

Addressing Caffeine-induced Psychosis: A Clinical Perspective

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Abstract

Introduction:

Caffeine-induced psychosis is a rare entity with just 6 cases published in the medical literature. According to these cases, massive caffeine intake can precipitate psychosis.

Objectives:

Authors reviewed the medical literature on caffeine-induced psychosis and its proposed neurobiological pathways.

Methods:

We performed a review on caffeine-induced psychosis using MEDLINE, Pubmed, and OVID with different word combinations including: "caffeine," "psychosis," "delusions," "agitation," "intoxication." In addition, we present a case of a previously healthy 29-year-old man who developed an abrupt onset of paranoid delusions, thought disorganization, and bizarre behavior after increasing his caffeine intake to >1500 mg per day over a period of 2 days. During the psychotic episode, the patient accidentally shot himself in the chest and was rushed to the hospital. Thyroid tests, toxicology, blood, and urine work-up excluded other conditions that could have triggered the psychosis. There is no personal or family history of psychiatric illness or substance use. Furthermore, the patient and family denied any suicidal intention or psychiatric symptoms before this episode.

Results:

Our case supports the existing data on psychosis precipitated by excessive amounts of caffeine intake.

Conclusions:

Caffeine-induced psychiatric disorders should be included in the differential diagnoses for patients presenting with psychotic symptoms. Overuse of coffee or other caffeine-containing beverages such as energy drinks should be investigated in these patients.

Key Words: caffeine, psychosis, delusions, agitation, intoxication

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and unregulated by our society and around the world. It is readily available in coffee, tea, soft drinks, supplements, medications, and increasingly popular "energy" drinks such as Red Bull, Monster, and Rockstar, which contain taurine, B-vitamins, and up to 280 mg caffeine as seen in Table 1.^{1,2}

Most caffeinated drinks contain between 40 and 150 mg.^{1,2} Caffeine is highly consumed for a variety of reasons. It is thought to induce mild substance dependence as evidenced by the development of tolerance, withdrawal, and difficulty cutting down or eliminating its use. Caffeine also produces apparent benefits such as increased alertness, attention, and cognitive function, while elevating mood.³ Ingestion of excessive amounts is associated with a series of negative effects known as "caffeinism," which manifests as restlessness, agitation, excitement, rambling thought and speech, and insomnia.⁴ Related to these neuropsychiatric side effects, the DSM IV recognizes several caffeine-induced disorders. These include Caffeine Intoxication, Caffeine-Induced Anxiety Disorder, Caffeine-Induced Sleep Disorder, and Caffeine-Related Disorder NOS.⁵ We present a case of rapid onset psychosis secondary to excessive caffeine consumption in a previously healthy 29-year-old man and the review of the medical literature on this subject.

CASE

Substance-induced psychosis is a common psychiatric diagnosis. Caffeine-induced psychosis, however, remains a rare phenomenon with only 6 cases reported previously in the literature. Caffeine is broadly accepted, used,

A 29-year-old married African American man with no significant past medical or psychiatric history was admitted to the hospital secondary to a self-inflicted gunshot wound to the left chest. On arrival, he coded with pulseless electrical activity and received 5 minutes of cardiopulmonary resuscitation.

TABLE 1. Approximate Amounts of Caffeine Per Drink^{1,2}

Caffeine Presentation	Milligrams Caffeine Per Serving
Caffeine tablets	100-200
Cup of coffee	100-125
Decaf coffee	5-15
Energy drinks	80-280
Monster 24 oz	320
NOS 16 oz	260
Colas	20-50
Chocolate	10-30
Tea	30-50

