

## Rise of Guillain Barre Cases Associated with Campylobacter Jejuni Infection in Mexico 2024

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**ABSTRACT:** Guillain-Barré syndrome is an autoimmune neurological disease that is currently the leading cause of acute flaccid paralysis in first and second level hospitals in Mexico, usually with a history of precursor infection by Campylobacter Jejuni described as gram- negative, aerobic and motile bacilli bacteria. In Mexico, an epidemiological alert was launched on March 5, 2024, which refers to an increase in cases of Guillain-Barré with a high suspicion of a previous infection by Campylobacter Jejuni, this in the state of Tlaxcala, Mexico. As of March 29, 2024, 81 cases of acute flaccid paralysis have been reported, of these, 42 cases have been positive for Campylobacter Jejuni bacteria and 34 have been classified as Guillain-Barré syndrome, and four deaths associated with this condition have been reported.

**KEYWORDS:** Guillain-Barre, Campylobacter Jejuni, Flaccid Paralysis, Epidemiological Alert.

### INTRODUCTION

Guillain-Barre syndrome (GBS) is an autoimmune, demyelinating disorder of the peripheral nervous system, being the most common cause of acute flaccid paralysis worldwide. The neuropathy affects motor, sensory and autonomic nerves, causing multiple symptoms in the patient such as numbness and tingling of extremities, mild to severe muscle weakness and autonomic dysfunction.

The incidence of GBS varies according to geographic region and sex. In Western countries the incidence ranges from 0.89 to 1.89 per 100,000 inhabitants with an average of 1.11 per 100,000 inhabitants and in children from 0.5 to 1.5 per 100,000 inhabitants, with a predominance in the male sex <sup>2</sup>.

GBS can manifest itself in different ways since there are 4 variants (Figure 1): Acute inflammatory demyelinating polyneuropathy (AIDP), Acute motor axonal neuropathy (AMAN), Acute sensory motor axonal neuropathy (AMASN) and Miller Fisher Syndrome (MFS) <sup>1</sup>, however the typical manifestation in a GBS is rapidly progressive weakness characterized by being in an ascending manner, starting in the distal part of the lower extremities, the weakness usually progresses, rapidly, developing quadriplegia in a period ranging from a few days to a month <sup>1</sup>.

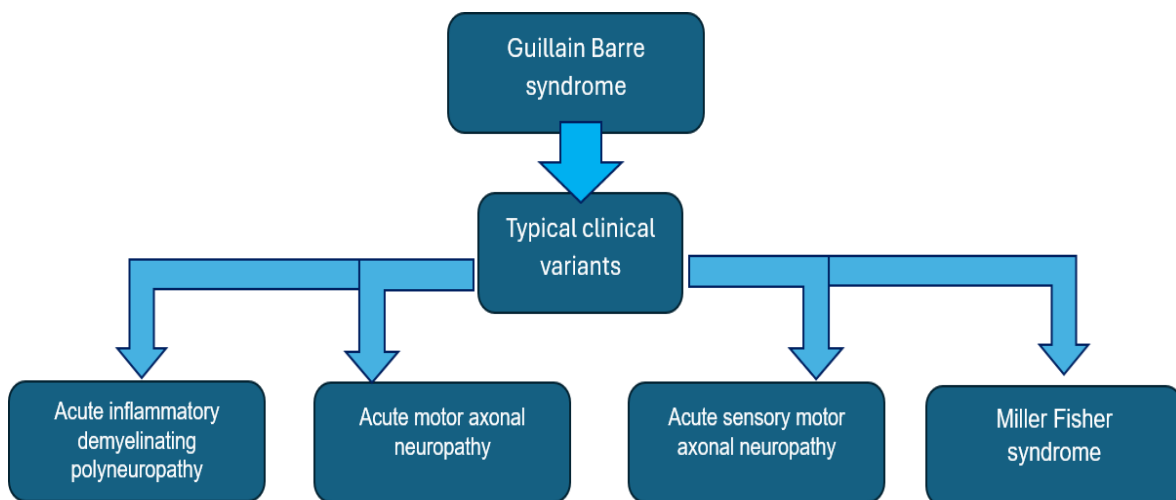


Figure 1: Typical clinical variants of Guillain-Barré syndrome.

