

# Evaluation of Surveillance and Response Systems of Foodborne Diseases and Outbreaks at Regional Level In Riyadh City-Saudi Arabia, 2015

Jaber Sharaheeli<sup>1</sup>, Bader Alibrahim<sup>1\*</sup>, Eman Elsayed Abd-Ellatif<sup>2</sup>

<sup>1</sup>Field Epidemiology Training Program, Ministry of Health, Saudi Arabia

<sup>2</sup>Department of Public Health and community medicine, Faculty of Medicine, Mansoura University

\*Corresponding Author: Bader Alibrahim, Field Epidemiology Training Program, Ministry of Health, Saudi Arabia.

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## Abstract

**Background:** Foodborne illnesses are major international health concerns, affecting millions of people each year and significantly negatively impacting economic growth. As a result, food safety has emerged as a critical global concern for consumers, governments, and industry. Through their enforcement officers, food safety organizations play an essential role in reducing foodborne illness.

**Objective:** To assess the capacity of surveillance and response systems of FBDs and FBDOs at the regional level in Riyadh city.

**Methodology:** Cross-sectional study was conducted at the regional level in Riyadh city. The questionnaire of the WHO model for surveillance was modified and filled from the regional level.

**Results:** At the regional level, 50 % said there is a national manual for surveillance and response systems of single FBDs, and 75 % said that there is for FBDOs too. 75 % reported that there is a capacity for case confirmation. There is a surveillance register for FBDOs. All FBDOs were investigated.

**Conclusion:** The communicable diseases directorate has a manual for single FBDs.

The food safety program needed a comprehensive national surveillance manual or priority list for FBDOs. This will have an impact on case detection and confirmation. However, the communicable diseases directorate had a manual for single FBDs and outbreaks of listed organisms. Data analysis and interpretation and epidemic preparedness, response, and control were all satisfactory. Feedback (distribution) needed to be improved. Underreporting is displayed.

## Introduction

Foodborne diseases (FBD) are a global public health issue that significantly impacts human health, livelihoods, healthcare systems, and international trade through national control strategies such as implementing food laws and regulations. FBD is a growing problem due to constant changes in global food trade dynamics, food consumption behaviors, food production environment and processes, and the emergence and re-emergence of foodborne pathogens and chemical contaminants entering the food chain [1].

Approximately 600 million cases of food poisoning are reported yearly, implying that one person in every ten is affected, with a mortality rate of up to 420,000 cases. Furthermore, children as young as 5 years old are vulnerable to food poisoning, with a foodborne disease burden of up to 40% and a mortality rate of 125,000 cases of child food poisoning each year [2].

Foodborne illness investigation and surveillance are critical for understanding and preventing them. Surveillance is the first step in the public health prevention cycle. It can identify at-risk populations, identify areas that need further investigation, and evaluate the

effectiveness of preventive measures. As a result of the surveillance activities, the community can be assured of improved prevention strategies and a safer food supply [3].

A well-established surveillance system aids in monitoring trends in foodborne illness at the national, state-provincial, and local levels. Because foodborne diseases can vary significantly by region, it is critical to analyze surveillance data with regional issues in mind [4]. The findings of foodborne illness surveillance analysis provide helpful information on the regional burden of disease, causative agents, and food types, which can aid in controlling and preventing foodborne illnesses at the regional level. Furthermore, foodborne illness outbreak investigations are critical in the prevention of future outbreaks [5].

According to the Saudi Ministry of Health's (MOH) 2020 annual statistics book, there were 1270 cases of foodborne disease in 2020, with an incidence rate of 2.34 and 134 food poisoning outbreaks across Saudi Arabia. There were 199 cases of foodborne illness in Riyadh in 2020, with 22 food poisoning outbreaks [6].

In Saudi Arabia, several government and non-governmental organizations are in charge of ensuring domestic and imported food safety. The Ministries of Health (MOH), Commerce & Industry, Municipal and Rural Affairs (MMRA), and Agriculture are among the governmental departments. At the same time, non-governmental organizations include the Saudi Society of Food and Nutrition, the Consumer Protection Association, and the National Standing Advisory Committee on Food Irradiation. These bodies had issued many regulations, guidelines, and administrative circulars, which needed to be clarified for food law enforcers and made effective enforcement difficult. As a result, ineffective management has resulted in limited official communication, overlapping duties, and a lack of coordination mechanisms among organizations, all of which have resulted in poor engagement with citizens and food businesses [7].

The Saudi Food and Drug Authority (SFDA) was established on January 1, 2003, by Council of Ministers resolution no [1], as an independent body reporting directly to the Prime Minister. The SFDA regulates, supervises, and controls food, drugs, and medical devices, as well as establishes mandatory standard specifications, whether imported or manufactured locally. Control and testing activities can be carried out at the laboratories of the SFDA or any other agency. The SFDA has been evolving as a new central agency to improve coordination and ensure the safety and quality of domestic and imported food. [8].