Injuries included a complex left lung laceration, left hemopneumothorax and multiple left-sided rib fractures. Initial laboratory results were obtained and reported as glucose 176 mg/dL, sodium 136 mmol/L, chloride 96 mmol/L, total CO₂ 26 mmol/L, blood urea nitrogen 26 mg/L, creatinine 1.82 mg/L, osmolality 282 mOsm/kg, white blood cells 13.4, red blood cells 3.92, hemoglobin 12.5, hematocrit 39.3%, thyroid stimulating hormone 2.4, folate 8.8 ng/mL, vitamin B₁₂ 740 pg/mL. The urine toxicology was collected after patient received lorazepam and pain medications, therefore results were presumptive for benzodiazepine and opiate class. Brain computed tomographic scan was reported within normal limits. In the operating room, the patient underwent a staple lung resection and placement of 2 chest tubes. He was kept intubated and transferred to the intensive care unit. Two days later he was extubated and psychiatry was consulted to evaluate for safety.

Before 2011, the patient consumed a daily cup of coffee and occasional caffeine-containing "energy" drinks. At the beginning of this year, however, he began working longer hours, which involved both day and night shifts. In the 5 months before his psychotic episode, the patient increased his daily caffeine intake to 6 cups of coffee, one 24 oz Monster (caffeine) drink, and an unknown number of caffeine tablets. One week before his hospital admission, the patient rapidly increased his already excessive caffeine consumption.

There was no prior medical, trauma, psychiatric, or family history. He was

taking no prescription medications and did not drink alcohol or use illicit drugs. The consumption of caffeine was calculated between 1500 and 2000 mg per day during the 2 days before admission. The patient and family reported that he did not eat or drink anything else other than 6 to 8 cups of coffee, about 2 cans of 24 oz Monster (caffeine) drink, 1 can of 16 oz NOS (caffeine) drink, and an unknown number of caffeine tablets per day during 2 continuous days. He began talking incoherently, became very agitated, and voiced paranoid delusions, stating that coworkers were trying to "poison" and "record" him. He was unable to sleep and failed to recognize family members. There was severe diaphoresis, restlessness, and odd behavior. By the end of the 2 days while patient continued to ingest solely high quantities of caffeine, his judgment and behaviors became very impaired and resulted in an accidental self-inflicted gunshot wound to the chest.

The mental status examination demonstrated a 29-year-old African American man who was well groomed and appeared his stated age. He did not remember injuring himself, or the events immediately surrounding the incident. During the interview, he was irritable and sensitive to noise, with prominent psychomotor retardation. Eye contact was good with soft speech. Mood was "good," but affect was blunted. Thought process was tangential and disorganized. Thought content included the paranoid ideation of "being poisoned," but there were no suicidal or homicidal thoughts, intent, or plan. He denied sensory or perceptual disturbances. Insight and judgment were very limited. Attention and concentration were decreased. Mini Mental Status Exam was 24/28.

Consultation psychiatry service started antipsychotic with Risperidone 1 mg orally per day, later increased to twice per day. By day 10 of hospitalization, patient was transferred to inpatient psychiatry unit for further stabilization after medical clearance.

DISCUSSION

On the basis of our review, there are 6 cases of caffeine-induced psychosis

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published in the medical literature as seen in Table 2.⁶⁻¹¹

To our knowledge this is first case with severe violent, life-threatening behavior resulting from excessive caffeine use. This diagnosis was evident after extensive clinical work-up and information was gathered from patient and family members. From these findings, it was clear that the patient's increasing use of caffeine (>1500 mg/d) was associated with his worsening restlessness, agitation, and paranoia. Despite feeling thirsty and overheated (no fever), the patient continued to ingest only caffeinated drinks. He did not hydrate himself or eat over these 2 days. We believe that the patient initially exhibited signs and symptoms of caffeine intoxication. This led to the onset of psychosis after he continued to consume large quantities of caffeine in different preparations (coffee, "energy" drinks, and caffeine tablets). All the cases published in the literature share common psychiatric symptoms including thought disorganization, paranoid delusions, agitation, and restlessness.

We would also like to state that some caffeinated "energy" drinks such as Monster also contain acetyl-L-carnitine. In our search, there is only 1 report of acetyl-L-carnitine-related psychosis in a patient with Bipolar disorder.¹² Apart from caffeine, no other substances in caffeine-containing "energy" drinks have been shown to precipitate psychosis.

