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INTRODUCTION

The Hajj is an annual mass gathering where > 1.8 million Muslim pilgrims from 183 countries come to Makkah, Kingdom of Saudi Arabia (KSA), for approximately two weeks. The KSA Ministry of Health (MOH) is responsible for ensuring the early detection and prevention of infectious diseases that can be transmitted among the markedly great number of pilgrims, such as foodborne illnesses. Foodborne illnesses are especially significant public health problems during mass gatherings. From 2009 – 2011, the Hajj Food Safety Unit (FSU) gathered data on all foodborne disease outbreaks (FBDOs), yet these data have yet to be fully analyzed to determine the underlining risk factors and the best methods for prevention and control of further outbreaks.

OBJECTIVES

- Describe all foodborne outbreaks investigated by the FSU from 2009 – 2011;
- Identify risk factors (e.g., type of food, food handling, and storage) for foodborne outbreaks; and
- Make evidence-based recommendations for improved prevention and control.

METHODS

Data was collected using the FSU reports of FBDOs during Hajj in Makkah, KSA, from 2009 to 2011. All reports were written in Arabic, so they were translated. The data from 2009 – 2011 outbreaks was concatenated and statistically analyzed using SAS. Graphs and tables were created using Microsoft Excel.

RESULTS

- A total of seven FBDOs were reported with a range of two to 45 cases per outbreak, totaling 107 cases. Among these cases, 74 were female (69%) and 33 were male (31%). Egyptians were the most common nationality affected (69%), followed by Saudis, Malaysians and Turks (23%, 6%, and 2% respectively). The mean age among cases was 46 years with a SD of 16 years (Table 1).
- All of the cases had the typical presentation of foodborne illness, with abdominal pain and diarrhea as the most common symptoms (93% and 85% respectively), followed by nausea and vomiting (43% and 44%) (Table 2).
- A total of 15 cases were admitted to the hospitals; all the cases were stable with no complications and no reported mortality. Of the total, 8 cases were males and 7 were females. Moreover, 8 cases were Saudis and the remaining were Egyptians (Table 3).

(continued)

RESULTS (CONT.)

- This study found a strong relationship between the three largest FBDOs during Hajj (#1, #6 and #7) and the storage conditions and food handling methods.
- Salmonella*, *Staphylococcus aureus* and *Bacillus cereus* were the most commonly suspected pathogens in these outbreaks based on the epidemiological data collected, including IP (Table 4 & Figures 1, 2 & 3).
- In reviewing the FSU reports, it was observed that no single outbreak among the reported FBDOs was linked bacteriologically by lab tests to a certain pathogen.

Table 1. Demographic Characteristics of Cases in Hajj Foodborne Disease Outbreaks, Kingdom of Saudi Arabia, 2009 – 2011

		2009	2010	2011	Total (%)
Gender	Male	0	7	26	33 (31)
	Female	29	4	41	74 (69)
Nationality	Egyptian	29	NA	45	74 (69)
	Saudi	NA	3	22	25 (23)
	Malaysian	NA	6	NA	6 (6)
	Turkish	NA	2	NA	2 (2)
Age Group	< 5	0	1	1	2 (2)
	5 – 18 years	0	2	3	5 (5)
	18 – 45 years	5	6	16	27 (25)
	45 – 65 years	23	2	47	72 (67)
	> 65	1	0	0	1 (1)

Table 2. Symptoms of Cases in Hajj Foodborne Disease Outbreaks, 2009 – 2011

Reported Symptoms	2009	2010	2011	Total (%)
Abdominal Pain	29	9	61	99 (93)
Diarrhea	20	11	60	91 (85)
Vomiting	21	11	15	47 (44)
Nausea	16	4	26	46 (43)
Fever	NA	6	10	16 (15)
Headache	NA	6	2	8 (7)
Itching	NA	4	NA	4 (4)
Chills	NA	2	NA	2 (2)
Bloody Diarrhea	NA	1	NA	1 (1)

Table 3. Demographic Characteristics of Cases Admitted to Hospitals During Hajj Foodborne Outbreaks, Kingdom of Saudi Arabia, 2009 – 2011

		2009	2010	2011	Total (%)
Gender	Male	0	0	8	8 (53%)
	Female	0	2	5	7 (47%)
Nationality	Egyptian	NA	NA	7	7 (47%)
	Saudi	NA	2	6	8 (53%)
	Malaysian	NA	NA	NA	NA
	Turkish	NA	NA	NA	NA
Age Group	< 5	NA	0	1	1 (7%)
	5 – 18 years	NA	2	2	2 (13%)
	18 – 45 years	NA	0	3	3 (20%)
	45 – 65 years	NA	0	7	7 (47%)
	> 65	NA	0	0	0 (0%)

