

Foodborne Outbreak, Meknes, Morocco, June 2017: What We Need to Learn

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Abstract

Introduction: Foodborne outbreaks remain a public health threat in Morocco that require compulsory reporting and epidemiological surveys to halt any risk of epidemics. We report a food outbreak that occurred in Meknes on the 10th of June 2017. We assessed its extent, determined its source and enforced preventive measures.

Methods: We performed a retrospective cohort study among the guests of the dinner to identify risk factors associated with the illness. Data were analyzed using Epi Info version 7. Association between assumed risk factors and intoxication was estimated using the relative risk (RR) and its 95% confidence interval. Percentages as well as p-values were determined using Fisher's exact test.

Results: Among the 15 guests, 9 cases were ill with an attack rate of 60%. The mean age was 39 ± 11.9 years with a male/female sex ratio of 0.28. The mean incubation period was 3 ± 3h30. The symptoms reported were vomiting (88.9%), dizziness (88.9%), abdominal cramping (44.4%), headache (44.4%) and fatigue (33.3%). All cases had a positive outcome. Chicken consumption was associated with the intoxication (p=0.04). The cook did not respect hand hygiene rules.

Conclusion: Although laboratory results were negative for microbiological and environmental germs, clinical signs suggest that the probable cause of intoxication are enterotoxins secreted by *Staphylococcus aureus* commonly found when hygiene is lacking and food storage is deficient. We recommend reinforcing public awareness on the importance of respecting the cold chain and the basic rules of hygiene.

Practical application: Our results show Defrosting the chicken for 7 hours without respecting the cold chain could be the cause of the proliferation of staphylococci and the production of enterotoxins. Some recommendations can be made following this survey, in particular: raising public awareness of the importance of respecting the cold chain and the rules of food hygiene.

Keywords: Foodborne outbreak; Enterotoxins; *Staphylococcus aureus*

Introduction

Foodborne outbreaks (FBOs) linked to food consumption at home, in restaurants and other public venues remain a relevant issue in terms of public health and economic impact. In Morocco, the FBOs are compulsory reporting and investigations are to be carried out.

The FBOs due to bacterial toxins are one of the most common diseases connected with food illness [1]. In the European Union, in 2015, bacterial toxins were responsible for 19.5% of all FBOs and 16 Member States (MS) reported 434 foodborne outbreaks caused by staphylococcal toxins.

Staphylococcus aureus frequently colonize the skin and mucosa of human beings. It's present on 88% of the hands and 48% of the aprons of food handlers working in the delicatessen sections of a retail store [2]. These data show that human contamination with enterotoxigenic

strains during food preparation and processing plays an important role as a source of food contamination.

In this study, we describe a FBO that occurred at a familial dinner to estimate the magnitude of the outbreak, to identify the vehicle of contamination and to prevent further cases. The outbreak on 10th June 2017, among the 15 individuals who had participated in a familial dinner in Meknès 9 persons fell ill with symptoms including vomiting, diarrhoea and abdominal cramping. They were transported to hospital. This report summarises the epidemiological and microbiological investigations into the cause of the outbreak.

Materials and Methods

Field work preparation

Field epidemiologists developed an operational case definition based on the common clinical and epidemiological signs identified in the confirmatory epidemic survey. A data collection tool was designed

to collect the epidemiological data to identify the risk factors associated with intoxication. The draft of the data tool designed was peer reviewed before being adopted [3].

Case identification

The epidemiological investigation was conducted June 10, 2017. It concerned a household in Meknes. An interrogation with the patients was carried out. A case was defined as any person who presented the following symptoms: Dizziness, nausea, abdominal cramping, headache, excessive thirst or fever greater than 38°C within 24 hours after had eating the dinner on June 10, 2017.

An adapted, closed-ended questionnaire was used to collect data on the: i) demographic data, ii) clinical symptoms, iii) food items consumed at dinner, iv) date and time of consumption, v) date and time of symptoms, vi) and outcome of patient [4-6].

The data were entered and analyzed on Epi Info version 7. The epidemic curve was performed by Excel version 7 and the attack rate was calculated. The epidemiological description of the data was done in terms of time of place and person.