Traditionally, the MOH has regulated foodborne disease outbreaks at both the administrative and field levels, educated society about food safety issues, and trained those investigating foodborne disease outbreaks to recommend appropriate sanctions following Saudi law [7]. The Ministry of Municipality and Rural Affairs, which has a more legislative and enforcement role in food safety, has some overlap. It plays an essential role in establishing food legislation (health conditions), regulating food and health inspection, commercial adulteration control, slaughterhouse supervision, responding to foodborne disease outbreaks, conducting food and water sampling, and registering food and health premises. Members of the Tripartite Committee on Food Poisoning Outbreaks come from the Ministries of the Interior, Health, and Municipalities. Members' work begins during an outbreak of "food poisoning" linked to two or more patients exhibiting similar symptoms after consuming the same food from the same source, where investigations point to food as the source of the disease. The Committee now includes the SFDA and seeks a coordinated approach across the various agencies, though the MOH is the primary reporting line. However, the Committee's structure means there still needs to be more analysis, interpretation, and

recommendations from the outbreak investigations that could be used to prevent future illnesses [9].

The Saudi Ministry of Health created a guideline manual for communicable disease surveillance and prevention. This manual contains laboratory-confirmed FBDs. Typhoid and paratyphoid fevers (enteric fevers), salmonellosis, shigellosis, amoebiasis, and hepatitis A and E are among the FBDs. They must be reported to the communicable diseases coordinator. Even if there are no outbreaks of these diseases, infection control or public health personnel must notify the coordinator if the notification is laboratory-based. These FBDs are reported within 48 hours from the service level to the regional level and within one month from the regional level to the mid-level.

The MOH's Communicable Diseases Directorate is sharing data with WHO. This manual must mention the food safety program or its coordination [10,11]. Because the MOH is the only surveillance system in the country, it may need more staff for food safety specialists, if any exist. Furthermore, there currently needs to be more laboratories accredited for food safety-related analysis and services in Saudi Arabia. This, combined with a lack of funding for food safety research, has resulted in inadequate knowledge and a lack of published data to estimate the burden of all foodborne diseases in Saudi Arabia. As a result, data on foodborne disease incidence in Saudi Arabia needs to be more stated. The need for medical attention for a foodborne disease is determined by the severity of the disease as well as the availability of transportation and a relative companion. Furthermore, patients who go to private hospitals may go undiagnosed and unreported to the MOH [10].

The rationale of the study:-

No studies have been conducted before to evaluate the surveillance and response systems of FBDs and FBDOs at the regional level in KSA, emphasizing the performance indicators.

### **Objectives:**

#### **General objective:**

To assess the capacity of surveillance and response systems of FBDs and FBDOs in Riyadh city at the regional level.

#### **Specific objectives:**

- 1- To utilize the WHO standardized tools to evaluate the current FBDs and FBDOs surveillance and response systems in Riyadh city [12].
- 2- To identify weaknesses (absence of core and support functions) in surveillance and response systems of FBDs and FBDOs in Riyadh city.
- 3- To recommend strategies to strengthen the capacity of surveillance and response systems of FBDs and FBDOs in Riyadh city based on the assessment findings.

## **Methodology:**

### **Study design:**

A cross-sectional study.

### **Study setting:**

The study was conducted in Riyadh city. Riyadh is the capital of KSA, with about six million people living in it.

The study was conducted at the Regional (district or intermediate) level represented by the food safety program in the General directorate of health affairs in Riyadh region.

### **Study population:**

The population distribution was four doctors at the regional level.

### **Sample calculation:**

The study covered all populations after applying inclusion and exclusion criteria. No statistical tests were needed to calculate sample size (n) because of the small number available.

### **Inclusion Criteria:**

The investigator interviewed the person who works a food safety program in the General directorate of health affairs in the Riyadh region for at least six months and above. Language, gender, and nationality were not barriers in the study.

### **Exclusion Criteria:**

Anyone working under six months was not included because he may have received formal training regarding food safety surveillance.

### **Data collection:**

Self-administered questionnaires and observational lists are the techniques to collect data. The principal investigator explained the questions to the participants when needed. The questionnaires were administered in English. These tools are based on the protocol for the Assessment of National Communicable Disease Surveillance and Response Systems, which was developed for WHO. The WHO recommended the protocol to help the national teams evaluate surveillance and response systems for communicable diseases, including FBDs [12]. The WHO designed three levels of generic questionnaires; central, district (intermediate), and health facility (service) levels. The questionnaires and observational lists are modified according to the local setting in systems used in Saudi Arabia to be suitable for food safety because they are designed for all communicable diseases; therefore, some elements do not apply to food safety, such as no weekly report in food safety.

The performance indicators and metrics used in the tools are suitable for food safety programs in Saudi Arabia. These indicators are selected based on their importance and feasibility of implementation. They include metrics for epidemiology, laboratory, and environmental health. Metrics are measurements used to estimate performance indicators. For example, if the objective is FBDO detection, one of the performance indicators regarding this objective is the reported cases. Two metrics used in this study are completeness, i.e., the percentage of subjects with complete data, and timeliness, i.e.,

on-time reporting. The district (intermediate) level is labeled as a regional level to assess the food safety program in the health directorate in Riyadh.

Each tool will focus on the program functions, both core and support functions. The core functions of the surveillance systems are case detection, case registration, case confirmation, reporting, data analysis and interpretation, epidemic preparedness, response and control, and feedback.

The supporting functions of the surveillance systems are standards and guidelines, training, supervision, communication facilities, resources, monitoring and evaluation, and coordination [13].

The principal investigator collected the data to ensure reliability and validity.

