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Jaber Sharaheeli and Hafsa Raheel



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EVALUATION OF THE REGULATION AND REPORTING CAPACITY OF SURVEILLANCE AND RESPONSE SYSTEMS OF FOODBORNE DISEASES AND OUTBREAKS IN RIYADH CITY, 2015

Jaber Sharaheeli¹ and Hafsa Raheel²

¹MD, FETP Diploma, Family and Community Medicine Department, College of Medicine, King Saud University, General Directorate of Environmental and Occupational Health, Ministry of Health

²Department of Family & Community Medicine, King Khalid Hospital & King Saud University, Riyadh, Kingdom of Saudi Arabia

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ABSTRACT

Objectives: Assess the regulation and reporting capacity of surveillance and response systems of FBDs and FBDOs in Riyadh city.

Methodology: Cross sectional study was conducted at ministerial, regional, and service levels in Riyadh city.

Results: Regarding central level; 100% admitted that, there is mandatory surveillance and response systems for FBDOs with a national manual for FBDOs but no priority list. 100% monthly reports received last year.

Regarding regional level; 50% and 75% admitted the presence of a manual for surveillance and response systems of FBDs, and FBDOs respectively. 50% admitted forms availability and 100% of reporting.

Regarding service level; there are no manuals for surveillance and response systems of FBDs or FBDOs. 52% admitted a shortage of forms. Only 44% admitted that they should report both single FBDs and FBDOs. Only 58% know deadline to report FBDOs.

Conclusion: Two independent surveillance and response systems of FBDs and FBDOs. Functions are not fulfilled. The reporting is impaired in the service level.

There are major gaps in the surveillance and response systems of FBDs and FBDOs in Riyadh city.

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INTRODUCTION

Surveillance is an ongoing, systematic process of data collection, analysis, interpretation and dissemination for action(1).

World Health Organization defines food-borne disease (FBD) as “disease of infectious or toxic nature caused by, or thought to be caused by, the consumption of food or water”(2).

The Food borne Disease Outbreak (FBDO) is defined as the occurrence of two or more cases of a similar illness resulting from the ingestion of a food in common. The etiologies of a FBD can be bacterial, chemical, parasitic, and viral agents. Food serves as vehicle to transmit these agents (3).

Food-monitoring programs identify the problems in food before its consumption, while food borne diseases surveillance

programs identify the problems in food after its consumption(4).

Global burden of FBDs is unknown in developed and developing countries. In 2006, WHO launched an initiative to Estimate the Global Burden of FBDs to provide Member States with data and tools to support policy-makers and other stakeholders to set appropriate, evidence-informed priorities of food safety at country level(5).

Food pathogens are more risky when food is undercooked or raw(6).

Food contamination can take place anywhere from the farm to the table. It can occur during cultivation, production, processing, distribution, storage, and preparation (7).

*Corresponding author: Jaber Sharaheeli

MD, FETP Diploma, Family and Community Medicine Department, College of Medicine, King Saud University, General Directorate of Environmental and Occupational Health, Ministry of Health

Public health surveillance is an essential component of a food-safety program. The ability to use public health surveillance to track cases of food borne disease and outbreaks, as well as behaviors and conditions that contribute to food borne disease, is critical to our understanding and control of these diseases(8). Surveillance data can reveal the burden of FBDs in the community or the presence and scale of a possible FBDO. Surveillance data also can provide clues to the source of and contributing factors to the FBDOs(9).

Saudi Arabia has a unique standing because it hosts pilgrimage and umrah throughout the year where large numbers of people obtain foods from local restaurants and cafeterias(10).

As observed in other countries, a large proportion of FBDOs are never reported to the health system in the Kingdom of Saudi Arabia. On the basis of reported outbreaks, it can be seen that number of reported food poisoning outbreaks has increased steadily during the period 1411(1990)-1422 (2002) Hijra from 186-482 accidents(11).

There is a study conducted in Al-qassim province to analyze the food borne illness surveillance data for the year 2006. During the year 2006, 31 food borne illness outbreaks, accounting for 251 cases, were reported(12).