Analytical epidemiology

We performed a retrospective cohort study among the guests of the familial dinner to identify risk factors associated with illness. The interview was conducted with all the people had familial dinner.

The data were entered and analyzed on Epi Info version 7. A bi-varied analysis was performed to determine the factors associated with intoxication and to determine the variables to be included in the multivariate analysis. The association between each assumed risk factor and intoxication was estimated using relative risk (RR) and 95% confidence interval. As well as the p-value values using Fisher's exact test [7].

Microbiological investigation

The remains of the chicken, tomato sauce and green olives were available for microbiological analysis. Food specimen were stored at 4°C and processed for bacteriological analysis within 24 hours. Samples were tested for several enteric pathogens (*B. cereus*, *Campylobacter*, *Clostridium perfringens*, *Enterobacteriaceae*, *E.coli*, *Listeria monocytogenes*, *Salmonella spp.*, *Staphylococci*). An enrichment medium sodium selenite was used to isolate salmonellae.

Faecal specimens were collected in 22% of cases within 10 hours of symptom onset. Part of the specimens was processed to detect *Salmonella spp.*, *Shigella*, *Campylobacter*, *Vibrios* and other enteropathogens using the enrichment medium sodium, Salmonella and Shigella medium and CLED medium (Cystine Lactose Electrolyte Deficient). No test for staphylococcal enterotoxins was performed [8].

Environmental investigation and public health response

We interviewed the food handler regarding food purchase, preparation process, storage and cleaning procedures. The list of food items served during dinner has been established (Couscous, Tajine of Chicken, Green Olives, Tomato Sauce, Melon, Bread and Coca Cola).

Ethics statements

Ethical approval was not required for this study because the main of the epidemiological investigation was to determine the extent of the poisoning, its source, its characteristics and to control public health threat. All participants had given their verbal informal consent. Laboratory tests were performed following routine diagnosis and treatment procedures [9,10].

Results and Discussion

Description of the outbreak

Nine of the 15 guests were identified (attack rate of 60%). The average age of the study population was 39 ± 11.9 years with a female sex ratio of 0.28. The mean incubation period was 3 ± 3h30 a.m. Cases began to occur on June 10th at 20'clock and the peaked on the same day at 2:30 a.m with 3 cases with last case at 12:00 p.m on the same day (Figure 1).

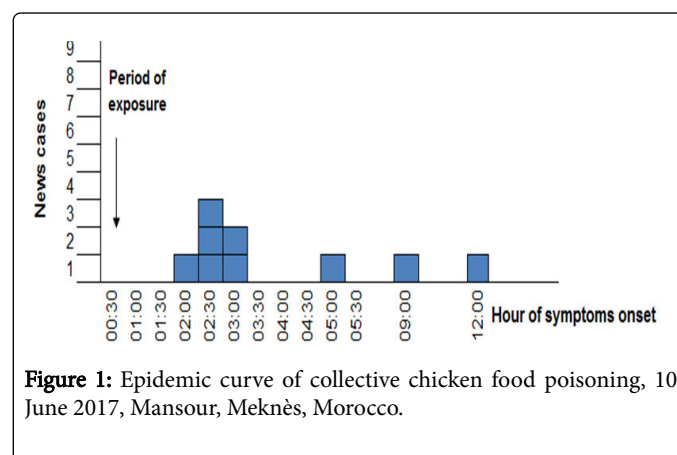


Figure 1: Epidemic curve of collective chicken food poisoning, 10 June 2017, Mansour, Meknes, Morocco.

The most frequently reported symptoms were vomiting (88.9%), dizziness (88.9%), abdominal cramping (44.4%), headache (44.4%) and fatigue (33.3%) (Table 1).

Symptoms	Frequency (%)
Vomiting	8 (88.9)
Dizziness	8 (88.9)
Abdominal cramping	4 (44.4)
Headache	4 (44.4)
Fatigue	3 (33.3)
Tachycardia	2 (22.2)
Fever >37°C	1 (11.1)
Excessive thirst	1 (11.1)
Nausea	1 (11.1)

Table 1: Distribution of symptoms of collective food poisoning, Meknes, Morocco, June 2017.