### **Pilot study:**

At the central level, the questionnaire was administered to a staff member who worked for a long time in the Food safety program at the ministry of health.

The pilot study aimed to test the questionnaires and reveal any ambiguities in the study tools. The questionnaires were reviewed and modified according to the findings of a pilot study. It was noticed from the pilot study that there were minor notes at a central level. This can be attributed to their experience working in food safety programs. Regarding notification or reporting of FBDs or FBDOs, no fixed system. It depends on the possibility and the availability of staff at the time. Sometimes physicians and sometimes nurses or other staff report the event. The role of infection control departments is the registration of cases. Some questions could be more understandable (e.g., questions about the standard manual of FBDs), and some could be more applicable (e.g., investigation of FBDOs and analysis). Hence significant changes were made to the service level questionnaire.

### **Analysis plan:**

Epi-Info software (version 3.5.4) from CDC was used for data entry and analysis. The data were analyzed to respond to the objectives of the study. The frequency of different descriptive variables, such as the availability forms, priority list of FBDs and standard case definition, etc. were estimated to know their percentages to find out the gaps and the opportunities in our surveillance and response systems of FBDs and FBDOs.

The answer options are "yes" and "no" (no answer comprises both no and do not know). In reporting time, "yes" is equal to "immediate," while "no" is equivalent to "do not know and 24 hours".

The frequencies, chi-square, and p-values were calculated for each indicator among the outcome.

### **Ethical concerns:**

1- Ethical approval was taken from the Institutional Review Board (IRB) in the General Directorate of Research and Study in the



- ministry of health (RS-MOH). The administrative approval was taken from the MOH authorities.
- 2- The informed consent was explicit and indicated the purpose of the study and was taken from health authorities and the participants at the central level.
- 3- No incentives or rewards were given to the participants.
- 4- There are no conflicts of interest.

- 5- Participants' anonymity and autonomy were respected, and the principal investigator was only responsible for the content, and the participants were not included in the report.
- 6- The purpose of collecting information is the improvement of surveillance of FBDs through scientific recommendations.

**Budget:**

The authors received no financial support for this article's research, authorship, or publication.

**Results**

Food safety program in Riyadh region responsible for FBDOs in the area. There is a program coordinator. The coordinator's duty is the surveillance of FBDOs, and he supervises FBDO's investigation. There are 7 on-call teams. These teams are from directorates and sectors, including the coordinator. Each unit has one doctor. An on-call team conducts the FBDO investigation under the direct supervision of the coordinator. All doctors are non-Saudi. 4 doctors, including the coordinator, cooperated and filled out the questionnaires. Two of them from the directorate and 2 from sectors. 3 doctors from the sectors still need to complete the questionnaires,

although they agreed to participate. Despite continuous contact with the principal investigator, they finished when the result was written.

**Indicator; availability of national surveillance manual:**

Two subjects (50 %) said that there is a national manual for surveillance and response systems of single FBDOs, while 2 (50 %) said "no."

Three subjects (75 %) said that there is a national manual for surveillance and response systems of FBDOs, while 1 (25 %) said: "do not know." (Table 1)

**Table 1:** Study participants response to availability of national surveillance manual at the regional level. (N=4)

| Indicator: availability of national surveillance manual                              | Response    | Frequency | Percentage % |
|--|-------------|-----------|--------------|
| Presence of a national manual for surveillance and response systems of single FBDOs. | Yes         | 2         | 50           |
|  | No          | 2         | 50           |
| Presence of a national manual for surveillance and response systems of FBDOs.        | Yes         | 3         | 75           |
|  | Do not know | 1         | 25           |

**Case confirmation indicator:**

3 doctors (75 %) reported that there is a capacity to transport specimens to a higher-level laboratory, while 1 (25 %) said "no."

3 doctors (75 %) reported that there are guidelines for specimen collection, handling, and transportation to the next level, while 1 (25 %) said "no." (Table 2)

**Table 2:** Study participants response to case confirmation at the regional level. (N=4)

| Indicator: case confirmation   | Response | Frequency | Percentage % |
|--|----------|-----------|--------------|
| Presence of the capacity to transport specimens to a higher level lab.                         | Yes      | 3         | 75           |
|  | No       | 1         | 25           |
| Presence of guidelines for specimen collection, handling and transportation to the next level. | Yes      | 3         | 75           |
|  | No       | 1         | 25           |

**Registration indicator:**

2 participants (50 %) admitted that there is a surveillance register for single FBDOs, while 2 (50 %) admitted "no." 1 participant admitted

that the type of register is electronic only, but 1 admitted that there are manual and electronic registers.

All participants (100 %) admitted that there is a surveillance register for FBDOs. 2 participants recognized that the type of register is electronic only, but 2 admitted that there are both manual and

electronic registers. 2 participants (50%) mentioned that there is a log for single FBDs, while 1 (25 %) mentioned, “do not know.” (Table 3)

**Table 3:** Study participants response to registration at the regional level. (N=4)

| Indicator: registration                                   | Response        | Frequency | Percentage % |
|---|-----------------|-----------|--------------|
| Presence of surveillance register for single FBDs.        | Yes             | 2         | 50           |
|   | No              | 2         | 50           |
| Type of register for single FBDs.                         | Electronic only | 1         | 50           |
|   | Both            | 1         | 50           |
| Presence of surveillance register for FBDOs.              | Yes             | 4         | 100          |
| Type of register for FBDOs.                               | Electronic only | 2         | 50           |
|   | Both            | 2         | 50           |
| Presence of surveillance Log or database for single FBDs. | Log only        | 2         | 50           |
|   | Both            | 1         | 25           |
|   | Do not know     | 1         | 25           |

**Data reporting indicator:**

Two doctors (50 %) admitted that there was no shortage in the surveillance forms for FBDOs during the past six months, while 2 (50 %) admitted: “do not know.”