In KSA, there is surveillance system but no study has been conducted to evaluate its functioning and working(13).

Objectives

This study aimed to assess the regulation and reporting capacity of surveillance and response systems of FBDs and FBDOs in Riyadh city.

METHODOLOGY

Study design

A cross-sectional study.

Study population

Food safety program staff in the ministry of health (MOH), food safety program coordinator in Riyadh health affairs, and the teams involved in food safety program. The four main hospitals in Riyadh city; King Saud medical city (KSMC), King Fahd medical city (KFMC), King Salman hospital, and Aleman general hospital. In each hospital; emergency department physicians.

The population distribution in each level is:

Five doctors in the ministerial level, four doctors in the regional level, and 50 doctors in the service level (KSMC = 15, KFMC =15, King Salman hospital = 12, Aleman hospital = 8). Total number in all levels is 59.

Sample calculation

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

Inclusion Criteria

Within each level, the investigator interviewed the person who works for at least 6 months and above. Language, gender, and nationality were not barriers in the study.

Exclusion Criteria: Anyone working for less than 6 months was not included, because he may not have received a 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. English languages questionnaires are used. There are three forms of questionnaires and observational lists to cover the three levels of food-safety program. These tools are based on the Protocol for the Assessment of National Communicable Disease Surveillance and Response Systems which was developed for WHO. The protocol was recommended by WHO to help the national teams in their evaluation of surveillance and response systems of communicable diseases including FBDs(14). In addition to the WHO protocol, we also used the CIFOR Guidelines for Food borne Disease Outbreak Response. CIFOR stands for the Council to Improve Food borne Outbreak Response(15).

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 objectives and the local setting in forms of systems used in Saudi Arabia to be suitable for food safety because they are designed for all communicable diseases, therefore some elements are not applicable in food safety such as no weekly report in food safety.

The performance indicators and metrics used in the tools are suitable to food safety program in Saudi Arabia. These indicators are selected based on their importance and feasibility of implementation. For example; if the objective is FBDO detection, one of the performance indicators regarding this objective is the reported cases and two of the metrics here are completeness, i.e. the percentage of cases with complete data, and timeliness. The central level is labeled as a ministerial level in order to assess food safety program in the ministry (central program), the district (intermediate) level as a regional / sectorial level in order to assess food safety program in the health directorate in Riyadh and the health facility level as a service level to assess food safety in hospitals(15).

Each tool focused on the program core functions. The core functions of the surveillance systems are case detection (regulation) and reporting(16).

The data are collected by the principal investigator at all levels to ensure reliability and accuracy. The research comprised ministerial food safety program, regional food safety program, and the main four hospitals in Riyadh city, King Saud medical city, King Fahd medical city, King Salman hospital, and Aleman hospital. The study covered emergency departments because they are the departments receiving patients with FBD. The hospitals assigned identified times to collect data because they were so involved in corona disease. All ER doctors who were available on the day of data collection and agreed to participate were included in the study. Few doctors apologized to participate because they were so busy in critical patients and some were not available at data collection time.

Analysis plan

Epi-Info software from CDC, was used to data entry and for analysis. The data were analyzed to respond to the objectives of the study. Frequency of the availability of regulatory manual and the availability of reporting forms were estimated to know their percentages to find out the gaps and the opportunities in our surveillance and response systems of FBDs and FBDOs.

Statistical analysis was done in the service level because of suitable sample size (50) to know the differences of each indicator among different hospitals. There are two medical cities (KSMC, KFMC) and two general hospitals (King Salman and Aleman hospitals). This is because KFMC and KSMC are medical cities i.e. referral or tertiary hospitals, so may have restriction on receive FBD cases. This restriction may affect negatively the results of the study. To test the differences and their significance, the investigator combined KSMC and KFMC to be one variable called medical cities and combined King Salman and Aleman hospitals to be one variable called general hospitals. This categorization is to make sample size reasonable more than taking each facility alone, particularly each two facilities in each category have similar regulations. Medical cities and general hospitals variables are the independent variables that, study sought to test the differences of indicators among them. The investigator analyzed the two indicators at the service level; presence of surveillance manual for FBDOs and reporting time. These indicators represent the dependent variables (outcomes) because their distributions depend on health facilities level. The investigator concentrated on FBDOs because they are more important and striking than single FBDs. The answers 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 equal to “do not know and 24-hours”.

