Epidemiological Report

Botulism
Historic Series 2010 – 2021

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BRIEF HISTORY OF BOTULISM

It is a serious neuroparalytic disease, caused by a potent neurotoxin produced by bacteria *Clostridium botulinum*. Botulism has a relatively low incidence and, when is caused by food, represents a public health emergency, as a single case is considered an outbreak by the Ministry of Health, since it may indicate the possible existence of others associated with the same food that may have been consumed by more people.[1,2]

It is characterized by bilateral, symmetric, descending flaccid paralysis that always starts in the cranial nerves. It can progress to respiratory failure and death due to paralysis of the diaphragm and accessory muscles of breathing.[1,2]

The average incubation period is 12 to 36 hours after ingestion of the contaminated food, It depends on the toxin amount ingested. The greater the amount of toxin, the shorter the incubation period and the greater the severity and letality.[1,2]

ETIOLOGICAL AGENT

The bacteria *C. botulinum* is an anaerobic Gram-positive bacillus, commonly found in soil, vegetables, fruits, human feces, and animal excrement, in the form of spores. These are resistant to boiling, pasteurization and home methods of disinfection.[1,2]

In an anaerobic environment, with a basic pH or close to neutral, the spore germinates and starts to produce the toxin, which is one of the most potent known and has neurotropic action, which acts on the presynaptic membrane of the neuromuscular junction, blocking the release of acetylcholine. Unlike the spore, the toxin is thermolabile, being destroyed at a temperature of 80 °C for ten minutes or at 100 °C for five minutes.[1,2]

Seven types of *C. botulinum* are known (A, B, C, D, E, F and G), based on the antigenic specificity of the toxin produced. Types A, B, E and F are those that cause botulism in humans, C and D cause the disease in animals; and C and E also cause botulism in birds. To date, no cases of type G toxin have been identified.[1,2]

FORMS OF BOTULISM AND MODES OF TRANSMISSION

The following forms of botulism are described, according to the mode of transmission:[1,2]

- **Foodborne form** – It is the most common, responsible for sporadic outbreaks. It is caused by eating foods that have been improperly preserved or processed, they contain preformed neurotoxin. It is common in homemade or commercially produced preserves, but the source can be any food.
- **Wound botulism** – It is a rare disease, with production of the toxin *in vivo*, in an infected wound.
- **Infant botulism** – Also known as nursing botulism (associated with sudden infant death syndrome), it occurs in children under 1 year of age due to the absorption of toxin produced in the child's own intestine, in which the absence of the protective microbiota allows colonization, germination of *C. botulinum* spores and toxin production in the intestinal lumen.
- **Adult botulism of intestinal colonization** – These are cases in which no food can be identified and there is no evidence of wound botulism. It occurs due to colonization of the intestine by *C. botulinum* with *in vivo* toxin production. The pathogenesis is analogous to that of infant botulism. It may occur in patients with a history of previous gastrointestinal surgery, inflammatory bowel disease, Crohn's disease, or long-term antibiotic use, with altered intestinal flora and a predisposition to enteric colonization by *C. botulinum*. Furthermore, the incubation period of this type of disease is unknown because it is impossible to know the exact moment of ingestion of the spores.

TREATMENT

It must be performed in a hospital unit that has an intensive care unit (ICU). General support measures and cardiorespiratory monitoring are the most important managements.[2-5]

Specific treatment aims to eliminate the circulating toxin using Botulinum antitoxin (BA). Before starting the specific treatment, all clinical samples for diagnostic tests must be collected.[2-5]

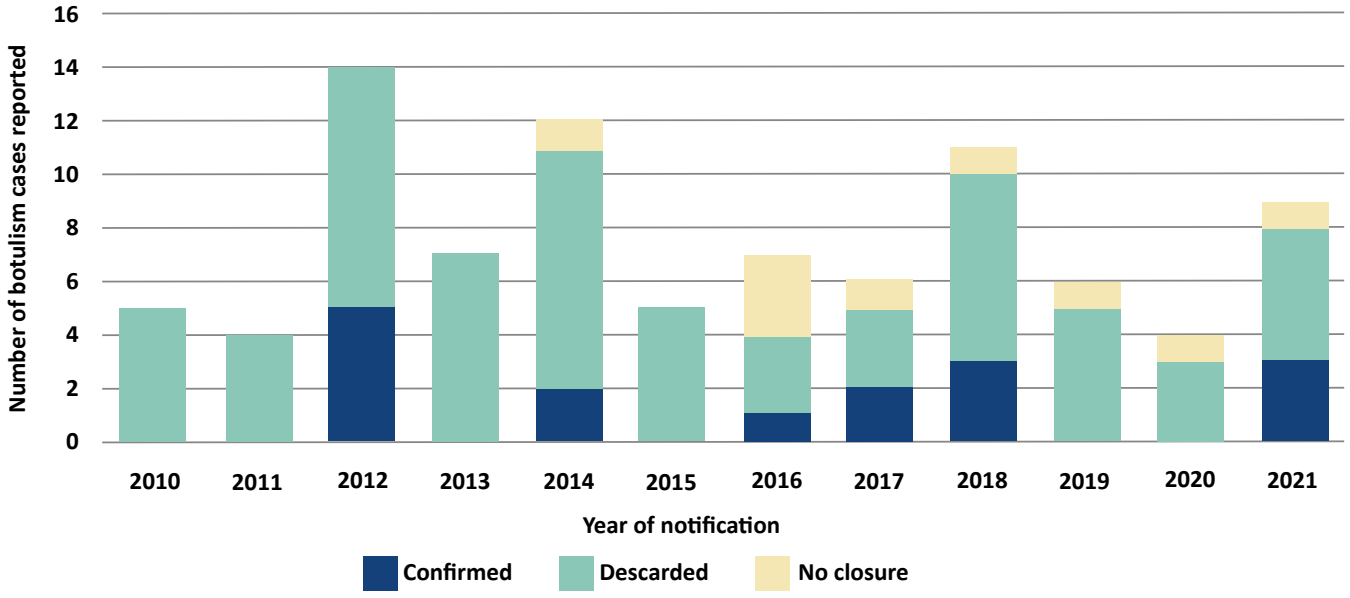
The BA acts against the circulating toxin, which has not yet fixed itself in the nervous system. Therefore, it is recommended that treatment with BA be performed as early as possible (up to seven days); otherwise, it will no longer be effective.[2-5]