All doctors 4 (100 %) admitted that there was a report from the region to the ministry by telephone, as reported by 2 of them (50 %), by fax, and by Email, as written by all of them (100 %).

3 doctors (75 %) admitted that only FBDOs are reported to the ministry, while 1(25 %) admitted that both FBDOs and single FBDs are reported.

2 doctors (50 %) admitted that there are 24-hour reporting times to the ministry of new FBDOs and monthly reports for all FBDOs during

the month, while 1(25 %) admitted that only monthly reporting presents for both single FBDs and FBDOs. One participant (25 %) needs to learn the reporting time.

2 doctors (50 %) admitted that the number of monthly reports to the ministry in the last year was 12 (100 %) compared to the expected number, and all reports 12 (100 %) were on time, while 1 (25 %) admitted that only 7 (58.3 %) reports sent to the ministry and 5 of them (71.4 %) reports were on time. 1 (25 %) admitted, “do not know.” (Table 4)

**Table 4:** Study participants response to data reporting at the regional level. (N=4)

| Indicator: data reporting  | Response    | Frequency | Percentage % |
|--|-------------|-----------|--------------|
| Presence of deficiency* of appropriate surveillance forms recommended by MoH for FBDOs at any time during the last 6 months. | No          | 2         | 50           |
|  | Do not know | 2         | 50           |
| Presence of the reporting to ministry.   | Yes         | 4         | 100          |
| How to report to the ministry.   | Telephone   | 2         | 50           |
|  | Fax         | 4         | 100          |
|  | Email       | 4         | 100          |
| The events to report.  | FBDOs only  | 3         | 75           |
|  | Both        | 1         | 25           |
| The deadlines for reporting FBDOs to the ministry.**   | 24-hours    | 2         | 50           |
|  | One month   | 3         | 75           |
|  | Do not know | 1         | 25           |
| The deadlines for reporting FBDs to the  | One month   | 1         | 25           |

|   |              |   |    |
|---|--------------|---|----|
| ministry.**   |              |   |    |
| Number of monthly reports in the last year compared to expected number from region to MoH.***         | 12/12 (100%) | 2 | 50 |
|   | 7/12 (58.3%) | 1 | 25 |
|   | Do not know  | 1 | 25 |
| Number of monthly reports on time in the last year compared to expected number from region to MoH.*** | 12/12 (100%) | 2 | 50 |
|   | 5/7 (71.4%)  | 1 | 25 |
|   | Do not know  | 1 | 25 |

\* Presence of deficiency of forms means not available.

\*\*2 participants said there is reporting for new FBDOs within 24 hours, and there is a monthly reporting by all outbreaks in that month. One said reporting of new FBDOs and FBDs is within one month.

\*\*\* 2 participants admitted that the number of monthly reports and the on-time messages sent to MoH is 12/12. 1 participant accepted only 7 reports sent, and 5 were on time.

**Data analysis indicator:**

3 participants (75 %) reported that there is an analysis of FBDOs data by a person (gender and age), by time, by place, and by trends of FBDOs, but 1 (25 %) participant reported “do not know” for all the 4 variables.

For analysis of FBDOs data by causes, by vehicles, and by contributing factors, 1 (25 %) reported that there is an analysis for these 3 variables, 2 (50 %) said “no,” and 1 (25 %) wrote, “do not know.” (Table 5)

**Table 5:** Study participants response to data analysis at the regional level. (N=4)

| Indicator: data analysis  | Response    | Frequency | Percentage % |
|---|-------------|-----------|--------------|
| Presence of data analysis for FBDOs by person (age and gender). | Yes         | 3         | 75           |
|   | Do not know | 1         | 25           |
| Presence of data analysis for FBDOs by time.                    | Yes         | 3         | 75           |
|   | Do not know | 1         | 25           |
| Presence of data analysis for FBDOs by place.                   | Yes         | 3         | 75           |
|   | Do not know | 1         | 25           |
| Presence of data analysis for causes of FBDOs.                  | Yes         | 1         | 25           |
|   | No          | 2         | 50           |
|   | Do not know | 1         | 25           |
| Presence of data analysis for vehicles of FBDOs.                | Yes         | 1         | 25           |
|   | No          | 2         | 50           |
|   | Do not know | 1         | 25           |
| Presence of data analysis for contributing factors of FBDOs.    | Yes         | 1         | 25           |
|   | No          | 2         | 50           |
|   | Do not know | 1         | 25           |
| Presence of data analysis for the trends FBDOs.                 | Yes         | 3         | 75           |
|   | Do not know | 1         | 25           |

**FBDO investigation indicator:**

2 participants in the directorate (50 %) only gave a response and reported that the number of FBDOs in the last year was 51. All of them (100 %) were investigated, and the findings were used for action among all of them.