Table 4. Number of Cases Reported during Hajj Foodborne Outbreaks and Suspected Pathogens, Kingdom of Saudi Arabia, 2009 – 2011

	2009		2010			2011		Total
	FBDO#1	FBDO#2	FBDO#3	FBDO#4	FBDO#5	FBDO#6	FBDO#7	
Number of cases	29	3	2	6	3	45	19	107
Suspected Pathogen	<i>Staphylococcus aureus</i>	Unknown	Unknown	Unknown	Unknown	<i>Staphylococcus aureus</i> or <i>Bacillus cereus</i>	<i>Salmonella</i> or <i>Bacillus cereus</i>	

Figure 1. Epidemic Curve for Hajj Foodborne Disease Outbreak #1, Kingdom of Saudi Arabia, 2009

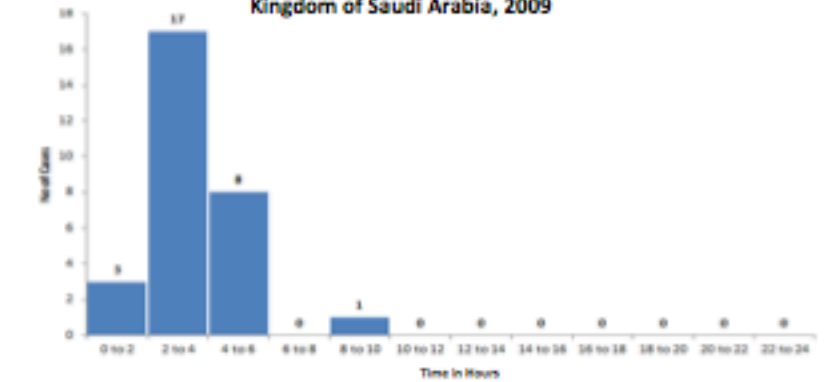


Figure 2. Epidemic Curve for Hajj Foodborne Disease Outbreak #6, Kingdom of Saudi Arabia, 2011

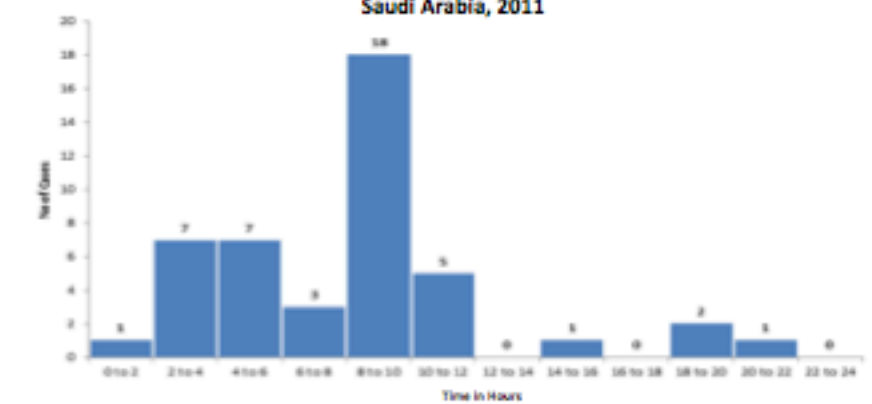
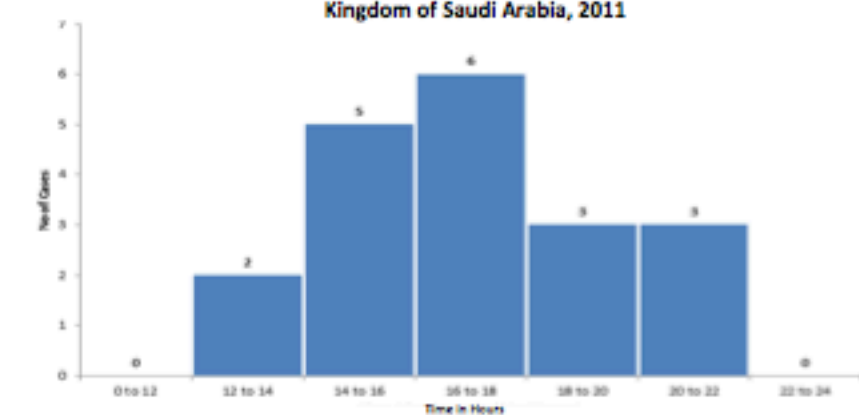


Figure 3. Epidemic Curve for Hajj Foodborne Disease Outbreak #7, Kingdom of Saudi Arabia, 2011



RECOMMENDATIONS

- Improving compliance with the Hazard Analysis Critical Control Point (HACCP) program.
- Establishing training programs in food safety for the food handlers and food managers.
- Reassessing the lab methods used in FBDO investigations.
- Expanding the electronic notification system.