EPIDEMIOLOGICAL SITUATION

In the state of São Paulo (SSP) there have been reports of confirmed cases since 1997. The Health Department made it a notifiable disease in the state, in 1999, through Resolution SS 165, of November 16 (DOE of 11/17/1999). Then, on October 18, 2001, by Ordinance GM/MS nº 1943, botulism was officially included in the list of notifiable diseases throughout the national territory.[2]

In this context, 90 suspected cases were reported in the SSP, of which 16 were confirmed as cases aggregated in outbreaks, or isolated, with 2012 being the year with the highest number of notifications (14) and confirmations (5) (Graph 1). It is also worth noting that, among the total notified, 65 were discarded and 9 are presented in the Notifiable Diseases Information System (Sinan) without the closing criteria fulfilled, considered as discarded cases.

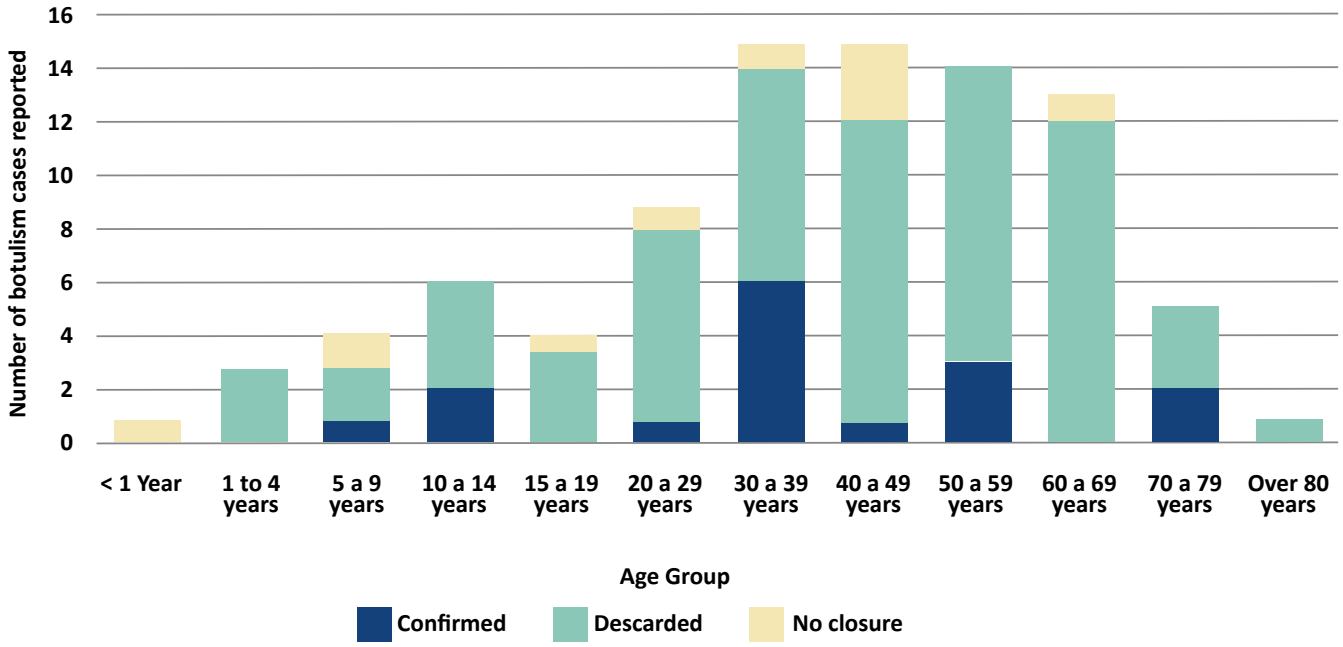
Graph 1. Reported cases of botulism, according to the closure criteria by year of notification, SSP, 2010 to 2021.*



Source: DFWD/ESC/SHD-SP. *Data extracted from Sinan and handled by DFWD/ESC/SHD-SP on June 20, 2022.

