turnaround-time targets, and commissioning a first joint annual report from data that already exist. Over the medium term, attention would shift to interoperability in the technical sense agreed exchange standards, automated transfer of laboratory results into the national surveillance platform, and decentralised confirmatory testing within regional laboratories alongside the introduction of routine sequencing at reference level and the first national attribution estimates. Longer-term objectives include fully integrated food chain surveillance with routine joint analysis, source attribution embedded within risk-based regulatory planning, and periodic re-assessment against the WHO framework to document progression between stages.

To our knowledge, this is the first systematic application of the WHO country self-assessment tool to foodborne disease surveillance and response in Saudi Arabia. The analysis draws on a document base spanning five national authorities and includes Arabic-language legislation, regulations, guidelines, and circulars that are not readily accessible in the international literature, and triangulation against the self-assessment completed by national experts allowed formal provisions to be examined alongside practitioner judgement, with reporting guided by the SRQR (17). The findings are also likely to have relevance beyond Saudi Arabia. Several countries in the Gulf and the wider Eastern Mediterranean Region share the defining features of this system substantial dependence on imported food, multiple sectoral authorities with well-specified individual mandates, rapidly modernising regulatory frameworks, and centralised reference laboratory capacity and may face the same transition from coordinated outbreak response to routine integrated surveillance. The approach applied here is reproducible and could support comparable national assessments and, in time, regional benchmarking.

Limitations

Policy documents describe intended roles and procedures and cannot establish implementation fidelity or system performance; absence of information in the reviewed documents is not evidence that a capacity is absent. Relevant internal or superseded documents may not have been accessible, and the evolving policy landscape limits the durability of this cross-sectional assessment. Expert responses may be affected by selection and social-desirability bias,

and the study did not analyse routine surveillance, laboratory-turnaround, or outbreak-outcome data. Future evaluation should compare these policy-level findings with subnational practice and performance measures.

Conclusion

Saudi Arabia has established important legal, surveillance, investigation, and regulatory foundations for foodborne disease control. National readiness is nevertheless limited by uneven regional laboratory capacity and incomplete integration of sectoral information systems and governance. Interoperable data-sharing arrangements, joint performance review, stronger laboratory referral and regional capacity, and more inclusive event-based surveillance would support progression from coordinated outbreak response to routine integrated One Health surveillance. These conclusions should be validated using implementation and outcome data.

Declarations

Ethics approval and consent to participate:

Ethics approval was not required, as the data used in this study were obtained from publicly available documents.

Competing interests:

The authors declare that they have no competing interests.

Funding:

Not applicable

Author Contribution

AA and YS were involved in the study methodology, data analysis, interpretation of the results, and writing of the Methods, Results, and Discussion sections. The other authors contributed to writing the Introduction, critically reviewing and revising the manuscript, and validating the results. All authors reviewed and approved the final version of the manuscript.

Data Availability

The policy documents are available from the cited sources; the completed country self-assessment is provided as Appendix 1.

References

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Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Appendix1Final.docx
- Appendix2SRQRcompleted.docx