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ORIGINAL ARTICLE

A survey on 80 cases of botulism and its clinical presentations as a public health concern

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ABSTRACT

Background: Botulism is a toxin-induced paralytic illness characterized by cranial nerve palsies and descending flaccid paralysis. Botulinum toxin is regarded as the most lethal ever-known substance. The diagnosis in sporadic cases and even in small outbreaks is the main physicians' challenge. The aim of this study was to assess clinical presentations of 80 cases of botulism referred to Loghman Hakim hospital in Tehran.

Materials and methods: A total of 80 botulism cases referred during a 10-year period (1996-2006) were included. The diagnosis of botulism was verified on epidemiological data and a clinical score of severity. Patients were assigned in 3 groups: mild, intermediate and severe.

Results: The study population included 40 males and 40 females with a mean age of 30.7±15.2 years (a range, 1-66 years). The suspected causative foods were cheese in 25 (31%), and sea-food in 20 (25%). The mean incubation period was 1.1±1.8 days (a range, 4 hours-10 days). Nausea and vomiting was noted as the first symptom in 17 cases. Diagnosis was confirmed in 47 patients (58.8%). The most common toxin subgroups were A (in 22 cases) and E (in 15 cases). All the patients were treated with antitoxin and recovered without sequel, however, 6 patients were admitted to intensive care unit (ICU) and required ventilatory support. Only one patient (1.3%) died.

Conclusion: The mainstays of therapy are meticulous intensive care (including mechanical ventilation, when necessary) and promptly treatment with antitoxin. Antitoxin should be given early in the course of illness, ideally <24 hours after onset of symptoms.

Keywords: *Botulism, Foodborne, Toxin*.
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INTRODUCTION

Botulism is a toxin-induced paralytic illness characterized by cranial nerve palsies and descending flaccid paralysis. Food-borne botulism results from eating foods containing botulinum toxin (1). Although rare, food-borne botulism is a public health emergency because of the potential severity of illness and exposure of many persons to contaminated food. C. botulinum spores exist widely in the environment, but proper food-preparation practices inhibit spore germination and toxin production (2).

Environmental conditions that facilitate spore germination and growth include pH>4.6, anaerobic conditions, low salt or sugar content, and a temperature of 4–121°C (2,3). Botulinum toxin is regarded as the most lethal ever-known substance.

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It is estimated that the human LD50 for inhalation botulism is 1 to 3 nanograms of toxin/kilogram body mass (4). The clinical syndrome of botulism is highly distinctive, consisting of symmetrical cranial nerve palsies, followed by symmetrical descending flaccid paralysis that may progress to respiratory arrest (5,6).

For a sporadic case, the differential diagnosis is not extensive, and the combination of neurological findings and specific laboratory tests provide highly sensitive clinical diagnosis pending laboratory confirmation (7). A cluster of ≥2 cases with compatible symptoms is essentially pathognomonic, because the illnesses that most resemble botulism do not produce outbreaks. The diagnosis in sporadic cases and even in small outbreaks is frequently missed, partly because botulism is a rare disease with which most clinicians are unfamiliar (8).

Confirmation of botulism rests on demonstration of the toxin in specimens of patient serum, gastric secretions, or stool or in a food sample (7). Clinical samples for suspected cases of food-borne botulism include serum (10 mL), vomitus or gastric secretions, stool (ideally ≥25mg), and suspect foods in original containers (7). The overall sensitivity of laboratory tests of clinical specimens has been reported to be as low as 33–44% (9,10) but varies inversely with the time elapsed between symptom onset and sample collection. In general, ingested toxin is not demonstrable in serum one week after exposure. Toxin can be isolated from stool samples farther in the course of illness, and the toxin is stable in many food matrices for a considerably longer period (11).

The aim of this study was to assess clinical presentations of recorded Botulism as a public health concern from Loghman Hakim hospital, in Tehran, over a 10-year period. Meanwhile, a scheme for evaluating severity based on the main clinical signs was proposed.

PATIENTS and METHODS

A descriptive study was conducted on 80 admitted botulism cases between 1996-2006 in Loghman Hakim hospital , in Tehran (capital of Iran). The diagnosis of botulism was verified on epidemiological data and a clinical score of severity. The previously proposed clinical symptoms and signs were used to establish a clinical score of severity which permitted classification of the disease into three forms: mild, intermediate, and severe. These signs and symptoms were: 1-Problems of accommodation (visual impairment), 2-Dryness of the mouth (dry syndrome), 3-Retarded intestinal transit, 4-Dysphagia with liquid and/or solid meals, 5-Persistent constipation, 6-Urinary symptoms, 7-Asthenia, 8-Respiratory paralysis, and 9-Peripheral paralysis and impossibility of oral feeding. Each symptom or sign was scored for 1 point. Therefore, score ≤3 was defined as mild, 4-7 as intermediate and 8-9 as severe form. Clinical samples for suspected cases of food-borne botulism include serum (10 mL), vomitus or gastric secretions, stool and suspect foods in original containers that were evaluated for toxin or C.botulinum. Botulinum toxin was detected by bioassay.

Demographics and disease information including age, gender, the lag time between the onset of symptom and arriving the hospital, the lag time between the onset of symptom and antitoxin administration, signs and symptoms were documented by a baseline questionnaire. For all tests, significance was defined as $p<0.05$. All statistical analyses were achieved using SPSS software (SPSS version 11.5, USA).