Analyzing the occurrences of notified and confirmed cases by age group, it is possible to affirm that the largest number of notifications is concentrated between 30 and 49 years old. The age group from 30 to 39 years old is the one with the highest number of confirmations of the disease in the period, representing 37.5% of the cases (Graph 2).

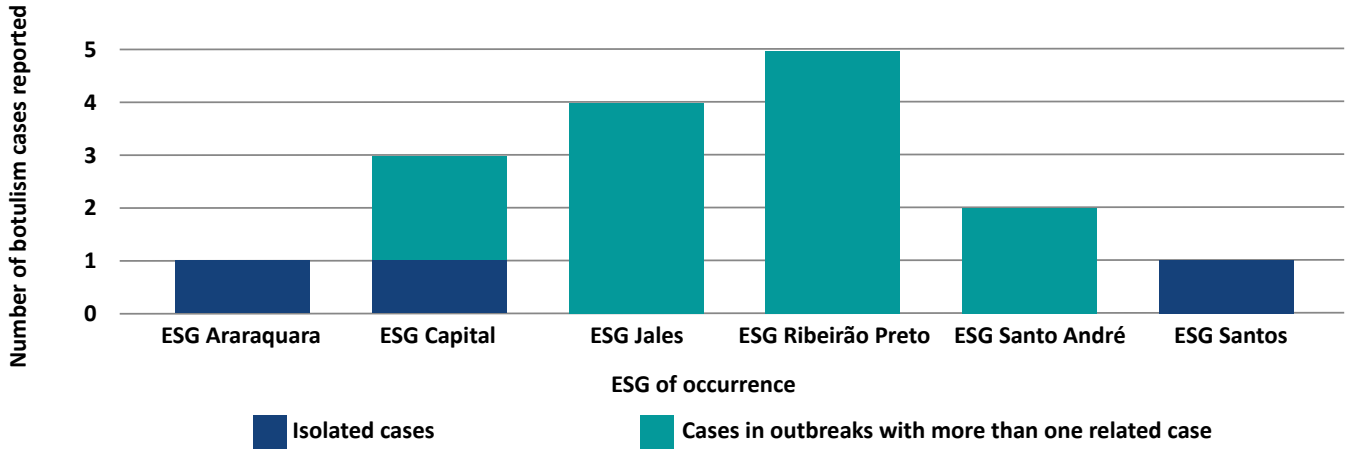
Graph 2. Reported cases of botulism, according to the age group closure criteria, SSP, 2010 to 2021.*



Source: DFWD/ESC/SHD-SP. *Data extracted from Sinan and handled by DFWD/ESC/SHD-SP on June 20, 2022.

In the period, it is possible to affirm that outbreaks were detected (with more than one related case) in the years 2012, 2014, 2017, 2018 and 2021, ranging from 2 to 4 cases per outbreak (Graph 3).

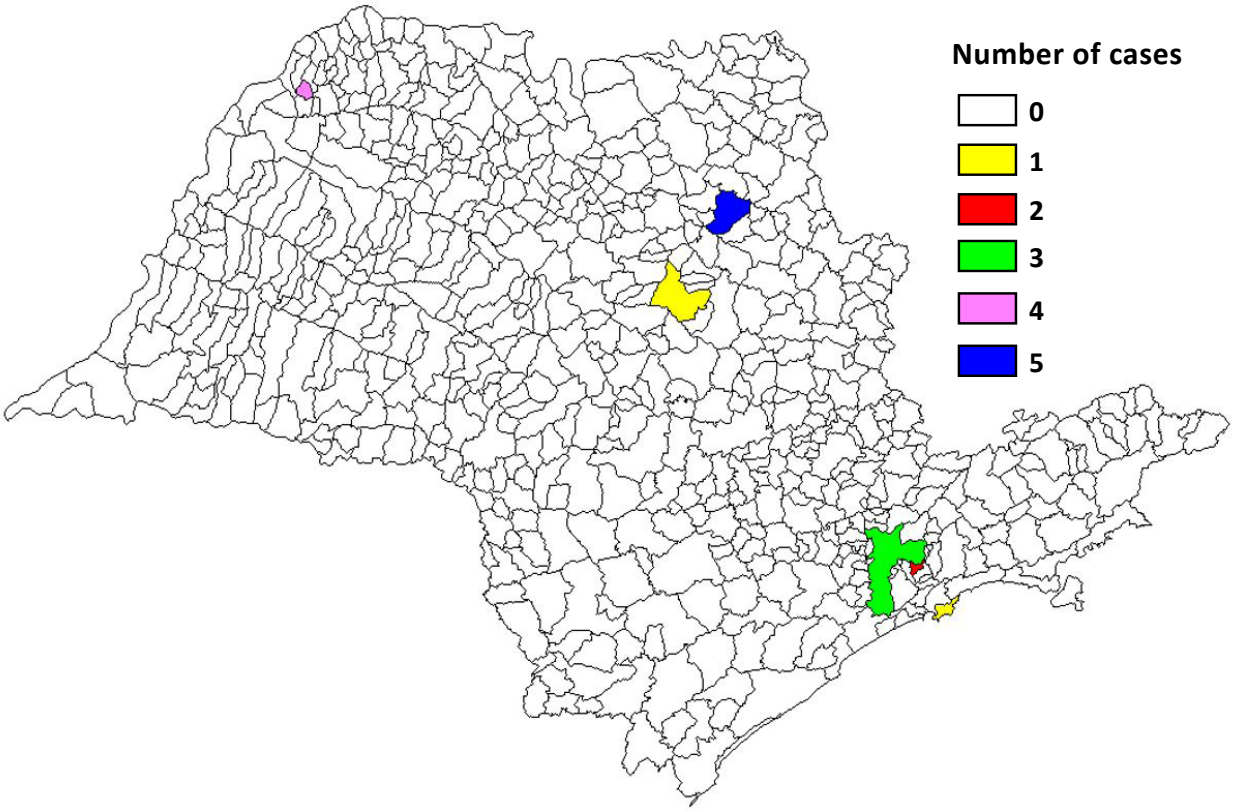
Graph 3. Isolated cases and cases in outbreaks with more than one related case of botulism, confirmed, by epidemiological surveillance group (ESG) of occurrence, SSP, 2010 to 2021.*