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In 60% of patients with GBS there is a history of respiratory or gastrointestinal infection, bacterial or viral, several weeks prior to the onset of neurological symptoms<sup>3</sup>. Of the various associated etiologies, the development of GBS has been found to be more frequently associated with infection by Campylobacter Jejuni, Cytomegalovirus, Epstein Barr virus, Mycoplasma pneumoniae, hepatitis virus, herpes simplex and infectious mononucleosis, as well as its development by vaccination: influenza and rabies; systemic diseases such as Hodgkin's disease, systemic lupus erythematosus, sarcoidosis and surgeries<sup>3</sup>. However it is important to mention that Campylobacter Jejuni, the most frequent bacterial cause of gastroenteritis in the world, being the pathogenic antecedent most frequently associated with GBS up to 25-50% of cases<sup>1</sup>.

Campylobacter is a bacterium with gram-negative, aerobic, motile bacilli, it has a wide range of hosts, such as poultry, chickens, cattle, sheep, pigs, these bacteria are considered commensal microorganisms in these animals. The mode of infection to humans is by oral route through the consumption of contaminated food and water, being the consumption of poultry meat, particularly chicken, the most frequent source of transmission<sup>1</sup>.

### OBJECTIVE

To determine the relationship between GBS and the causative agent Campylobacter Jejuni, a description of the cases reported by the Secretary of Health of the state of Tlaxcala Mexico, in March 2024<sup>1</sup>. As well as a bibliographic review on the associated pathophysiology and an invitation to prevention to stop contagion in risk areas.

### METHODOLOGY

The model of this study is descriptive observational which was carried out by collecting and reviewing national and international literature from 2000 to 2024, in: Google Scholar, Pubmed, SciELO, Elsevier, Frontiers in Neurology. Articles were selected using the following search terms: "Campylobacter Jejuni" "Guillain-barre" "Epidemiological alert".

### EPIDEMIOLOGICAL ALERT IN MEXICO

During 2024 in Mexico there has been an unusual increase of GBS cases, all this was made known since the beginning of March, on March 5th the Secretary of Health of the state of Tlaxcala issued the first epidemiological alert where 18 cases of patients with GBS were notified, without any death due to this disease.

This first notification mentions the following epidemiological data: 12 (66.60%) patients were male (Figure 2), in 6 (33.33%) of the cases it was possible to achieve the following results. 33%) of the cases it was possible to isolate the presence of Campylobacter Jejuni (Figure 3), in 11 (61%) of the patients have a history of gastrointestinal infection, 9 (50%) patients with a history of respiratory symptoms and 3 (16%) patients with a history of fever, in addition to the 18 total cases of GBS, 13 (72.2%) presented neurological manifestations such as ascending paralysis (Figure 4)<sup>1</sup>.

