



# An Overview of Cocaine Overdose Diagnosis and Management in the Emergency Department; A Literature Review

Anhar Khalid Zahrani<sup>1</sup>, Kadhém Mahfouz Alkathim<sup>2\*</sup>, Aban Wael Alabbadi<sup>3</sup>, Abdulmaajid Ibrahim O Alahdal<sup>4</sup>, Osamah Ali Albader<sup>5</sup>, Bassam Mana Alahmari<sup>6</sup>, Abdulkareem Khalid Almotairi<sup>7</sup>, Hamoud Jadan Madhour Alruwail<sup>8</sup>, Dafer Abdulrhman Alshehri<sup>1</sup>, Ali Awdah Alzahrani<sup>9</sup>, Aishah Mohammed Babbain<sup>10</sup>

<sup>1</sup> General Practitioner, King Abdulaziz University Hospital, Jeddah, KSA

<sup>2</sup> Pediatric Department, King Faisal General Hospital, Al Ahsa, KSA

<sup>3</sup> Emergency Department, King Faisal Medical Complex, Taif, KSA

<sup>4</sup> Emergency Department, Alnoor Specialist Hospital, Makkah, KSA

<sup>5</sup> Faculty of Medicine, Medical University of Warsaw, Warsaw, Poland

<sup>6</sup> Faculty of Medicine, King Abdulaziz University, Jeddah, KSA

<sup>7</sup> General Practitioner, King Fahad Hospital, KSA

<sup>8</sup> Emergency Department, Prince Metab Bin Abdelaziz Hospital, Sakaka, KSA

<sup>9</sup> Emergency Department, King Saud Medical City, Riyadh, KSA.

<sup>10</sup> Faculty of Medicine, Imam Mohammed Bin Saud University, Riyadh, KSA

## ABSTRACT

**Background:** Cocaine use has been an extremely serious and major public health issue worldwide. The risk of cocaine addiction is terribly high leading to unintentional fatal and serious pathological complications. The emergency management of cocaine overdose might be challenging. The discussion of this review stands on evidence-based and designed elements for diagnosing and managing cocaine overdose, to aid ER physicians to provide successful management and evaluation techniques to assess cocaine toxicity issues and complications. **Objectives:** To provide the recent literature on diagnosing and managing cocaine overdose as an ER physician. **Methodology:** Comprehensive medical research was collected from PubMed/MEDLINE using these search terms ((“Cocaine” [Mesh] AND “Overdose” [Mesh] AND “Diagnosis” [Mesh] AND “Management” [Mesh])). **Conclusion:** ER physicians must consider taking a full history, positive clinical laboratory results, and pharmacological aspects with multidisciplinary care in order to improve patient outcomes.

**Key Words:** Cocaine, Overdose, Emergency, Drugs, Intoxication, Addiction, Treatment, Management

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## INTRODUCTION

Cocaine use has been an extremely serious and major public health issue worldwide, especially among teenagers, young adults, and older people. [1] Unfortunately, there has not been any examined scientific information that suggests an effective therapy for the treatment of cocaine addiction [2, 3]. Recent 2018 Global statistics on illicit drug use United Nations Office on Drugs and Crime

reported approximately 275 million illicit drug users globally with addiction [4-7]. Cocaine consumers who are dependent on cocaine have high relative risks of overdose. Cocaine can be injectable, smokable, swallowed, or snorted but the most common way of usage is through snort. Notably, the risk of reaching cocaine toxicity and unintentional drug overdose can happen even after consuming a few hundred milligrams. Overdose may cause

**Corresponding author:** Kadhém Mahfouz Alkathim

**Address:** Pediatric Department, King Faisal General Hospital, Al Ahsa, KSA.

**E-mail:** kad10hem@gmail.com

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psychological problems and life-threatening symptoms involving the central nervous system, renal, and cardiopulmonary symptoms [8, 9]. This review deliberates evidence-based and designed elements for diagnosing and managing cocaine overdose, to aid ER physicians in assessing cocaine toxicity symptoms, possible complications, and provide successful management.

