**Real-time Surveillance of Infectious Diseases and Other Health Conditions during the Arbaeenia Mass Gathering, Kerbala, Iraq, 2016. A Teaching Case-Study**

**Student's Guide***

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**Abstract**

The Arbaeenia mass gathering (MG) is considered the largest religious MG in Iraq and occurs annually in the city of Kerbala with participation of several million visitors from different countries and most Iraqi provinces. This MG places attendants at a significant risk for contracting communicable diseases, sustaining injuries, and facing complications of health problems related to chronic diseases due to overcrowding and intensive physical activity.

The goal of this case study to build the capacity of trainees on how to improve the surveillance systems for infectious diseases and other health conditions during MGs. This case study is based on the implementation of a real time surveillance system for illness and health problems affecting people attending the Arbaeenia MG in 2016 which enabled the surveillance team in Iraq to rapidly detect and respond to disease outbreaks. This case study teaches students how MGs offer an opportunity to improve existing surveillance systems or establish new ones. The case study is designed for training Novice field epidemiology trainees. The case study can be administered in 3-4 hours. Used as adjunct training material, the case study provides the trainees with competencies to use real time technology for surveillance data collection, analysis and timely response during the event.

**How to Use the Case Study?**

**General instructions:** This case study should be used as adjunct training material for novice epidemiology trainees to reinforce the concepts taught in prior lectures. The case study is ideally taught by a facilitator in groups of about 20 participants. Participants are to take turns reading the case study, usually a paragraph per student. The facilitator guides the discussion on possible responses to questions. The facilitator may make use of flip charts to illustrate certain points. Additional instructor's notes for facilitation are coupled with each question in the instructor's guide to aid facilitation.

**Audience:** This case study was developed for novice field epidemiology students. These participants are commonly health care workers working in the county departments of health whose background may be as medical doctors, nurses, environmental health officers or laboratory scientists who work in public health-related fields. Most have a health science or biology background.

**Prerequisites:** Before using this case study, participants should have received lectures on definition, objectives and types of public health surveillance, Mass gathering and public health.

**Materials needed:** Flash drive, flip charts, markers, computers with MS Excel

**Level of training and associated public health activity:** Novice – Surveillance

**Time required:** 2-3 hours

**Language:** English

**Goal of Case Study**

The goal of this case study to build the capacity of trainees on how to improve the surveillance systems for infectious diseases and other health conditions during MGs.

**Learning Objectives**

At the conclusion of the teaching session, participants will be able to:

1. Develop syndrome surveillance during emergency situations that could take place in MGs.
2. Recognize the importance of real-time surveillance for early detection, analysis, and response during MGs.
3. Identify the most common infectious disease and other health conditions that might be reported during a MG which differ according to the nature of event.
4. Create descriptive analysis from surveillance data organized by time, place, and people.
5. Interpret surveillance data.
6. Suggest recommendations to improve surveillance systems during future MGs.

**Introduction:**

MGs are frequent events around the world and include religious and sports events, musical festival, and other activities [1][2] Religious MGs are well established in the Arab world such as the Hajj in Saudi Arabia, and Arbaeenia in Iraq. MGs are held throughout the year in Kerbala, Najaf, and Baghdad [3][4]. The remembrance of Imam Hussain ibn Ali is considered the largest MG in Iraq, it occurs annually on the 20th of the lunar month Safar in Kerbala. Kerbala is located 100 km south-east of the capital Baghdad and has a population of approximately 1.2 million inhabitants. The Kerbala health directorate encompasses four districts with three main hospitals in the center of the province, and another three hospitals at the periphery of the city, in addition to 31 primary health care centers. Figure 1 shows the map indicating to the main routes for the pilgrims travelling towards Kerbala annually by walking on feet.
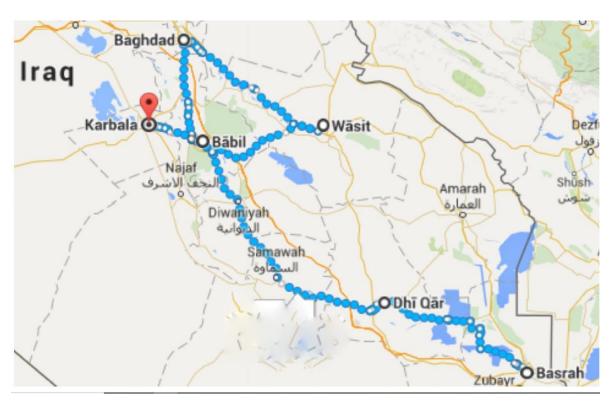