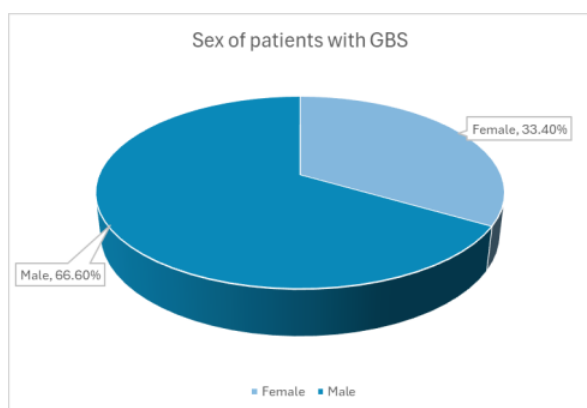


Figure 2

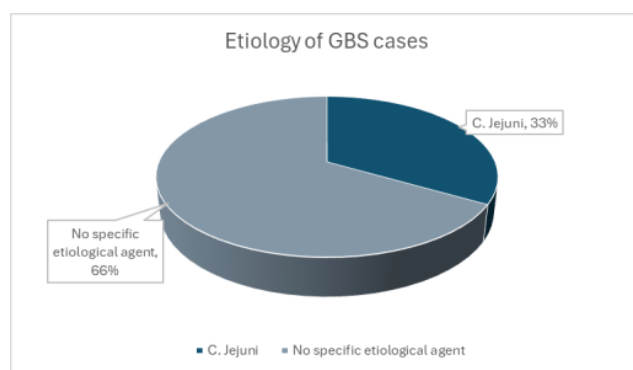


Figure 3

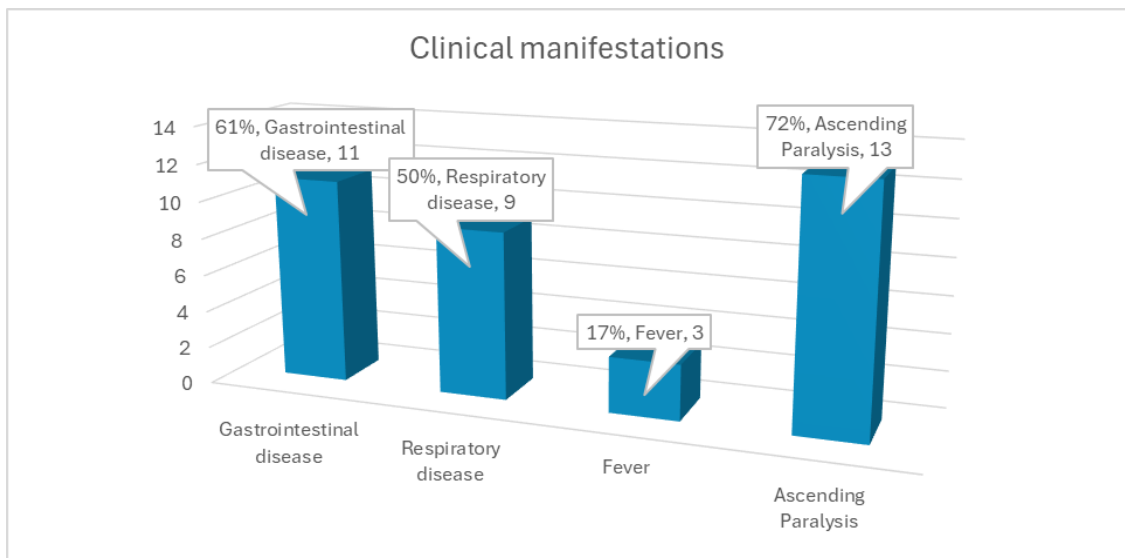


Figure 4

From this, the Ministry of Health on March 29 of the same year, reported 81 cases of flaccid paralysis in the state of Tlaxcala, 34 classified as GBS (Figure 5) and 42 of these with positive presence of Campylobacter Jejuni (Figure 6), in addition to this, 4 deaths due to this disease<sup>9</sup> were registered up to this point.

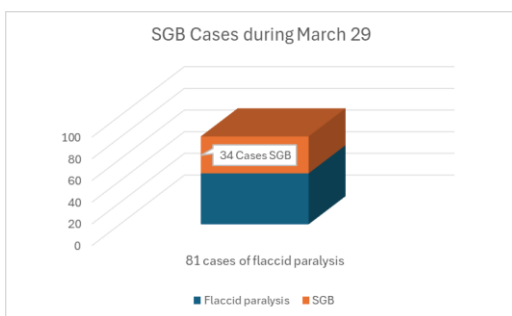


Figure 5

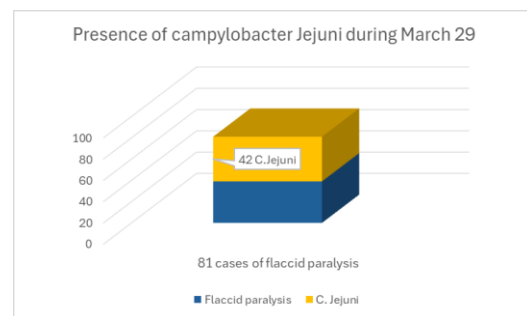


Figure 6

Likewise, we can see an increase of GBS cases and deaths from March 5 to March 28, from 0 to 4 deaths (Figure 7).