Source: DFWD/ESC/SHD-SP. *Data extracted from Sinan and handled by DFWD/ESC/SHD-SP on June 20, 2022.

There is no pattern of occurrence in relation to confirmed cases over the years, nor when analyzing the spatial distribution (Figure 1).

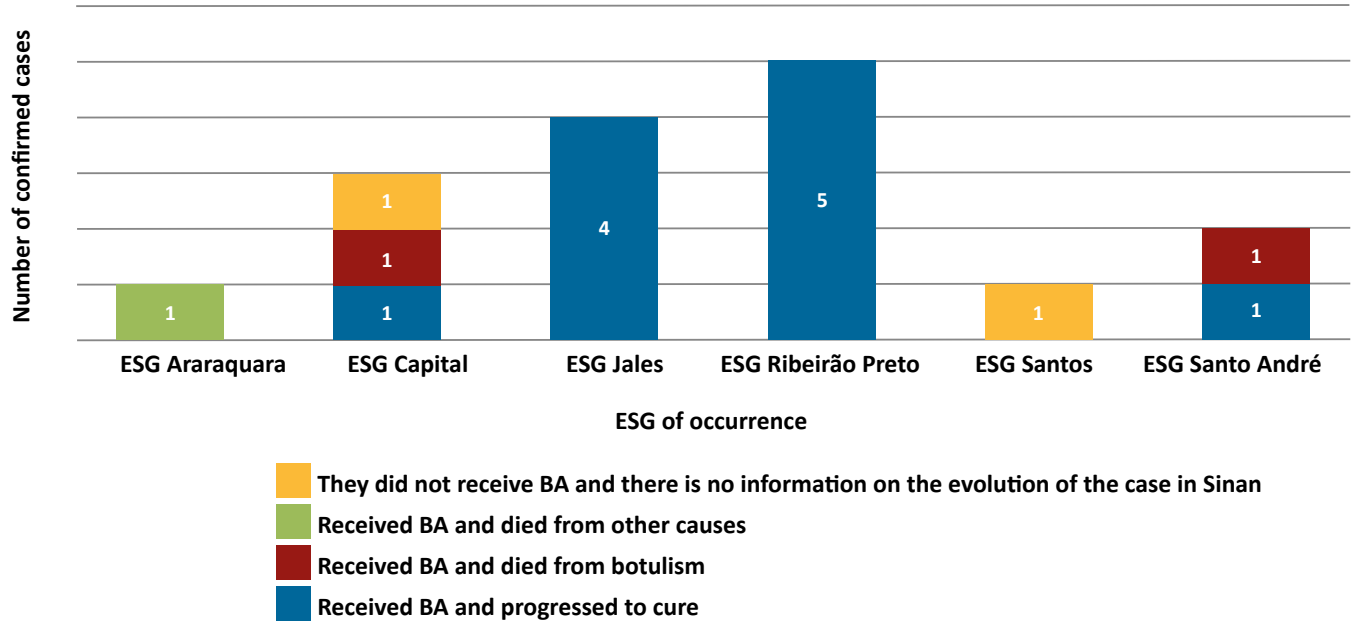
Figure 1. Spatial distribution of confirmed cases of botulism, by municipality of occurrence, SSP, 2010 to 2021.



Source: DFWD/ESC/SHD-SP. *Data extracted from Sinan and handled by DFWD/ESC/SHD-SP on June 20, 2022.