*Figure 1. Map indicating the major routes of travel for attendee of the Arbaeenia mass gathering, Kerbala, Iraq, 2016. Source: JMIR Public Health and Surveillance*

**Part 1: The Story**

The increasing number of participants who gather annually at the Kerbala governorate each year to attend the Imam Hussain Arbaeenia (20% of which come from abroad) require more than what is available from local resources, especially local health care services and particularly preventive care services. The MG places attendants at risk of contracting air, water, and foodborne communicable diseases as well as sustaining injuries and complications of health problems related to existing chronic diseases due to poor adherence to diet and medication as well as walking for long distance [5][6]7].

Health services are provided to participants along their journey to Karbala through temporary mobile clinics provided by the Iraqi health directorates. These clinics provide basic curative care, so health conditions presented at these facilities were not reported in the routine surveillance system. Therefore, the implementation of a syndromic approach for communicable diseases surveillance at these health facilities during MGs was recommended in order to fill in this gap, which is what happened during the 2014 Arbaeenia MG [8]. Nevertheless, the first time that a real-time surveillance system was implemented during MGs was in 2016, however, it was implemented during the past years amongst health facilities present in the internally displaced and migrant's camps as a part of the early warning, alert, and response network.

In Iraq, the national surveillance system is a passive one that collects data on immediate notified diseases, case-based diseases, and aggregated diseases (Annex 1).

**Part 1 questions:**

**Question 1:** Define public health surveillance, what are the objectives of surveillance during MGs?
**Question 2:** Define Mass Gatherings, what is the impact of a MG on the host country's health system?
**Question 3:** Do you think the routine surveillance system in Iraq will work effectively during mass gatherings? Justify your answer.

**Part 2 Methods**

A total of 20 health care facilities run by the Iraqi Health Ministry are distributed along the Ya-Hussain road which is the main road between the Najaf and Karbala provinces (80 km road and 10 health facilities in each province). The majority of people attending Arbaeenia Imam Hussain passed through this road over a period of 11 days from the 12th to the 22nd of November 2016. For each health facility, three data collectors were assigned to cover services provided 24-hours a day. A structured questionnaire created on the D4 application by the information technology team at EMPHNET and installed on smart devices (tablets) with access to the Internet were able to send data in a real-time manner. These tablets were distributed amongst selected health facilities and the location of each tablet one was determined using GPS (Global Positioning System).

The questionnaire included:

- An ID number assigned for each selected health facility, for each data collector, and for each case,
- Demographic information such as age, gender, nationality, and province of residency for Iraqi patients.
- Patient presented health complaints consisting of symptoms and signs related to acute infectious conditions, chronic conditions, injuries, and other conditions related to walking for long distances such as joint pain and blisters.

**Part 2 Questions:**

**Question 4a:** What is the type of surveillance system implemented during this study?

**Question 4b:** When do you think that this type of surveillance system should be established? Justify your answer.

**Question 5:** List the signs and symptoms related to acute infectious diseases that might be reported during the MG?

Access to the real-time online collected data was provided to the surveillance supervising team in Kerbala and Najaf governorates, where they were able to monitor data collection in real-time and take any actions in a timely manner. Daily reports were provided to the surveillance section manager in the communicable diseases and control center in Baghdad and the manager of the public health department in Kerbala and Najaf. Microsoft Excel was used for data management and analysis.

**Part 3: Results**

During the study period, a total of 41,689 patients attended the selected health facilities. You will receive an excel sheet with information related to the patients attending these facilities such as age, gender, nationality, province of residency for Iraqi patients and type of health complaints.

**Part 3 questions:**

**Question 6:** Using the data from the excel sheet (Annex 2), fill in the table below regarding the socio-demographic characteristic of patients attending the selected health facilities during Arbaeenia Imam Hussain, Karbala, Iraq, 2016

*Table 1. Sociodemographic characteristics of patients attending related health facilities*

| Variable | Number | Percentage |
|---|---|---|
| **Age / year** | | |
| Mean (SD) | | |
| **Gender** | | |
| Male | | |
| Female | | |
| Total | | |
| **Nationality** | | |
| Iraqi | | |
| Iranian | | |
| Bahraini | | |
| Lebanese | | |
| Saudi | | |
| Kuwait | | |

| | | |
|---|---|---|
| Pakistani | | |
| Others | | |
| Total | | |

**Question 7a:** Calculate the percentages for acute or infectious conditions, chronic conditions, injuries and dermatological conditions amongst all attendee of selected health facilities. Present your findings in a table.