In all the previously listed cases, psychosis resolved with cessation of caffeine consumption. In 2010, for example, Boos et al⁶ described a soldier whose episode of psychosis resolved just 72 hours after cessation of caffeine intake. In 2009, Hedges et al⁷ described a chronic course of caffeine-induced psychosis, which developed over a course of 7 years and entirely resolved over a period of 3 weeks to 2 months. Thus, it seems the course is variable and may depend on the chronicity of caffeine ingestion before the development of psychosis. Despite cessation of caffeine intake, our patient continued to demonstrate signs and symptoms of psychosis during his hospital stay and was, thus, admitted to an inpatient psychiatry ward.

TABLE 2. Caffeine-induced Psychosis Cases in the Medical Literature⁶⁻¹¹

References	Summary
Boos et al ⁶	32-y-old soldier with acute confusion state, diaphoresis, disorientation, and extreme paranoia. History of taking daily caffeine supplements, ripped fuel stimulant, 6 cups of coffee, and 6 cans Red Bull for 3 wk before symptoms
Cerimele et al ⁸	Patient presented with paranoid delusions, agitation, after 8 wk of consumption of eight to ten 16 oz cans of energy drink per day
Hedges et al ⁷	47-y-old male with no psychiatric history with chronic psychosis due to intake of up to 40 cups of coffee per day
Caykoylu et al ¹⁰	46-y-old male with persecutory delusions, psychotic symptoms, aggressive behavior, irritable mood showed significant improvement when stopped consumption of caffeine completely. Was taking 4-5 L cola per day (about 460-575 mg)
Shaul et al ⁹	18-y-old female consumed 48 Aqua Ban caffeine tablets, 100 mg each. Presents with restlessness, confusion, hot flashes, feeling anxious, distracted, perplexed, feelings of depression, and psychosis
McManamy and Shube ¹¹	24-y-old female prescribed caffeine citrate for fatigue took a box of 50 tablets, 1.5 grains each. Presents with 2 separate episodes of confusion, restlessness, disorientation, and erratic behavior, the second requiring hospitalization

Caffeine is known to antagonize adenosine A1 and A2A receptors in the central nervous system.^{1,3} It is thought to exert its effect on psychosis specifically through antagonism of adenosine A2A receptors, which increases neurotransmission through dopamine D2 receptors.⁴ The dopamine system is known to play a role in mood and depression, as well as psychosis. Thus, through its effect on dopamine caffeine can mediate positive effects on mood and cognition, but may also produce psychotic symptoms.³ Its ability to produce differential effects in different people may be related to a genetic predisposition. As reviewed by Lara,⁵ people with the 1976T/T genotypes for A2A adenosine receptors were more susceptible to anxiety-producing effects of caffeine than people with other genotypes. By analogy, we hypothesize that certain individuals may be more susceptible to caffeine-induced psychosis than others.

More research in this field is necessary as caffeine is widely used and, as our case illustrates, may produce life-threatening consequences when consumed in large amounts. Currently, psychiatrists and primary care physicians do not regularly ask about caffeine intake. On the basis of the findings in our case and literature review, patients presenting with signs and symptoms of psychosis should be surveyed for caffeine intake. Furthermore, specific regulations should be studied regarding over-the-counter supplements and energy drinks containing caffeine. Warnings and information to the public should be included in those products. Combinations with other substances such as alcohol or stimulants could further impair individuals' judgment and increase the risks for accidents, neuro-psychiatric, and medical conditions. By surveying patients' caffeine intake, and educating them regarding the known medical risks of this substance, physicians may be able to prevent such occurrences.

CONCLUSION

Caffeine-induced psychosis should be included in the differential diagnoses for patients presenting with psychotic symptoms. Overuse of coffee or other caffeine-containing beverages such as "energy" drinks should be investigated in these patients. We also propose the possibility of a genetic or metabolic predisposition to caffeine-induced psychosis. More research is warranted in this area.

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