Among all the FBDOs in the last year, the risk factors and causative agents were identified in 3 (6 %) of them. (Table 6)

**Table 6:** Study participants response to FBDO investigation at the regional level. (N=4)

| Indicator: FBDO investigation   | Response  | Frequency | Percentage % |
|---|-----------|-----------|--------------|
| Number of FBDOs in the past year.*  | 51        | 2         | 50           |
| Of those FBDOs in the past year, percent investigated.*   | 51 (100%) | 2         | 50           |
| Of the investigated FBDOs in the past year, percent in which the risk factors were identified.    | 3 (6%)    | 2         | 50           |
| Of the investigated FBDOs in the past year, percent in which the causative agents were confirmed. | 3 (6%)    | 2         | 50           |
| Of the investigated outbreaks in the past year, percent in which findings were used for action.   | 51 (100%) | 2         | 50           |

\*2 subjects only gave answers. They said 51 outbreaks etc. The others may need clarification about the numbers.

### FBDO preparedness and response indicator:

3 members (75 %) mentioned that there is a written plan for FBDO preparedness and response, while 1 (25 %) cited “do not know.”

3 members (75 %) mentioned that there are no emergency stocks of drugs (e.g., antitoxins of C.botulism, vaccines (e.g., hepatitis A), and supplies at all times in the past 1 year, while 1 (25 %) mentioned “do not know.”

3 members (75 %) mentioned that there is a standard case management protocol for FBDOs, while 1 (25 %) cited “do not know.”

2 members (50 %) mentioned that there is no budget line or access to funds for FBDO response, while 2 (50 %) cited “do not know.”

2 members (50 %) mentioned that there are indicators like the number of FBDOs as a region priority to take emergency action, while 2 (50

%) cited “do not know.” 3 members (75 %) mentioned that there is rapid communication and coordination with the quartet (FBDO committee) during FBDOs, while 1 (25 %) cited “do not know.”

3 members (75 %) mentioned that they know all quartet members in the region, while 1 (25 %) mentioned “no.”

2 members (50 %) mentioned that the quartet implements preventive and control measures, while 1 (25 %) cited “do not know” and 1 (25 %) mentioned “no.”

3 members (75 %) mentioned that the quartet did not hold meetings the past year to evaluate their outbreak preparedness, while 1 (25 %) cited “do not know.” (Table 7)

**Table 7:** Study participants response to FBDO preparedness and response at the regional level. (N=4)

| Indicator: FBDO preparedness and response  | Response    | Frequency | Percentage % |
|--|-------------|-----------|--------------|
| Presence of a written plan of FBDO preparedness and response.  | Yes         | 3         | 75           |
|  | Do not know | 1         | 25           |
| Presence of emergency stocks of drugs (e.g. antitoxins of C.botulism, vaccines (e.g. hepatitis A), and supplies at all times in past 1 year. | No          | 3         | 75           |
|  | Do not know | 1         | 25           |
| Presence of a standard case management protocol for FBDOs.   | Yes         | 3         | 75           |
|  | Do not know | 1         | 25           |
| Presence of a budget line or access to funds for FBDO response.  | No          | 2         | 50           |
|  | Do not know | 2         | 50           |
| Presence of indicators like number of FBDOs as a region priority to take an emergency action.  | Yes         | 2         | 50           |
|  | Do not know | 2         | 50           |
| Presence of a rapid communication and coordination with quartet (FBDO committee) during FBDOs.   | Yes         | 3         | 75           |
|  | Do not know | 1         | 25           |

|  |             |   |    |
|--|-------------|---|----|
| Do you know all quartet members in the region?                               | Yes         | 3 | 75 |
|  | No          | 1 | 25 |
| Does quartet implement preventive and control measures?                      | Yes         | 2 | 50 |
|  | No          | 1 | 25 |
|  | Do not know | 1 | 25 |
| Did quartet hold meetings past year to evaluate their outbreak preparedness? | No          | 3 | 75 |
|  | Do not know | 1 | 25 |

**Feedback indicator:**

2 subjects (50 %) reported that 51 feedbacks were produced in the last year to the ministry and 2 received from it, while 1 issue (25 %) said

neither feedback was created nor received. 51 feedbacks were the outbreaks investigation reports. (Table 8)

**Table 8:** Study participants response to feedback at the regional level. (N=4)

| Indicator: feedback   | Response | Frequency | Percentage % |
|---|----------|-----------|--------------|
| Number of feedback written reports has the region produced in the last year.*       | 51       | 2         | 50           |
|   | 0        | 1         | 25           |
| Number of feedback reports has the region received in the last year from ministry.* | 2        | 2         | 50           |
|   | 0        | 1         | 25           |

\*3 subjects gave answers. 2 issues said 51 feedbacks were produced and 2 received, while 1 topic said 0.

**Supervision and training indicator:**

2 participants (50 %) admitted that the ministerial food safety program team did visits to the region in the past six months, while 2 (50 %) admitted: they “do not know.”

All participants (100 %) admitted that they had been trained in the surveillance and response systems of FBDOs.

2 participants (50 %) admitted that the regional food safety program team did visits to the lower levels (service levels, i.e., hospitals) in the past six months, while 1 (25 %) admitted “do not know” and 1 (25%) admitted “no.”

