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303. Treatment of caffeine poisoning by medical toxicologists

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Background: Caffeine (1,3,7-trimethylxanthine) products have increased in popularity in recent years. Caffeine poisoning may present with symptoms ranging from tremor and irritability to agitation, hypokalemia, seizures, tachydysrhythmias, and hemodynamic instability. Severely poisoned patients may require treatment with beta blockers or vasoactive medications, as well as invasive measures such as intubation and extracorporeal membrane oxygenation (ECMO). While the Extracorporeal Treatments in Poisoning (EXTRIP) Workgroup published recommendations regarding hemodialysis for theophylline (a structurally similar methylxanthine) poisoning, no such guidelines exist for caffeine. Despite this, there are case reports of hemodialysis being used in severe caffeine poisoning. In this study, we analyzed cases submitted to the Toxicology Investigators Consortium (ToxIC) registry to characterize their key features and treatment by medical toxicologists.

Methods: We queried the ToxIC database to perform a descriptive study of acute, single-agent caffeine exposures and their treatment by medical toxicologists from 2010 through March 2025. We excluded cases involving chronic caffeine overdose or ingestion of multiple agents. We evaluated cases for common symptoms, as well as severe presentations—defined as seizures, ventricular dysrhythmias, therapeutic use of beta blockers, use of vasoactive medications, intubation, hemodialysis for toxin removal, or ECMO. Fisher's exact tests were used where appropriate to assess for significant associations.

Results: Fifty-six cases met our inclusion criteria. There were 29 adult and 26 pediatric patients (age was unknown in one case). Many cases were attempts at self-harm (20/56) or pediatric exploratory ingestions (16/56). Most patients had signs and symptoms (47/56), which were attributed to caffeine exposure in all but three cases. Common symptoms included agitation and tachycardia, defined as a heart rate greater than 140 beats per minute. In only six of 26 patients was this heart rate normal for the patient's age. Twelve patients were admitted to the ICU. In total, 10 patients had severe presentations. Five patients had seizures, and three patients had a ventricular tachydysrhythmia. Three patients received beta blockers, four were managed with vasoactive medications, and six were intubated. Four patients underwent hemodialysis for toxin removal, and one patient received ECMO. Fisher's exact test comparing the rate of severe features in adult vs. pediatric patients was not significant. All patients survived.

Conclusion: Although many of these caffeine-poisoned patients were significantly tachycardic, only three were treated with beta blockers. Only one of three patients with a ventricular dysrhythmia received beta blockers. Among four cases who underwent hemodialysis for toxin removal, all had severe symptoms; however, not all patients with seizures, ventricular dysrhythmias, or vasoactive medication use received dialysis. Clinical presentations in the setting of caffeine poisoning are varied and may be severe. Medical toxicologists have used hemodialysis to manage these patients despite the absence of formal guidelines.