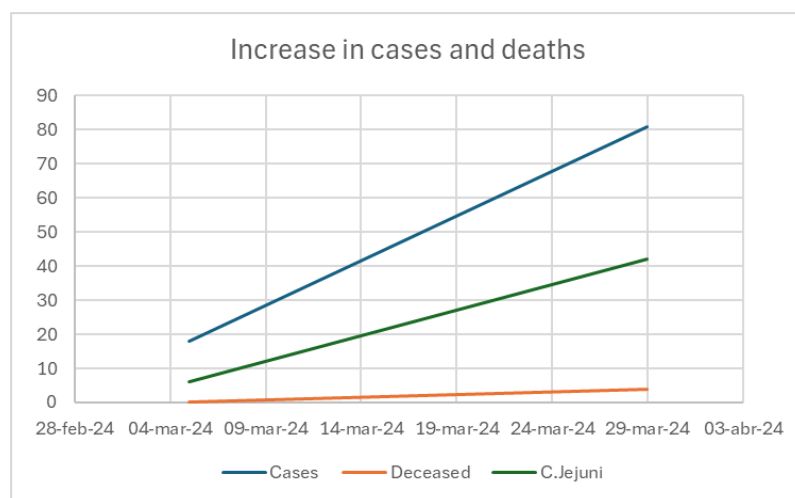


Figure 7

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On April 4 of this year, the state communication coordination of Tlaxcala (CCOM) mentioned that the State Commission for the Protection against Sanitary Risks of Tlaxcala, undertook actions through epidemiological fences in multiple municipalities in Tlaxcala, in order to verify drinking water systems such as wells, inspection of businesses selling chicken, I feel one of the main points suspected as a focus of infection of Campylobacter Jejuni.

In addition to this, training was given to chicken sellers, where the objective is the correct handling of the product for its hygienic sale and the regulations that must be complied with to avoid cross contamination and inhibit infections by Campylobacter Jejuni. As of April 4,

2024, more than 200 trainings have been carried out in the handling of chicken meat in the state of Tlaxcala <sup>11</sup>.

### CLINICAL MANIFESTATIONS OF GUILLAIN BARRE SYNDROME (GBS)

GBS is characterized by bilateral ascending or descending motor paralysis in a symmetrical and progressive manner, presence of hyporeflexia or areflexia, presence of dysautonomic symptoms and even reaching respiratory paralysis, being the most severe complication.

Muscle weakness usually begins in the lower pelvic limbs but may begin in the arms. In addition, paralysis may be mild, moderate, or severe, and cranial or respiratory nerves may be affected <sup>3</sup>.

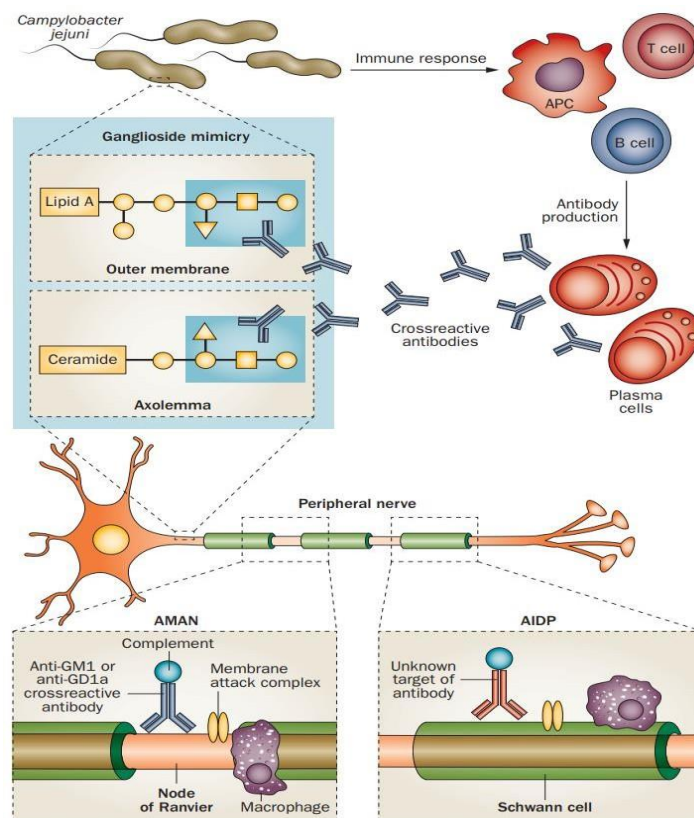
In patients with suspected GBS it is recommended in addition to clinical evaluation to use the Brighton criteria (Figure 6) for diagnosis, as the Brighton diagnostic criteria increase the detection rate of patients with GBS <sup>11</sup>.