2 participants (50 %) admitted that they had trained the lower levels in surveillance and response systems of FBDOs, while 2 (50 %) admitted “no.” (Table 9)

**Table 9:** Study participants response to supervision and training at the regional level. (N=4)

| Indicator: supervision and training   | Response    | Frequency | Percentage % |
|---|-------------|-----------|--------------|
| The ministerial food safety program team visits to the region in the past 6 months. | Yes         | 2         | 50           |
|   | Do not know | 2         | 50           |
| The regional team visits to the lower levels in the past 6 months.                  | Yes         | 2         | 50           |
|   | No          | 1         | 25           |
|   | Do not know | 1         | 25           |
| Have you been trained in surveillance and response systems of FBDOs?                | Yes         | 4         | 100          |
| Have you trained the lower levels in surveillance and response systems of FBDOs?    | Yes         | 2         | 50           |
|   | No          | 2         | 50           |

**Resources indicator:**

For data management resources in the regional food safety program, there are computers, as reported by 3 subjects (75 %), printers,

photocopiers, and statistical packages, as reported by 2 subjects (50 %).



The program also has communication resources; telephone, as reported by 3 subjects (75 %), fax, and Email, as reported by 2 subjects (50 %).

For transportation, the program has a car, as reported by 3 subjects (75 %), while 1(25 %) said “no.”

The staff is not enough to cover the program duties as reported by 2 subjects (50 %), while 1 (25 %) said “no” and 1 (25 %) wrote, “do not know.” (Table 10)

**Table 10:** Study participants response to resources available at the regional level. (N=4)

| Indicator: resources  | Response            | Frequency | Percentage % |
|---|---------------------|-----------|--------------|
| The data management resources in the regional food safety program.  | Computer            | 3         | 75           |
|   | Printer             | 2         | 50           |
|   | Photocopier         | 2         | 50           |
|   | Statistical package | 2         | 50           |
| The communication resources in the regional food safety program.  | Telephone           | 3         | 75           |
|   | Fax                 | 2         | 50           |
|   | e.mail              | 2         | 50           |
| The availability of car to go to the outbreak places in cases the regional team called for investigation. | Yes                 | 3         | 75           |
|   | No                  | 1         | 25           |
| The presence of enough staff* to cover different program duties.  | Yes                 | 2         | 50           |
|   | No                  | 1         | 25           |
|   | Do not know         | 1         | 25           |

\*Enough staff means the number that can cover the duties.

**Cooperation and coordination indicator:**

3 participants (75 %) admitted that there is a surveillance coordination body at a regional level, while 1 (25 %) admitted: “do not know.”

3 participants (75 %) were not satisfied with the surveillance system, while 1 (25 %) said: “do not know.” (Table 11)

**Table 11:** Study participants response to cooperation and coordination at the regional level. (N=4)

| Indicator: cooperation and coordination                              | Response    | Frequency | Percentage % |
|--|-------------|-----------|--------------|
| The presence of a surveillance co-ordination body at regional level. | Yes         | 3         | 75           |
|  | Do not know | 1         | 25           |
| The satisfaction with the surveillance system.                       | No          | 3         | 75           |
|  | Do not know | 1         | 25           |

**The observational list of the regional level:**

It is observed that some indicators are present at the regional level. There is a practical national manual for the surveillance and response systems of FBDOs—no priority list. There is a clear definition of FBDO. There is a systematic description of (line graph, maps, and tables) of FBDOs data by time, place, and person. A written FBDO preparedness and response plan is available but not standard FBDO

management protocol. No stocks of drugs, vaccines, and supplies are observed. The updated forms are present. There are manual and electronic registers for FBDOs. There is a folder acting as a logbook. Observed reports of FBDOs from region to MOH are there. No quartet reports. (Table 12)

**Table 12:** Observational list at the regional level.

|   |     |
|---|-----|
| Observed national surveillance manual for foodborne diseases and outbreaks.         | Yes |
| Observed national surveillance manual for foodborne diseases.                       | No  |
| Observed the existence of a manual and electronic registers for foodborne diseases. | No  |

|   |     |
|---|-----|
| Observed the existence of a manual and electronic registers for foodborne diseases outbreaks. | Yes |
| Observed the standard case definition for priority list of foodborne diseases.                | No  |
| Observed description of data by person (age and sex).   | Yes |
| Observed description of data by region (tables, maps).  | Yes |
| Observed description of data by time (line graph).  | Yes |
| Observed reports of investigated FBDO.  | Yes |
| Observed a written plan of epidemic preparedness and response.                                | Yes |
| Observed the adequacy of stocks of drugs, vaccines and supplies at time of assessment.        | Yes |
| Observed a surveillance log or database of FBDs.  | Yes |
| Observed updated forms of FBDOs investigation.  | Yes |
| Observed the presence of FBDOs reports from region to MOH.                                    | Yes |
| Observed minutes (or report) of meetings of FBDO management committee (Quartet).              | No  |

## Discussion

The food safety program developed its manuals demonstrating FBDO investigation. These manuals are created and distributed with the permission of MOH.

In the regional-level food safety program, 50 % of participants admitted that there is a national manual for surveillance and response systems of FBDs, and 75 % admitted that there is a national manual for management and response systems of FBDOs. The investigator only observed only FBDOs manual. The differences in answers can be explained as follow: There needs to be more information, or it may be because some are working in the sectors, not in the main office in the region, so covering both FBDs and FBDOs. The program is not responsible for single FBDs linked to the region's communicable disease department.