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

Ethical concerns

1. Ethical approval was taken from the Institutional Review Board (IRB) in the
2. RS-MOH. The administrative approval was taken from the MOH authorities.
3. The informed consent was clear and indicating the purpose of the study and was taken from health authorities and the participants at each level.
4. No incentives or rewards were given to the participants.
5. There are no conflicts of interest.
6. Participants anonymity and autonomy were respected and the principal investigator only was responsible about the content and the participants were not included in the report.
7. The purpose of collected information is the improvement of surveillance of FBDs through a scientific recommendations.

RESULTS

Central (ministerial) level

Regarding the availability of legal mechanism to enforce surveillance of single FBDs and FBDOs; it is admitted that, there are mandatory surveillance and response systems for FBDOs but not for individual FBDs.

Table 1 Evaluation of the regulation and reporting capacity of Surveillance and Response Systems of Foodborne diseases and outbreaks in Riyadh city, 2015, the regional level. (N=4)

| Indicators: case detection | Response | Frequency | Percentage % |
|---|----------------------|-----------|--------------|
| Presence of a national manual for surveillance and response systems of single FBDs. | Yes | 2 | 50 |
| | No, Do not know | 2 | 50 |
| Presence of a national manual for surveillance and response systems of FBDOs? | Yes | 3 | 75 |
| | No, Do not know | 1 | 25 |
| Indicator: data reporting | | | |
| Presence of deficiency* of appropriate surveillance forms recommended by MoH for FBDs and FBDOs at any time during the last 6 months. | Yes | 0 | 00 |
| | No, Do not know | 4 | 100 |
| Presence of the reporting to ministry. The events to report. | Yes | 4 | 100 |
| | No, Do not know | 0 | 00 |
| | FBDOs only | 3 | 75 |
| | scattered cases only | 0 | 00 |
| | Both | 1 | 25 |
| | Neither, Do not know | 0 | 00 |
| The deadlines for reporting to the ministry of FBDOs.** | 24-hours | 2 | 50 |
| | One month | 3 | 75 |
| | Do not know | 1 | 25 |
| | Other (specify) | 0 | 00 |
| The deadlines for reporting to the ministry of single FBDs.** | 24-hours | 0 | 00 |
| | One month | 1 | 25 |
| | Do not know | 0 | 00 |
| | Other (specify) | 0 | 00 |
| 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 that, 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.

Regarding the availability of a national manual of surveillance and response systems of single FBDs and FBDOs; this manual is available for FBDOs but not for single FBDs.

No shortage of surveillance and investigation forms of FBDOs was reported at any time during the last 6 months. The central level receives reports about FBDOs only but not about individual FBDs. There is 24-hours reporting about FBDO notification and monthly reporting about all FBDOs during that month. Percent of monthly reports and monthly reports received on time from region during the last year was 100% (12 reports out of expected reports "12"). Ministry of Health does not share the surveillance data of FBDOs with World Health Organization.

Regulatory manuals For FBDOs only and forms are observed by the investigator.

Regional level

50% said that, there is a national manual for surveillance and response systems of single FBDs. 75% said that, there is a national manual for surveillance and response systems of FBDOs.

50% admitted that, there was no shortage in the surveillance forms for FBDOs during the past 6 months. 100% admitted that, there was a reporting from region to the ministry. 75% admitted that, only FBDOs are reported to the ministry, 25% admitted that, both FBDOs and single FBDs are reported. 50% admitted that, there are 24-hours reporting time to the ministry of new FBDOs and monthly report as well for all FBDOs during the month, while 25% admitted that, only monthly reporting present for FBDs and FBDOs. 50% admitted that, the number of monthly reports to the ministry in the last year was 100% compared to the expected number and all reports 12 (100%) were on time, 25% admitted that only 7 (58.3%) reports sent to the ministry and 5 of them (71.4%) reports were on time.

