

# Supratherapeutic Carbamazepine Concentration Following a Recent SARS-CoV-2 Infection

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## CASE DESCRIPTION

A 29-year-old male presented to the emergency department after a dizziness episode and drop attack followed by impaired ambulation, nausea, and vomiting. Prior to this episode, the patient had experienced multiple days of coughing, general malaise, and poor oral intake. His medical history was notable for genetically confirmed Coffin-Lowry syndrome, which is characterized by intellectual disability, motor dysfunction, and frequent drop attacks without epilepsy. Additionally, he tested positive for SARS-CoV-2 (COVID-19) via at-home testing 2 days prior to his presentation. At the time of presentation, his medications included carbamazepine extended release (600 mg twice a day), clonazepam (0.5 mg twice a day), fluoxetine (20 mg daily), and recently initiated (2 days prior to presentation) Paxlovid™ (nirmatrelvir 300 mg/ritonavir 100 mg twice a day).

A workup was initiated to determine the cause of the patient's presentation with primary concern for seizure activity and head injury. His physical exam indicated no acute focal neurologic deficits. Laboratory results were largely unremarkable (Table 1). Mild anemia was noted, indicated by decreased hemoglobin and hematocrit levels. A slightly increased serum total CO<sub>2</sub> concentration was suggestive of metabolic alkalosis, likely induced by emesis. Additionally, the patient had an elevated D-dimer and tested positive for SARS-CoV-2 via RNA analysis. Imaging studies showed no evidence of acute injury, ischemia, pulmonary embolism, or infection. Given the inconclusive workup, the patient was admitted for treatment with intravenous fluids, antiemetics, and reassessment of his baseline ambulation.

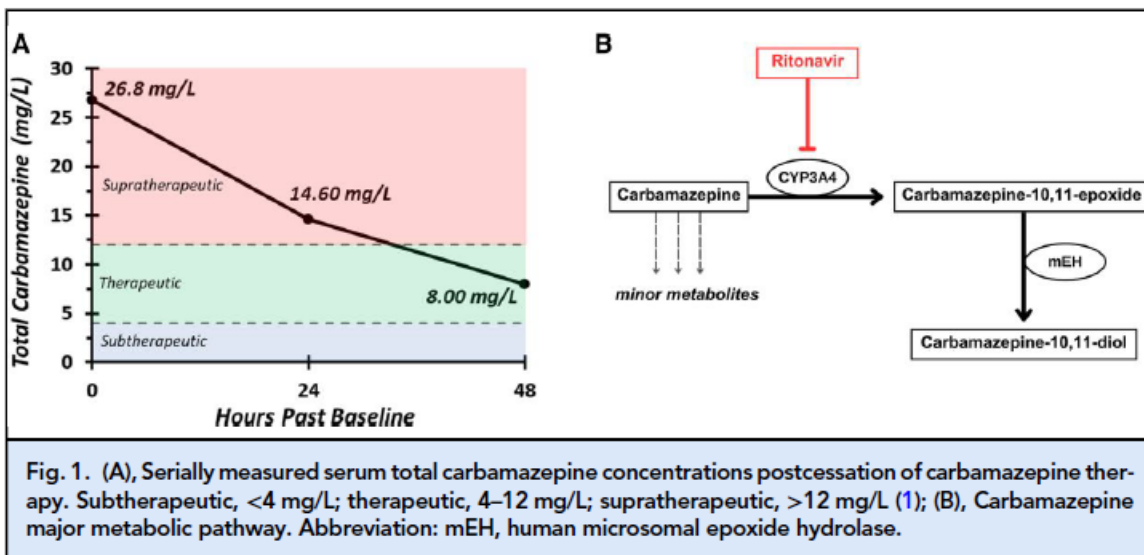
The following day, a serum total carbamazepine level was measured using the Roche Cobas Pro c503 homogenous KIMS immunoassay with a supratherapeutic result of 26.8 mg/L (therapeutic range: 4.0–12.0 mg/L). While the exact timing of his last carbamazepine dose was unknown, it is suspected to have occurred sometime the day prior. Carbamazepine administration was withheld, and levels were monitored serially every 24 hours (Fig. 1A). Twenty-four hours after the initial supratherapeutic measurement, concentrations declined to 14.6 mg/L and, 48 hours later, decreased to 8.0 mg/L. His ambulation, nausea, and vomiting improved, and he was subsequently discharged with instructions to resume his regular carbamazepine dosing the following morning.

### QUESTIONS TO CONSIDER

1. What are the common causes of acute changes in drug concentration?
2. Why is carbamazepine routinely measured in clinical laboratories?
3. How does serum carbamazepine concentration correlate with clinical symptoms?

Table 1. Laboratory results at the time of emergency department presentation.		
Analyte	Result	Reference interval
White blood cell count	5.02 K/mm <sup>3</sup>	4.50–11.00 K/mm <sup>3</sup>
Red blood cell count	4.37 M/mm <sup>3</sup> (L)	4.50–5.90 M/mm <sup>3</sup>
Hemoglobin	13.3 g/dL (L)	13.9–16.3 g/dL
Hematocrit	39.4% (L)	41.0–53.0%
Mean corpuscular volume	90.2 fL	80.0–100.0 fL
Platelet count	224 K/mm <sup>3</sup>	150–350 K/mm <sup>3</sup>
D-dimer	0.84 mg/L FEU (H)	0.19–0.79 mg/L FEU
SARS-CoV-2 (NAT)	Positive	—
Sodium	140 mmol/L	135–148 mmol/L
Potassium	4.1 mmol/L	3.5–5.1 mmol/L
Chloride	98 mmol/L	98–110 mmol/L
Bicarbonate	32 mmol/L (H)	21–31 mmol/L
Blood urea nitrogen	8 mg/dL	7–22 mg/dL
Creatinine	0.9 mg/dL	0.5–1.4 mg/dL
Glucose	91 mg/dL	71–99 mg/dL (fasting)
Calcium	9.3 mg/dL	8.4–10.5 mg/dL
Anion gap	10 mmol/L	7–16 mmol/L
Alkaline phosphatase	66 U/L	30–130 U/L
Aspartate amino transferase	34 U/L	≤37 U/L
Alanine amino transferase	23 U/L	≤41 U/L
Total bilirubin	0.2 mg/dL	≤1.2 mg/dL
Total protein	7.0 mg/dL	6.0–8.2 g/dL
Albumin	4.4 mg/dL	3.5–5.0 g/dL
High sensitivity-troponin-T	6 ng/L (0 hr), 6 ng/L (1 hr)	≤22 ng/L

Abbreviations: L, below the lower reference limit; H, above the upper reference limit.



## REFERENCE

1. Wang L, Wang Y, Zhang RY, Wang Y, Liang W, Li TG. Management of acute carbamazepine poisoning: a narrative review. *World J Psychiatry* 2023;13:816–30.

## Final Publication and Comments

The final published version with discussion and comments from the experts will appear in the October 2025 issue of *Clinical Chemistry*. To view the case and comments online, go to <https://academic.oup.com/clinchem/issue/71/10> and follow the link to the Clinical Case Study and Commentaries.

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