Brighton diagnostic criteria			
Clinical data	Diagnostic certainty level		
	1	2	3
Bilateral and flaccid muscle weakness in extremities	+	+	+
Hyporeflexia or areflexia in weak extremities	+	+	+
Monophasic disease pattern	+	+	+
Onset of weakness: 12 hours to 28 days, plus plateau subsequently	+	+	+
Albumin-cytological dissociation in cerebrospinal fluid (Elevation of proteins and number of leukocytes to more than 50 cells/ $\mu$ )	+	$\pm$	-
Electrophysiological findings consistent with GBS	+	$\pm$	-
Absence of an identified differential diagnosis of weakness	+	+	+

Figure 6: Brighton criteria for the diagnosis of GBS <sup>11</sup>.

### PATHOPHYSIOLOGY

It is interesting to know how a bacterium that we can find very frequently is able to develop a neurological syndrome such as GBS, all this is an immune process triggered by the bacterium in which lipooligosaccharides (component of the outer membrane of the bacterium) of infectious organisms contain epitopes similar to gangliosides in peripheral nerves, in the case of C. Jejuni its membrane lipooligosaccharides mimic exactly the gangliosides GM1b, GM1b, GD1a and GalNAc GalNAc. Jejuni its membrane lipooligosaccharides mimic exactly the membrane gangliosides GM1b, GM1b, GD1a and GalNAc-GD1a, triggering a process of inflammation and demyelination by antibodies against peripheral nerves, this is called a cross-reaction through molecular mimicry (Figure 7) <sup>11-12</sup>.



**Figure 7: Pathophysiology of GBS from C.Jejuni primary infection, immune reaction through molecular mimicry, which triggers an inflammatory process and demyelination by immune cells to different neuronal structures (Van den Berg et al. Nature Reviews Neurology, 10(8), 469-482) <sup>13</sup>.**

Molecular mimicry between infectious agents mainly *C. Jejuni* and gangliosides plays an important role in the induction of these antibodies that contribute to inflammatory demyelinating processes of ranvier's nodes of peripheral nerves, myelin sheaths in Schwanncells, as well as terminal nerves of oculomotor muscles <sup>11,12</sup>.

### CONCLUSION

*C.Jejuni* has been identified as the main triggering factor of Guillain-Barré Syndrome during the epidemiological outbreak in the state of Tlaxcala in Mexico, during the period of March 2024<sup>1</sup>.

On March 5, 18 positive cases of GBS were reported of which in 6 patients *C.Jejuni* was isolated, subsequently by March 29 the numbers increased to 81 cases of flaccid paralysis of which *C.Jejuni* bacteria were isolated in 42 patients.

It is important to recognize how this bacterium triggers GBS by presenting virulence factors, such as the lipopolysaccharide of its outer membrane or capsular polysaccharides, capable of triggering an autoimmune response in the host due to their high similarity to self-antigens<sup>15</sup>.

Most patients with GBS experience gradual improvement and may recover completely within 6 to 12 months<sup>11</sup>.

### DISCUSSION

It is important to implement prevention measures starting with the simplest ones: hand washing before handling any type of food, especially products of poultry origin, recognizing that it is the main source of infection for humans, it is exhorted to cook food properly, not to consume raw meat or medium term from poultry, wash cooking utensils perfectly, establish national surveillance programs, educate producers of food of poultry origin and/or the population about the diseases that can cause *Campylobacter Jejuni*; establish a teaching model to prevent infections through animal products through the use of sanitizers<sup>11</sup>.

Currently, there is a lack of orientation about the health problem caused by the inadequate use of food prepared in the wrong way, consequently the number of gastrointestinal diseases caused by consuming food that does not present the prevention measures in the hygienic way, as well as the lack of programs oriented to the producers of food that comes from poultry. A problem that incorporates not only the consumer, but also includes poultry producers, to be trained and/or receive guidance from the authorities in order to have the necessary measures to keep poultry in the best conditions.

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