The manuals present in food safety programs need to be completed in national manuals, with no priority list. The national manual is like that in the communicable diseases directorate.

It is noticed that two arms are dealing with FBDs, the communicable disease directorate dealing with single FBDs, and the food safety program dealing with FBDOs. This division is at both central and regional levels. This impacts the reporting process and biostatistics of single FBDs and FBDOs. It is leading to underreporting and inaccurate biostatistics because of no actual coverage of FBDs and FBDOs and no coordination between two departments as the coordination in developed countries. Regarding case detection and registration, there are manual and electronic surveillance registers for FBDOs. The investigator observes this. There needs to be a priority list for organisms causing FBDOs in the food safety program, even those organisms in the communicable diseases directorate [11].

Regarding scattered FBDs, neither a priority list, surveillance register, log book, or database is available because they are in the communicable diseases directorate. The priority list is essential in establishing laboratory infrastructures for FBDs. It is not possible and not practical to provide kits for all organisms causing FBDOs. Therefore, please select the most prevalent microorganisms and

organize them in a priority list. This can reduce the number of FBDOs with unknown laboratory results.[16]

The regional level admitted there is no capacity to transport specimens to a higher level laboratory, and there need to be guidelines for specimen collection, handling, and transportation to the next level, as reported by 25 % of participants. Hence, case confirmation is possible for 75 % of cases. The question is about kits; are there kits for all FBD agents? In the communicable diseases directorate, there is a priority list of which kits are available for all organisms. There is no priority list in the food safety program which deals with FBDO. It is known that more than 200 diseases can be transmitted to people through ingesting food contaminated with microorganisms (bacteria, viruses, and parasites) or with chemicals [14].

Logically, no kits for all these diseases are always available, either in central or regional levels.

Study participants admitted that there is a surveillance register for FBDOs. Only half (50 %) said there are manual and electronic registers.

Only 50 % of participants admitted that there is a surveillance register for single FBDs, and 25 % admitted that there are manual and electronic registers.

50 % mentioned that there is no log for single FBDs. The investigator observed that both manual and electronic registers, as well as folders, work as a log book. Many single cases forms were observed in the folder.

At the regional level, the surveillance forms for FBDOs have been present during the past six months as admitted by hospital doctors.

All doctors admitted that there is a report from the region to the ministry by different means. Half of them need to learn that the reporting should be within 24 hours for new FBDOs, and some admitted that FBDOs reporting to MOH is within 1 month. They may have confused the reporting time of FBDOs with single FBDs, which is one month [11].

Most doctors admitted that only FBDOs are reported to the ministry, while some admitted that both FBDOs and single FBDs are reported,

despite that single FBDs are not belonging to food safety programs but to communicable diseases departments. This may be due to a need for more information, or sometimes one person can deal with the two departments simultaneously, as in vacation times, once a single coordinator can cover both departments.

There needs to be a solution for accurate reporting and reporting time according to the number of monthly reports to the ministry last year. It is noticed that there are two channels of reporting system of foodborne diseases:-1- Single FBDs are reported to the communicable diseases directorate [11].

2- FBDOs are reported to food safety programs.

There is a regulation that the service level must report even single cases of FBDs based on the complaints, not on the laboratory confirmation, to the coordinator of the food safety program, who will collect them in a folder (similar to a logbook) to find out if there is any link between the cases (e.g., common food source) to discover hidden FBDOs. The latter method is not applied at the mid-level, so more likely not involved in other regions apart from Riyadh. (Appendix 13)

The indicator of data analysis at the ministerial level is for FBDOs only but not for FBDs. The data analysis for FBDOs is by time, place, and person (age and gender). It is also for causes, vehicles, contributing factors, and trends of FBDOs. Therefore, a complete analysis is performed at the central level. The investigator observes this. It is analysis for all regions, not only for the Riyadh region.

At the regional level, 25% of doctors reported that there is no data analysis for FBDOs by time, place, and person (age and gender), 75% said there is no data analysis for causes, vehicles, contributing factors, and 25% said, there was no data analysis for trends of FBDOs. The investigator observed this. This means there is a regional data analysis defect, although dealing only with one region, which will undoubtedly affect the mid-level analysis. The main level analysis relies entirely on the reports from areas. Hence, a central analysis will only be partially accurate if there is a defect in regional research.

All FBDOs reported to the region last year were investigated. The mid-level confirms this.

Causative agents were not identified in very high percentages of investigated FBDOs (94 %) at the regional level and (78.3 %) at the central station, although it deals with all FBDOs from all regions. This again indicates the importance of laboratory infrastructure and a priority list. This is also against the information mentioned above regarding case confirmation at the regional level.

Risk factors, in their turn, were not identified in a very high percentage of investigated FBDOs (94 %) at the regional level but remembered at a very high rate (95 %) in the main story, although it deals with all regions. This finding raises a critical question about the effectiveness of the environmental investigation. As scientifically known, 3 types of inquiry must be conducted in FBDO; epidemiological, laboratory, and ecological studies [15].

FBDO preparedness and response indicator are complete at a central level.