RESULTS

The study population included 40 (50%) males and 40 (50%) females with a mean age of 30.7±15.2 years (a range, 1-66 years). The suspected causative foods were cheese in 25 (31.3%), and sea-food in 20 patients (25%). The mean incubation period was 1.1±1.8 days (a range,

4 hours to 10 days) and the mean lag time between the onset of symptoms and arriving into the hospital and starting antitoxin therapy was 3.8±4.0 days (a range, 2 hours to 17 days) and 3.9±4.3 days (a range, 2 hours to 17 days), respectively. Nausea and vomiting was noted in 17 cases (21.3%) as the first symptom (table 1). Of 80 cases, 48 (60%) were familial, 17 (21.2%) were detected during an outbreak and 15 cases (18.8%) were sporadic.

Totally, 11 (13.7%) patients were suffered from severe illness, compared to 5 (6.3%) from intermediate and 64 (80%) from mild forms. Meanwhile, the diagnosis was confirmed in 26 patients (32.5%) (table 2).

Table 1. *Distribution of patients with botulism according to the first symptom, Loghman Hakim hospital, 1996-2006.*

First symptom	Frequency	Percentage
Diplopia	6	7.5
Blurred Vision	7	8.8
Ptosis	8	10
Dizziness	15	18.8
Asthenia	10	12.5
Nausea &Vomiting	17	21.3
Diarrhea	2	2.5
Low limb force	1	1.3
Drowsiness	5	6.3
Impaired oral feeding	1	1.3
Dry throat & mouth	2	2.5
Abdominal pain	3	3.8
Neck & shoulder pain	1	1.3
Dysartheria	1	1.3
Dysphagia	1	1.3
Total	80	100

Table 2. *Distribution of patients with botulism according to the confirmation status of their disease, Loghman Hakim hospital, 1996-2006*

Specimen	Frequency	Percentage
Unknown	33	41.2
Toxin in serum	15	18.7
Toxin in stool	7	8.7
Organism in stool	1	1.3
Toxin in gastric secretion	1	1.3
Toxin in food	22	27.5
Toxin in serum & stool	1	1.3
Total	80	100

The most commonly found toxin subgroup was A (27.5%), followed by E (20%). One patient had both A and B toxin subgroups, however, another one had both A and E toxin subgroups.

Of 11 patients with severe illness, 6 were found to have botulinum toxins (E, A, and E-A in 4,1, and 1 patients, respectively), while in 5 patients toxin was not detected. Among these, 8 were familial, 2 were sporadic and 1 was detected during an outbreak. There was a significant correlation between the type of reported disease (familial, sporadic, outbreak) and severe form of the disease ($p<0.005$).

Meanwhile, type of toxin was neither correlated with clinical presentations nor with severity of disease.

All patients were treated with antitoxin and recovered without sequel, however, 6 were admitted to intensive care unit (ICU) and required ventilatory assistance. Only one patient (1.3%) presented with severe illness, died in whom toxin assay was negative.

DISCUSSION

A total of 80 patients with botulism represent only a proportion of the cases in our country. It appears that the incidence of botulism in certain regions is high. This may be in part associated with traditional food and traditional home-made food practice (12). It can be estimated that there is an average of 8 cases of botulism per year in Loghman Hakim hospital in Tehran. Roblot reported an average of 4.15 cases of botulism annually in Poitiers in France (13). In our study, both genders were equally infected, in contrary, Roblot, Wainwright and Quenum showed men to be affected more commonly than women (13-15).

In our study, the mean incubation period was 1.1±1.8 days (a range, 4 hours to 10 days) and the mean lag time between the onset of symptoms and arriving into the hospital and starting antitoxin

therapy was 3.8±4.0 days (a range, 2 hours to 17 days) and 3.9±4.3 days (a range, 2 hours to 17 days), respectively. Roblot (13) reported a mean incubation period of 3.45 days (a range, 5 hours to 16 days) and the mean lag time between the onset of symptom and diagnosis of 7.1 days (a range, 3-32 days). Lecour reported an incubation period of 10 hours to 6 days (16). Although the diagnosis in sporadic cases and even in small outbreaks is frequently missed (8), it appears that the diagnosis is often early in our geographic area.

Similar to Roblot study, mild form of illness was the most common form of presentation (13). Meanwhile, the observed clinical presentations were in agreement with previously published studies (13-15).

Confirmation of botulism rests on demonstration of the toxin in specimens of patient serum, gastric secretions, or stool or in a food sample (7). In our study, the diagnosis was confirmed in 47 patients (58.8%), among whom toxin was detected in serum of 14 cases (17.5%). Roblot (13) and Fourrier (17) detected toxin in sera of 52% and 50% of their patients, respectively.

We detected toxin in stool samples of 7 cases (8.8%), however, Barker (18) reported botulism type B outbreak caused by a commercial food product in which serum specimens obtained from all patients were negative for toxin, but stool specimens from three patients were positive for type B toxin. Toxin can be isolated from stool samples farther in the course of illness (11).

Environmental conditions that facilitate spore germination and growth include pH>4.6, anaerobic conditions, low salt or sugar content, and a temperature of 4–121°C (2,3). Home-canned vegetables (19), fruits and food products are now the most common sources. Spores can be inactivated by exposure to a high temperature, i.e., 116-121°C (20).

We had only one death. Quenum et al reported 2 fatal cases in France between 1987-1988 (15), however, mortality was much higher (53%) in Wainwright study (14). Roblot reported no death in his study (13).

All patients were treated with antitoxin and recovered without sequel. The mainstays of therapy are meticulous intensive care (including mechanical ventilation, when necessary) and promptly treatment with antitoxin (2). Antitoxin can arrest the progression of paralysis and decrease the duration of paralysis and dependence on mechanical ventilation. Antitoxin should be given early in the course of illness, ideally <24 hours after onset of symptoms (21,22), because antitoxin neutralizes only toxin molecules that are yet unbound to nerve endings.

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