Regarding the treatment, it was observed that there was timely administration of BA, up to 7 days after the onset of flaccid paralysis/motor deficit, in 14 confirmed cases. In two other cases, BA was not administered because the recommended period had been exceeded; they do not include the evolution information (cases of ESG Capital and ESG Santos). Eleven cases progressed to cure, two to death from botulism and one to death from other causes (Graph 4). As for the age group, the deaths from botulism, one was between 30 and 39 years old and the other, 70 and 79 years old; for other causes was between 30 and 39 years old.

Graph 4. Confirmed cases of botulism according to evolution, by ESG of occurrence, SSP, 2010 to 2021.



Source: DFWD/ESC/SHD-SP. *Data extracted from Sinan and handled by DFWD/ESC/SHD-SP on June 20, 2022.

Laboratory confirmation is not necessary for the supply and administration of BA - only the analysis of the clinical aspects referring to the case definition. Thus, from 90 patients reported, 30 were treated with BA, as they had a very compatible clinical presentation.

In confirmed cases, the most frequent signs and symptoms in the evaluated period were: presence of dizziness (75%), blurred vision (75%), dysarthria (63%), vomiting (56%) and dyspnea (56%) (Table 1).

Table 1. Frequency of signs and symptoms reported by confirmed cases of botulism, SSP, 2010 to 2021.*

Reported symptom	Presence of symptom (n)	Frequency of symptom presence (%)	Symptom absence (n)	Frequency of symptom absence (%)	Not informed (n)	Frequency not informed (%)
Temperature	2	13%	14	88%	-	-
Nausea	5	31%	11	69%	-	-
Vomit	9	56%	7	44%	-	-
Diarrhea	6	38%	10	63%	-	-
Constipation	1	6%	15	94%	-	-
Headache	2	13%	14	88%	-	-
Dizziness	12	75%	4	25%	-	-
Blurred vision	12	75%	4	25%	-	-
Diplopia	7	44%	9	56%	-	-
Dysarthria	10	63%	6	38%	-	-
Dysphonia	6	38%	10	63%	-	-
Dry mouth	3	19%	13	81%	-	-
Wound	-	-	15	94%	1	6%
Floppy neck	5	31%	10	63%	1	6%
Dyspnea	9	56%	6	38%	1	6%
Respiratory failure	8	50%	8	50%	-	-
Cardiac insufficiency	-	-	16	100%	-	-
Coma	-	-	16	100%	-	-
Paresthesia	3	19%	12	75%	1	6%

Source: DFWD/ESC/SHD-SP. *Data extracted from Sinan and handled by DFWD/ESC/SHD-SP on June 20, 2022.

In the neurological examination, in addition to symmetrical and descending paralysis, with no change in sensitivity in 100% of the cases, the presence of eyelid ptosis (88%) and weakness in the upper (75%) and lower (75%) limbs are also common in these cases (Table 2).

Table 2. Frequency of signs and symptoms reported on neurological examination of confirmed cases of botulism, SSP, 2010 to 2021.*

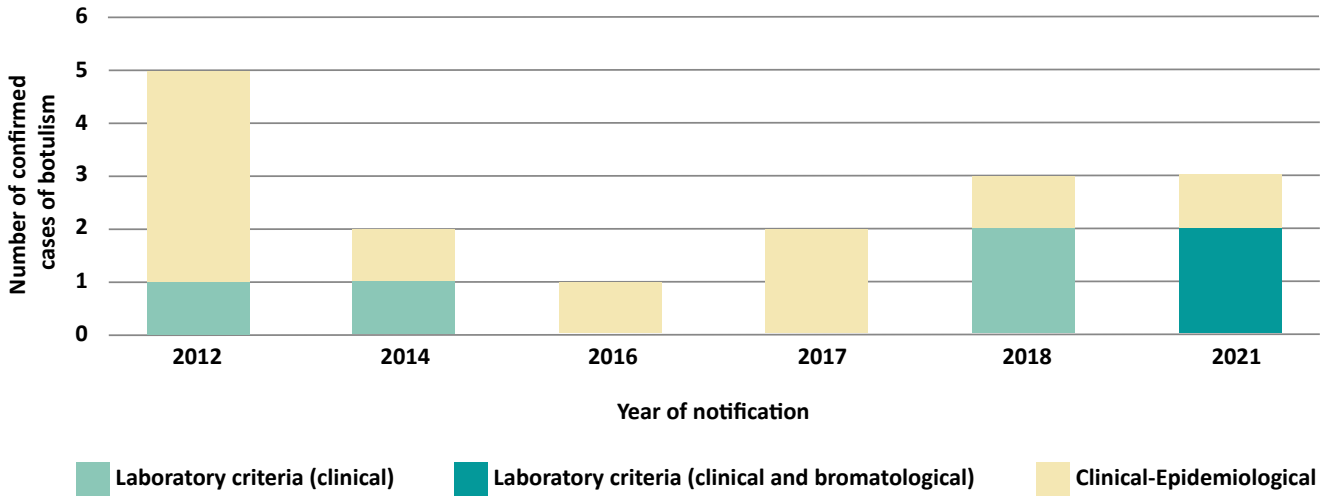
Reported symptom	Presence of symptom (n)	Frequency of symptom presence (%)	Symptom absence (n)	Frequency of symptom absence (%)	Not informed (n)	Frequency not informed (%)
Eyelid ptosis	14	88%	1	6%	1	6%
Ophthalmoparesis / ophthalmoplegia	6	38%	9	56%	1	6%
Mydriasis	6	38%	9	56%	1	6%
Facial paralysis	4	25%	11	69%	1	6%
Involvement of the bulbar musculature	5	31%	10	63%	1	6%
Lower limb weakness	12	75%	3	19%	1	6%
Upper limb weakness	12	75%	3	19%	1	6%
Sensitivity change	-	-	16	100%	-	-