There is a written plan of FBDO preparedness and response, which the investigator observes. Emergency stocks of drugs and supplies are available in food-safety Program all the times in the past year but not observed by the investigator. There is a standard FBDO management protocol, although not regarded by the investigator. How are there standard FBDO management protocols and emergency stocks of drugs as long as there is no priority list? Drugs against which organism? There may be protocol but only sometimes. It shows steps of FBDO investigation but not cases treatment.

There must be a budget line or access to funds for FBDO response. This is not easy to deal with FBDOs without a budget.

There are national indicators to take emergency action in case of FBDOs (high number of patients, deaths, more than one region).

There is no written plan for FBDO preparedness and response at the regional level, as reported by 25 % and observed by the investigator. 75 % of doctors mentioned that there are no emergency stocks of drugs, which is contrary to the central level but corresponds with investigator observation.

25 % of doctors mentioned no standard case management protocol for FBDOs. The investigator observed this.

At the regional level, 50 % of doctors reported that 51 feedbacks were produced in the last year to the ministry, and 2 were received from it. 51 feedbacks are the outbreaks investigation reports.

The principal investigator thinks there needs to be more clarity between feedback and FBDO investigation reports. Feedbacks represent one of the primary components of the surveillance system (dissemination).

Feedbacks play a crucial role in improving the practice. They are essential in maintaining a spirit of collaboration among the public health and medical communities, improving reporting to the surveillance system.<sup>179</sup> The ministerial food-safety program teams admitted that it visited lower levels (regional, sectorial, and service) in the past six months and has been trained and trained the lower levels in the past six months in surveillance and response systems of FBDOs.

At the regional level, 50 % admitted that the ministerial food safety program team did not visit the region in the past six months, but all participants (100 %) admitted that they had been trained in the surveillance and response systems of FBDOs by mid-level. Participants who said "no visits" are working in sectors.

This supports what the main level said, except in the visiting part. This may be due to the no visits to sectors.

50 % of participants admitted that they do not know if the regional food safety program team did visits to the lower levels (service levels, i.e., hospitals) in the past six months or not and admitted that the couple had not trained the lower classes in surveillance and response

systems of FBDOs. This can go somewhat to what was reported by the service level regarding supervision and training.

This double information in supervision and training may be since participants from sectors needed to be made aware of visits and activities.

Regarding resource indicators, central and regional levels have good communication and data management. The main problem is a need for more staff to cover program duties.

At the regional level, 25 % of doctors admitted that there is no surveillance coordination body at a regional level, and 75 % are not satisfied with the surveillance system.

Massive efforts are required to solve the dichotomy between single FBDs and FBDOs managements.

### Conclusion:

- 1- Two surveillance and response systems of FBDs and FBDOs working independently without coordination at the central or regional levels.
- 2- A complete national surveillance manual or priority list for FBDOs in a food safety program must be included. This will affect case detection and confirmation. But there was a manual for single FBDs and outbreaks of listed organisms in the communicable diseases directorate.
- 3- Data analysis and interpretation, epidemic preparedness, besides response and control, were acceptable.
- 4- Feedback (dissemination) was impaired.
- 5- Underreporting is presented clearly.
- 6- Registers for FBDOs were there.
- 7- No budget, unfortunately.
- 8- The communication facilities were excellent.

### Recommendations:

- 1- Development of a national manual for FBDOs comprising a clear priority list with case definitions that can improve the laboratory infrastructure.
- 2- Unite the two arms of FBDs and FBDOs, namely the communicable diseases directorate and food safety program, under one division. If regulations do not allow, enhance the coordination between two divisions firstly at the regional level and then at the main level. The coordination can take various shapes:-

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Syndromic surveillance of FBDs has no role in Saudi Arabia at any level.

No formal surveillance system is not applicable in Saudi Arabia.

Statistical analysis at the service level did not show any significant differences in the selected indicators (surveillance manual for FBDOs, policy protocol to deal with FBDOs, and reporting time) between medical cities or general hospitals ( $\chi^2$  and *p-value results are not significant*). So the level of health facility did not affect the study's results.

The results could not reject the research hypothesis that the surveillance and response systems of FBDs and FBDOs in Riyadh city are ineffective, not sensitive, inconsistent, and not timely systems. Significant defects exist in core and support functions at regional and service levels.

A- Assigning one person in the directorate to receive all reports of both FBDs and FBDOs, then filtering them and distributing them according to specialty, i.e., FBD to the coordinator of communicable diseases and FBDOs to the coordinator of a food safety program.

b- One log book, either manual or electronic (better), in the directorate to receive all reports, either single FBDs or FBDO. The logbook must be checked at least once daily by both coordinators, and each one collects his cases and finds out if there is a duplication of reported cases. If more patients are reported based on the laboratory, salmonella, for instance, which belongs to the communicable diseases list, must be reported to the food safety program coordinator to deal with it as an FBDO. Suppose an organism from the contagious diseases list causes an FBDO. In that case, the food safety program coordinator must conduct the investigation and collect all confirmed cases, then give them to the communicable disease coordinator to obtain more accurate biostatistics.

c- At the central level, during analysis, the confirmed cases from the list of communicable diseases must be reported to the infectious diseases directorate with ascertainment to check again if they are already registered from the region (communicable disease coordinator). Therefore, more valid biostatistics can exist.

3- Intensified training and supervision.

4- Continue more extensive studies nation wise to assess our surveillance system.



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