Outbreak of probable foodborne ciguatera intoxication at a training center - Haïti, September 27th, 2013

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BACKGROUND
Foodborne Illness

- Foodborne diseases are an important cause of morbidity and mortality worldwide
- In the United States, each year 76 million cases and 5,000 deaths are reported due to foodborne diseases
- In Haiti, foodborne diseases are typically not documented nor investigated
Detection of the illness

- On September 27th 2013, the Haiti Ministry of Public Health was notified of many persons with gastrointestinal illness at a residential adult training center in Petion-ville.

- The training center has:
  - approximately 1,200 trainees
    - Entry-level: 1,150 trainees
    - Advanced-level: 50 trainees
  - a cafeteria that provides meals twice a day
Detection of the illness

- The illness was of sudden onset and characterized by stomach cramps, diarrhea, nausea, vomiting, itching, and dizziness.
- Many reported eating a buffet lunch on September 27.
- FETP was invited to investigate the illness.
OBJECTIVES
Objectives

- To characterize the illness in terms of time, place and person
- To identify the causative agent
- To identify risk factors associated with the illness
- To develop and implement prevention and control measures
METHODS
Data collection

- Review of medical records of the ill persons hospitalized
- Face-to-face administration of semi-structured questionnaire on paper to persons who ate the buffet lunch on September 27
  - hospitalized and non-hospitalized persons
  - food history, demographic and clinical data
  - prior verbal consent
Case definition

Trainees who, up to 48h after eating the buffet-lunch on September 27, developed one or more of the following signs

- stomach cramps
- nausea or vomiting
- diarrhea
- dizziness
- muscle pain or itching
Laboratory

- Clinical samples: stools were collected from ill persons
  - *Shigella*
  - *Escherichia coli*
  - *Salmonella*
  - *Vibrio cholera 01 Ogawa*

- Environmental samples: water
  - residual chlorine test, ortholidine method
  - Bacteriologic – total coliforms E. Coli
Inspection of facilities

- Hygenic conditions
  - Kitchen
  - Food storage area
  - Cafeteria
- Food storage and handling practices
- Cooking practices
Data Analysis

- Data compiled in Excel database
- Analysis: using Epi Info™ 7
- Calculations
  - Means, range
  - Frequencies, Chi-square, Fisher’s exact
  - Rates of attack
  - Hospitalization and fatality rates
  - Relative risk with 95% confidence intervals
RESULTS
Temporal Distribution of Onset of Symptoms Among Cases - Petionville, Haiti, September 27th, 2013

Time of lunch: 12 PM

n = 34
Sociodemographic characteristics of the cohort (n=44)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>32</td>
<td>72.7</td>
</tr>
<tr>
<td>Female</td>
<td>12</td>
<td>27.3</td>
</tr>
<tr>
<td><strong>Age group (Mean, Range)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-29</td>
<td>3</td>
<td>6.8</td>
</tr>
<tr>
<td>30-39</td>
<td>8</td>
<td>18.2</td>
</tr>
<tr>
<td>40-49</td>
<td>32</td>
<td>72.7</td>
</tr>
<tr>
<td>≥ 50</td>
<td>1</td>
<td>2.3</td>
</tr>
</tbody>
</table>
## Sociodemographic characteristics of cases (n=34)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No</th>
<th>%</th>
<th>Attack rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>25</td>
<td>73.3</td>
<td>78.1</td>
</tr>
<tr>
<td>Female</td>
<td>9</td>
<td>26.5</td>
<td>75.0</td>
</tr>
<tr>
<td>Age group (Mean, Range)</td>
<td>(42 years, 26-49)</td>
<td>(42 years, 26-49)</td>
<td></td>
</tr>
<tr>
<td>20-29</td>
<td>1</td>
<td>3.0</td>
<td>33.3</td>
</tr>
<tr>
<td>30-39</td>
<td>5</td>
<td>14.7</td>
<td>62.5</td>
</tr>
<tr>
<td>40-49</td>
<td>28</td>
<td>82.3</td>
<td>87.5</td>
</tr>
</tbody>
</table>
34 (77.3 %) trainees of the 44 who ate the buffet lunch became sick.