Source: DFWD/ESC/SHD-SP. *Data extracted from Sinan and handled by DFWD/ESC/SHD-SP on June 20, 2022.

Regarding BA, it should be noted that, as it is heterologous, it is recommended that the patient be hospitalized in the ICU during its use, given the risk of adverse events. These, so far, have not been noticed in the administrations carried out in the SSP.

Notification and investigation must be immediate. All 90 reported cases were investigated, 10 of which were confirmed by clinical-epidemiological criteria and 6 cases by laboratory criteria (Graph 5).

Graph 5. Criteria for confirmation and closure of confirmed botulism cases, by year of notification, SSP, 2010 to 2021.*

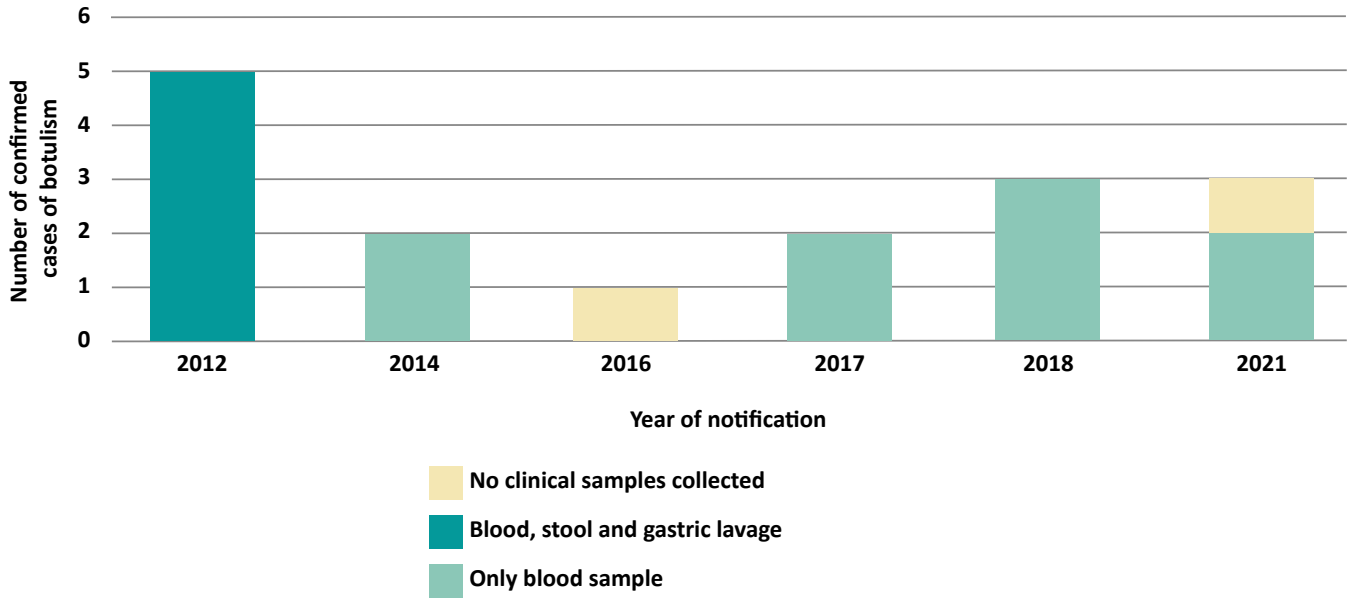


Source: DFWD/ESC/SHD-SP. *Data extracted from Sinan and handled by DFWD/ESC/SHD-SP on June 20, 2022.

Among the 6 laboratory confirmed cases, 100% were confirmed in clinical samples (blood, feces and/or gastric lavage) and, of these, 2 (33.3%) also had toxin detection in bromatological samples.

As for the clinical samples collected (Graph 6), in 9 of the 16 confirmed cases, only blood was collected and in 5 cases, blood, feces and gastric lavage. It is noteworthy that the six confirmations by laboratory criteria in clinical samples occurred through the analysis of serum (blood), with the detection of toxin.

Graph 6. Confirmed botulism cases according to the type of clinical samples collected, by year of notification, SSP, 2010 to 2021.