**Question 7b:** By a suitable graph, show the distribution of acute or infectious conditions among attendee of selected health facilities.

**Question 8:** Create a suitable graph to display the distribution of patients with acute or infectious conditions over the 11-days study period.

**Question 9:** Show the distribution of acute or infectious conditions by age group.

**Question 10:** Present the types and causes of reported injuries using a suitable graph.

**Part 4: Discussion**

The Arbaeenia MS is considered the biggest religious MG in Iraq that occurs annually in the Kerbala governorate and causes a burden on local health resources [9]. A total of 41,689 patients seeked medical care and presented different health complaints, where more than 58% (n=24,398) had acute or infectious conditions, and two thirds of these patients complained from fever, coughing, or a flu, with a considerable percentage of patients suffering from vomiting and diarrhea (although these infections were expected as a result of overcrowding, but their numbers were still less than expected, which is consistent with a previous study conducted during the 2014 Arbaeenia MG[8].

More than one third of all patient complaints were related to chronic conditions such as hypertension, hyperglycemia, or heart problems. These finding are consistent with the results of other studies [7]. Since the data was collected and monitored in real-time, the supervising surveillance team was able to watch this data in real-time which enabled them to clarify any clustering of specific cases or outbreaks, and enabled appropriate action to take place accordingly at in a timely manner.

**Part 4 Questions**

**Question 11:** How could these findings be used to address the burden of MGs on the public health system in Iraq?

**Question 12:** Discuss the importance of real-time surveillance.

**Question 13:** Since the main objective of surveillance is information for action, to whom should this surveillance data be made available?

**Part 5: Conclusion**

Many health problems are expected to be witnessed during the Arbeenia MG given that overcrowding at MGs increase the risk of transmission of infectious diseases and injuries. Therefore, efforts should be made before and during the event to ensure proper health care services are provided to MG participants in the form of sufficient numbers of medical staff and units supported with essential medical equipment, drugs, and human resources for the management and control of different conditions. Regarding the surveillance system, the implementation of a real-time syndromic surveillance system to monitor presented health problems during the event more efficiently as a part of an alert, early detection, and response measures.

**Question 14:** Based on the information provided in the introduction and the result sections, what are your recommendations to improve surveillance systems in future MGs in Iraq?

**Question 15:** What actions should be taken to engage the community in planning for future MGs?

**Annex 1:** Immediate notified diseases, case-based diseases, and aggregated diseases: Iraq national surveillance system

| Immediate notification | Case based diseases | Aggregated |
|---|---|---|
| S. Measles | Leprosy | Acute Diarrhea |
| S. Rubella | Brucellosis | Acute Jaundice |
| Diphtheria | Cutaneous Leishmaniosis | Pneumonia |
| Bilharziasis | Visceral Leishmaniasis | Amebiasis |
| | Toxoplasmosis | Animal Bite |
| Meningitis | Tetanus | Scabies |
| SARI<br>H1N1, H3N2, H5N1, | Fasciolopsiasis | Giardiasis |
| Cutaneous Anthrax | H. Cyst | S. Typhoid Fever |
| Tetanus | Mumps | Enterokinases |
| Pulmonary Anthrax | Pertussis | Acute Bloody Diarrhea |
| S.H. F | Typhus | Chickenpox |
| AFP | Ascariasis | |
| Poliomyelitis | Ancylostomiasis | |
| Rabies | Hymenolepiasis | |
| S. Ebola | Strongyloidiasis | |
| Food Poisoning | Taeniasis | |
| Malaria | Trichiasis | |
| Unusual Health Event | Dysentery<br>(Shigellosis) | |
| | Hepatitis A, B, C, E | |
| | Typhoid Fever | |
| | Filariasis | |

**Annex 2:** Real-time Surveillance of Infectious Diseases and Other Health Conditions during the Arbaeenia Mass Gathering, Kerbala, Iraq, 2016

## Acknowledgements

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**Resources and reading materials**

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