Cohort study

Food specific attack rate for tomato sauce was 83.3%, while that of green olives and tajine of chicken was 75.0% each. People who had

consumed couscous were 2 times more likely to become (CI 95%; (0.38-10.4)). Only tajine of chicken was significantly associated with the occurrence of collective food poisoning (p=0.04) (Table 2).

	Incidence of disease								
	Among exposed			Among unexposed			RR	95% CI	p-value
	N	Total	%	N	Total	%			
Couscous	8	12	66.7	1	3	33.3	2.0	(0.4-10.4)	0.52
Tajine of kitchen	9	12	75.0	0	3	0.0	---	---	0.04
Melon	9	13	69.2	0	2	0.0	---	---	0.14
Green olive	3	4	75.0	8	11	72.7	1.0	(0.5-2.0)	1.00
Tomato sauce	5	6	83.3	7	9	77.8	1.1	(0.6-1.8)	1.00
Coca Cola	9	13	69.2	0	2	0.0	---	---	0.14
Bread	9	13	69.2	0	2	0.0	---	---	0.14

Table 2: Incidence of *Staphylococcus aureus* infection according to selected characteristics, retrospective cohort study. Mansour, Meknes Morocco, 10 June 2017.

Environnemental results

The interview conducted with food handler the dinner showed that the hands were not washed with soap before handling food. However, he reported having handled the foods provided on a cleaned surface with clean utensils. The tajine of chicken was cooked previously thawed (7 hours) at room temperature. None wounds or boils were found. The tajine of chicken prepared for dinner has remained more than 12 hours at room temperature of the kitchen. Indeed, the tajine was cooked at 12:00 p.m of June 09, 2017 and consumed at midnight thirty. Before consumption, the tajine was slightly warmed [11-13].

Microbiological results

The results of the food and stool specimen from the patients were all negative. Staphylococcal poisoning, particularly *Staphylococcus aureus*, is one of the major causes of food-borne bacterial infections worldwide. They are caused by the enterotoxins produced by these bacteria in foods such as meats, eggs and ice creams [3]. These enterotoxins cause rapid onset of nausea, vomiting and abdominal cramps with the presence or absence of diarrhea.

Depending on the immunity of persons and the amount of enterotoxin ingested, the average incubation period is 3 hours with a minimum duration of 30 minutes and a maximum duration of 8 hours [4]. In our study, all the clinical symptoms and the average period of incubation were in favor of a collective food poisoning due to the enterotoxins produced by the *S. aureus*, however the biological specimens obtained from the patients and the foodstuffs didn't allow the isolation of the germ, which could probably be explained by the destruction of the bacterium during the refrigeration of the rest of the food. In this epidemic, the risk factor associated with intoxication was chicken tajine. Defrosting the chicken for 7 hours without respecting the cold chain could be the cause of the proliferation of staphylococci and the production of enterotoxins. The subsequent warming of the chicken did not destroy the thermostable toxin.

There were some limitations to our study, including the non-biological confirmation following the non-isolation of the germ. In the present investigation, the alert was reported early at the CPE in Meknes and allowed to set up the first actions of case management and seizure of the dishes available the same day of the poisoning. Active case finding was conducted. A questionnaire administered face-to-face the same day made it possible to limit the biases of response and memory.

Conclusion and Recommendation

This investigation made it possible to confirm the occurrence of a TIAC on June 10th 2017 with 9 cases belonging to the same family.

The source of contamination guided by clinical signs would be in favor of poor preservation of food. Some recommendations can be made following this survey, in particular raising public awareness of the importance of respecting the cold chain and the rules of food hygiene.

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Author Contributions

Touria Essayagh: Designed the study, collected data, analyzed, interpreted the results and drafted the manuscript; Abderrahman El Rhaffouli: Designed the study and collected data; Mohamed Khouchoua: Drafted the manuscript; Sanah Essayagh: Analyzed, interpreted the results and drafted the manuscript; Asmae Khattabi: Drafted the manuscript.

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