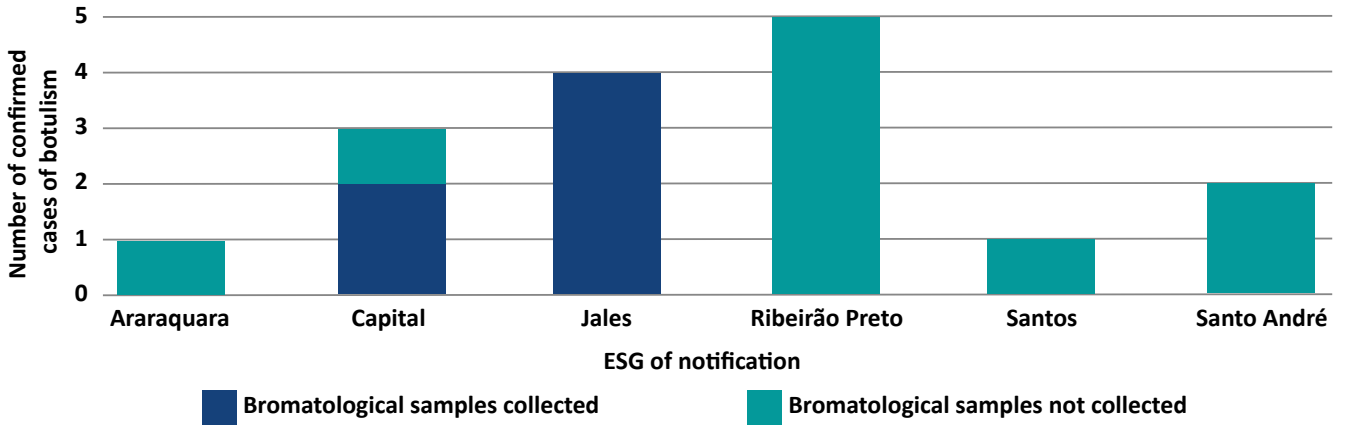


Source: DFWD/ESC/SHD-SP. *Data extracted from Sinan and handled by DFWD/ESC/SHD-SP on June 20, 2022.

Toxin A was found in 2 cases with clinical samples and 2 in bromatological samples. In 1 clinical sample, AB toxin was found.

It was concluded that all 16 cases are of the foodborne form. In 10 (62.5%) food collection was not performed (Graph 7).

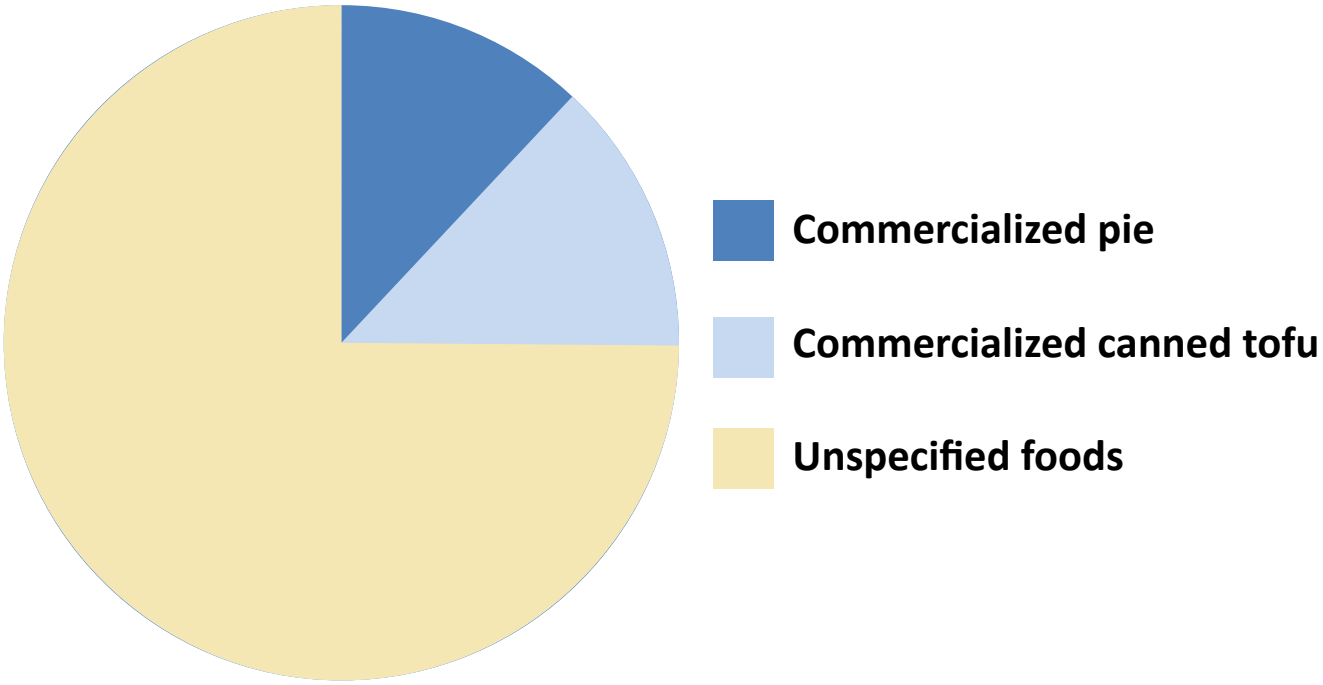
Graph 7. Collection of bromatological samples from confirmed cases of botulism, by ESG of occurrence, SSP, 2010 to 2021.*



Source: DFWD/ESC/SHD-SP. *Data extracted from Sinan and handled by DFWD/ESC/SHD-SP on June 20, 2022.