The median of duration between eating and onset of symptoms was 2 hours (range: 15 minutes to 12 hours).
Distribution of signs and symptoms among cases in a training center, Petion-ville, Haiti, September 2013

- Diarrhea 79.4%
- Headache 64.7%
- Dizziness 64.7%
- Vomiting 58.8%
- Nausea 50%
- Abdominal cramps 32.4%
- Mialgia 17.6%
- Fever 8.8%
- Pruritus 5.9%
- Hypotension 3%
- Bradycardia 3%

N=34
Severity of illness (n=34)

- Hospitalisation rate: 49.0 %
- Fatality rate: 0%

- Severe dehydration: 17%
- Moderate dehydration: 14%
- Mild dehydration: 64%
- Don’t know: 5%
Hospital management

- The median between onset of symptoms and management of patients was 2 hours
- Main treatment was: rehydration
- Some patients had antibiotic
### Relative risk of food consumed by the trainees, Petion-Ville, Haiti, September 2013

<table>
<thead>
<tr>
<th>Risks factors</th>
<th>Number of persons consumed and sick</th>
<th>Number of persons who didn’t consumed and became sick</th>
<th>RR</th>
<th>CI 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>12</td>
<td>21</td>
<td>0.6</td>
<td>0.4-1.0</td>
</tr>
<tr>
<td>Wheat</td>
<td>21</td>
<td>11</td>
<td>1.5</td>
<td>0.9-2.2</td>
</tr>
<tr>
<td>Fish**</td>
<td>34</td>
<td>0</td>
<td>7.0</td>
<td>1.1-43.9</td>
</tr>
<tr>
<td>Salad</td>
<td>21</td>
<td>12</td>
<td>1.2</td>
<td>0.8-1.8</td>
</tr>
<tr>
<td>Mashed Potatoes</td>
<td>17</td>
<td>15</td>
<td>1.4</td>
<td>0.9-1.9</td>
</tr>
<tr>
<td>Grenadia juice</td>
<td>14</td>
<td>18</td>
<td>1.3</td>
<td>0.9-1.4</td>
</tr>
<tr>
<td>Orange juice</td>
<td></td>
<td></td>
<td>0.9</td>
<td>0.6-1.3</td>
</tr>
</tbody>
</table>

**RR**: Relative Risk, **CI 95%**: Confidence Interval at 95%
Laboratory Results

- All (10) stools collected were negative for:
  - Salmonella
  - E. coli
  - Shigella
  - Vibrio cholerae 01 Ogawa

- Chlorine content of the water used for food preparation:
  - 0
Inspection findings (I)

- Poor sanitation structures in the training center, including: kitchen, cafeteria, storage tank, storage
- Workers do not seem to master the techniques of food hygiene
- Food handlers had no medical clearance available
Inspection findings (II)

- Food storage and conservation status does not meet the standards.
- Products ready to be consumed are stored in the same place as other products such as semi cooked.
- The labelling of food products is virtually absent and there were no leftovers for inspection.
DISCUSSION
Ciguatera intoxication

- Occurs in persons within 24 hours after eating fish contaminated with ciguatoxin produced by dinoflagellates.
- Incubation period: 1-48 hours.
- Symptoms aren’t specific and include digestive and neurological symptoms.
- Generally, the digestive symptoms followed by neurological symptoms such as weakness in the extremities and cardiac symptoms such as bradycardia.
- Most patients recover a few days after the intoxication.
Duration of symptoms

- similar to the studies results of Arcila et al
  - the range of time for onset of symptoms is 20 minutes to 12 hours

By the frequency of the symptoms

- predominant symptoms were similar to the results obtained during the Yatsumoto study
  - gastrointestinal symptoms follow by neurological symptoms
In this study

- A low percent of people had hypotension and bradycardia
  - It could be as a result of rapid medical intervention
Control measures

- Temporary closure of the cafeteria
- Decontamination of the site by chlorination
- Food handlers sanitary education (food preparation, hand washing)
Limitations

- Inability to test leftovers foods for isolation of the toxin
- Failure to trace the source of the fish consumed in the buffet
Conclusion

- First documented outbreak of ciguatera intoxication in Haiti

Table B-2. Guidelines for confirmation of foodborne-disease outbreaks (Chemical)

<table>
<thead>
<tr>
<th>Etiologic Agent</th>
<th>Incubation Period</th>
<th>Clinical Syndrome</th>
<th>Confirmation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine toxins - Ciguatoxin</td>
<td>1-48 hrs; usually 2-8 hrs</td>
<td>Usually gastrointestinal symptoms followed by neurologic symptoms (including paresthesia of lips, tongue, throat, or extremities) and reversal of hot and cold sensation</td>
<td>Demonstration of ciguatoxin in epidemiologically implicated fish OR Clinical syndrome among persons who have eaten a type of fish previously associated with ciguatera fish poisoning (e.g., snapper, grouper, or barracuda)</td>
</tr>
</tbody>
</table>

RECOMMENDATIONS
Since ciguatera is typically caused by large tropical reef fish such as barracuda, amberjack, etc., the disease can be avoided by not eating them.

A surveillance system should be established to detect ciguatera outbreaks caused by eating fish which can cause ciguatera.
Also we recommend to:

- Train supervisory personnel and food handlers
- Hire 2 health technicians to control environmental health
- Apply the relevant principles of hygiene in the food supplies
- Provide a refrigerator for storage for 48h sample food (cooked or raw)
- Chlorinated drinking water
- Set the storage of foods
Acknowledgment

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UVG

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