The updated forms are present. Regulatory manuals For FBDOs only and forms are observed by the investigator. Observed reports of FBDOs from region to MOH are there. (Table 1)

Service (hospital) level

None said that, there is a national manual for surveillance and response systems of single FBDs or FBDOs. This was observed by the investigator.

52% admitted that, there was a shortage in the forms recommended by MOH for FBDOs during the past 6 months. The updated MOH forms are not present but the hospitals have their own forms as observed.

Only 44% admitted that, they should report both FBDs and FBDOs. Only 58% admitted that, they should report FBDs and FBDOs immediately, and 12% admitted that, they should report FBDs and FBDOs within 24 hours. (Table 2).

Statistical analysis

The statistical analysis demonstrated that; the national manual for surveillance and response systems of FBDOs is not available neither in medical cities nor in general hospitals. 58% of participants said "yes" there is an immediate reporting of FBDOs.

This immediate reporting presented more in medical cities 55.2% than in general hospitals 44.8%. There is no statistical significance. (Table 3).

DISCUSSION

The globalized economy, increasing social, political interdependence, transnational trade, travel, and migration increase the risk of cross-border transmission of FBDs(17).

Outbreak reports are frequently deficient because of late notification, unavailability of clinical specimens and/or food samples, unsuitability of laboratories or methods to detect and identify the pathogen, insufficient resources and trained staff to

Table 2 Evaluation of the regulation and reporting capacity of Surveillance and Response Systems of Foodborne diseases and outbreaks in Riyadh city, 2015, the service level. (N=50)

| Indicators: case detection | Response | Frequency | Percentage % |
|--|---------------------|-----------|--------------|
| Presence of a national manual for surveillance and response systems of single FBDs. | Yes | 0 | 00 |
| | No, Do not know | 50 | 100 |
| Presence of a national manual for surveillance and response systems of FBDOs? | Yes | 0 | 00 |
| | No, Do not know | 50 | 100 |
| Indicator: data reporting | | | |
| Presence of deficiency of appropriate surveillance forms recommended by MoH for FBDs and FBDOs at any time during the last 6 months. | Yes | 3 | 6 |
| | No, Do not know | 47 | 94 |
| The events to report. | FBDOs only | 24 | 48 |
| | scattered FBDs only | 0 | 00 |
| | Both | 22 | 44 |
| | Do not know | 4 | 8 |
| | Immediately | 29 | 58 |
| | 24-hours | 6 | 12 |
| The deadlines for reporting of FBDs and FBDOs. | Do not know | 15 | 30 |

Table 3 Evaluation of the regulation and reporting capacity of Surveillance and Response Systems of Foodborne diseases and outbreaks in Riyadh city, 2015, statistical analysis at the service level

| | Reporting time of FBDOs (+)* | Reporting time of FBDOs (-) | Total | X ² | P value |
|-------------------|------------------------------|-----------------------------|-----------|----------------|---------|
| General hospitals | 13 (44.8%) | 7 (33.3%) | 20 (40%) | 0.657 | 0.4 |
| Medical cities | 16 (55.2%) | 14 (66.7%) | 30 (60%) | | |
| Total | 29 (58%) | 21 (42%) | 50 (100%) | | |

* Positive means immediate (correct) reporting time.

conduct investigations, lack of cooperation between the different disciplines, or failure of investigators to write the final report(18).

In KSA, ministry of health developed a guidelines manual for surveillance and preventive measures of communicable diseases. This manual includes a list of FBDs which are laboratory-confirmed. Reporting time of these FBDs from service level to regional level is within 48 hours and from regional level to central level is within one month. Communicable diseases directorate in MOH is sharing data with WHO. Nothing is mentioned in this manual about food safety program or coordination with it regarding reporting of FBDOs outside the list(19, 20).

In the central level food safety program, there is mandatory surveillance and response systems for FBDOs and a national manual for surveillance and response systems of FBDOs. The program is not responsible about single FBDs which are linked to communicable disease directorate.

In the regional level food safety program, there are different responses regarding a national manual for surveillance and response systems of FBDs. The differences may be due to lack of information, or may be because some doctors are working in the sectors not in the main office in the region so covering both FBDs and FBDOs.