Among the incriminated or potentially suspect foods with which it was possible to establish a causal link, ready-made pies sold in the market (toxin detected in laboratory) and homemade preserves prevailed, demonstrating that the source can be any type of manipulated food. This is because the occurrence in many cases is related to errors in preparation, conservation, and consumption (Graph 8).

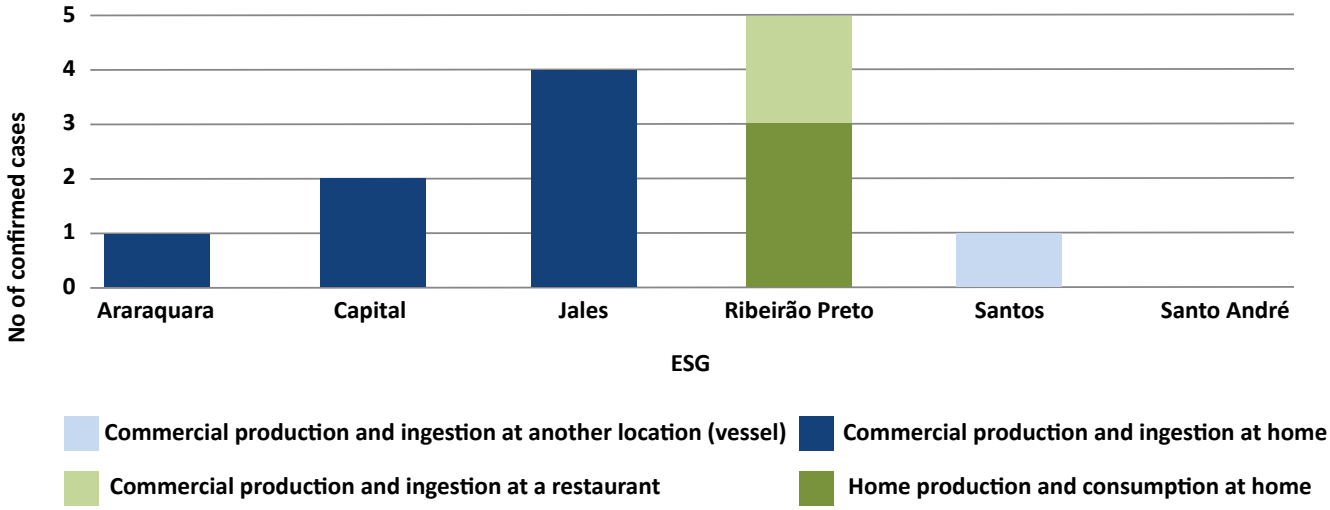
Graph 8. Incriminated or potentially suspect foods involved in confirmed cases of botulism, SSP, 2010 to 2021.*



Source: DFWD/ESC/SHD-SP. *Data extracted from Sinan and handled by DFWD/ESC/SHD-SP on June 20, 2022.

The ingestion of these foods occurred in a home environment. When analyzing the food intake data of all confirmed cases, it is possible to affirm that the highest frequency was in the home environment (62.5%). As for the type of production, commercial production was more frequent (62.5%) (Graph 9), with no information on the mode of production and place of ingestion referring to the two confirmed cases in ESG Santo André.

Graph 9. Foods involved in confirmed cases of botulism according to type of production and place of ingestion, by ESG of occurrence, SSP, 2010 to 2021.*



Source: DFWD/ESC/SHD-SP. *Data extracted from Sinan and handled by DFWD/ESC/SHD-SP on June 20, 2022.

OPERATIONALIZATION OF THE EPIDEMIOLOGICAL SURVEILLANCE SYSTEM

The botulism surveillance system presupposes:[2]

- integration of epidemiological and health surveillance actions in the investigation of suspected cases;
- laboratory back-up for specific diagnostic tests; and
- rapid availability of BA.

In the SSP, notification must be immediate to the Division of Food and Waterborne Diseases (55 11 3066-8234) and/or to the Central-CIEVS (0800-555466) for guidance on the procedures applicable in the clinical and epidemiological investigation of suspected cases.

Laboratory support is offered by Instituto Adolfo Lutz Central/SES-SP for the performance of specific tests to identify the toxin. The Butantã Institute/SHD-SP produces the AS, which is stored at the Vital Brasil Hospital, which is also responsible for distributing it to regional and municipal epidemiological surveillance teams, responsible for the investigation throughout the state.

Both specific laboratory tests for botulism, in clinical samples and food, and the release of serum must be authorized by the ESC, after notification made by the hospital and clinical discussion of the case.

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