There are two arms dealing with FBDs, communicable disease directorate dealing with single FBDs and food safety program dealing with FBDOs.

This division is in both central and regional levels. This has its impact on the reporting process and biostatistics of single FBDs and FBDOs. It is leading to underreporting and inaccurate biostatistics because no actual coverage of FBDs and FBDOs and no coordination between two departments as the coordination in developed countries.

The forms of FBDs or FBDOs are available during the last six months in central, regional and service levels. The central and regional levels receive surveillance reports about FBDOs only but not about individual FBDs that go to communicable diseases department. 75% of regional level staff recognize that it should report only FBDOs to the central level. Only half of the staff recognize that, time of reporting for new FBDOs should be ideally within 24-hours from regional level to ministry about FBDO and should be monthly reporting about all FBDOs during that month. There may be a confusion about the reporting time of FBDOs with single FBDs which is one month(20).

The striking gaps are in the service level which is the front station to encounter FBDs, either scattered cases or outbreaks. All hospitals and all doctors do not have any idea about national manuals for FBDs or FBDOs and never seen them. Less than a half (44%) admitted that, they should report both FBDs and FBDOs.

The forms are not the recommended forms by MOH as seen by investigator but the hospitals have developed their own forms. Immediate reporting of FBDOs presented in 58%. This means that, there is a delay of reporting which may harm the investigation process. Cases can be discharged before seen by the coordinator and there is deficiency in registry as shown

above, so coordinator cannot trace them. This indicates to major underreporting of FBDs or FBDOs. Also, the timeliness criterion of surveillance is not fulfilled in the service level. If there is any defect in one part of surveillance will affect the whole system. For instance, there is great gaps in reporting system of FBD or FBDO (underreporting and no timeliness). The level initially responsible about the reporting is the service level. Hence, the iceberg phenomenon is markedly obvious in the service level.

By looking at the service level results and recognizing the significance of this level because it is the first place patients enter, it is clear that there is a failure or drop in the surveillance and response systems of FBDs and FBDOs in Riyadh city, 2015.

From the discussion, it is clear that, the study results answered the research question that, the surveillance and response systems of FBDs and FBDOs in Riyadh city are functioning but not in proper way. The main two types of FBD surveillance are there but dispersal. Laboratory-based (pathogen-specific) surveillance is there but reported to communicable diseases directorate in region and in MOH not to food safety program and no coordination with food safety program in regional and central levels to search if there is a link between scattered cases. Therefore, many FBDOs can be missed because only individual cases are reported and no link can be achieved between them.

Complaint system surveillance is the only surveillance system of FBDs in the food safety program in MOH and directorate. This system works exclusively on FBDOs but not on single cases of FBDs. Food safety program does not inform communicable diseases directorate about FBDOs caused by salmonella for instance. Even in the regional level, the coordinators of communicable diseases and food safety are sitting next to one another but the no one knows about the cases received by his neighbor. That means, communicable diseases coordinator is notified about laboratory-confirmed cases (scattered cases) such as salmonellas is but does not inform food safety coordinator about them. These cases may have represented hidden outbreaks which need investigation. Not only scattered cases, but even laboratory-confirmed outbreaks due to pathogens in the list are reported to communicable diseases coordinator according to the regulations(20).

On the other hand food safety coordinator does not inform communicable diseases coordinators about FBDOs caused by organisms that must be reported to the communicable diseases directorate.

The consequence of this dichotomy is misleading biostatistics of these agents. Certainly these biostatistics represent the tip of iceberg. But the iceberg phenomenon here is in the central level which is a serious issue because ministry of health should communicate with international agencies about these cases and the situation in the country. The iceberg phenomenon in the service level is due to underreporting process and no timeliness.

Timeliness is a very important measure of performance of public health surveillance systems. Even in developed countries with high public health system level like USA, there are timelines lags(21).

Statistical analysis at the service level did not show any significant differences of the selected indicators (surveillance manual for FBDOs and reporting time) between medical cities or general hospitals.

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Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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