## METHODOLOGY:

Comprehensive medical research was collected from PubMed/MEDLINE using these search terms: (“Cocaine” [Mesh] AND “Overdose” [Mesh] AND “Diagnosis” [Mesh] AND “Management” [Mesh])). Only published articles, clinical trials and documents were included in this review. Publications describing cocaine overdose, assessment, and/or management were all included. Exclusion criteria were all other articles that did not have one or more of these topics as their primary endpoint.

## Review

### Pharmacodynamics and Toxicokinetics:

Cocaine can be injectable, smokable, swallowed, or snorted. Complex mechanisms are stimulated after the consumption of cocaine despite the fact that the drug starts in about 1 hour. Cocaine drug manipulates monoamines transporters (norepinephrine, dopamine, and serotonin) as it accumulates in the synaptic cleft reinforcing prolonged sympathetic influence. Cocaine activates alpha and beta-1-adrenoceptor that stimulate the cardiovascular system resulting in elevated heart rate, myocardial contractility, and systemic arterial pressure which the principal mechanism for the myocardial oxygen demands. The branches of the coronary arteries are susceptible to cocaine effects that diminish myocardial oxygen supply. Cocaine promotes thrombus formation by activation of plasminogen activator inhibitor and thrombosis by activation of platelet aggregation that is influenced by adenosine diphosphate and alpha-adrenergic agonists. Cocaine also blocks sodium channels and inhibits nerve conduction that intrudes the amplitude of the action potential propagation (Vaughan Willaims class IC blocker effect) causing conduction interruptions and tachyarrhythmias. [10]

### History and Physical examination

The emergency management of cocaine overdose may be challenging. Initially, ER physicians must take a detailed history and physical examination to define essential forms of cocaine toxicity whenever possible. Patients with cocaine overdose may experience serious cardiotoxicity symptoms such as tachycardia, hypertension, dysrhythmia, and coronary vasospasm. These may lead to more severe pathological complications such as stroke, acute coronary syndrome, and sudden death. Cocaine has powerful

hematological effects as it induces vascular defects and enhances the development of endothelial dysfunctions, vasoconstriction, and accelerated atherosclerosis. [11] Cocaine also interferes with the dopamine buildup for its immediate psychological changes and neurological alteration, especially after a long-term cocaine addiction. Behavioral effects such as psychosis and withdrawal syndromes (anxiety, depression, cocaine cravings, nightmares, hunger, concentration disturbance) might be present as a result of frontal cortex impairment. [12, 13] Gender differences have been the main factor in monitoring stages of cocaine toxicity mechanism in addiction progression. They clarify different series of addiction experience and negative behavioral responses in both sexes as the process and vulnerability to addiction differs between males and females. [14] Stages of cocaine overdose include the evaluation of a wide spectrum of clinical features and helping the physicians in their management. (Table 1) [15]

**Table 1: Stages of Acute Cocaine Overdose**

Stage 1	CNS: Headache, twitching, vertigo, pseudohallucinations, mydriasis, nausea, and preconvulsive movement. Cardiopulmonary: Tachycardia, Tachypnea, ectopic beats, hypertension. Psychiatric: Euphoria, aggression, paranoia, agitation, confusion, emotional lability, restlessness. Skin: Pruritus, Hyperthermia
Stage 2	CNS: Seizures, incontinence, Encephalopathy, increased deep tendon reflexes, Encephalopathy. Cardiopulmonary: Arrhythmias, gasping, irregular breathing, peripheral cyanosis, apnea. Skin: Pruritus, Hyperthermia
Stage 3	CNS: Fixed dilated pupils, coma, areflexia Cardiopulmonary: Hypotension, apnea, ventricular fibrillation, cyanosis, agonal breathing, respiratory failure, cardiac arrest.

Moreover, older adults seek illicit drug use for major personal psychiatric and medical problems. (Table 2) It is uncommon for older adults to report excessive drug use and seek medical attention. This might be due to many potential barriers including denial of addiction, feeling of shame, limited information about the patient's condition, reluctance to seek help, and comorbid conditions that complicate the situation. [16]

**Table 2: Comorbid conditions associated with Drug use in older adults in general [16]**

Alcoholism
Major depressive disorder (more common in women)
Generalized anxiety disorder (more common in women)
Other Chronic Diseases (more common in men)

## Differential Diagnosis

Defining the differential diagnosis should be based on clinical expressions of cocaine toxicity and this might include psychological and physical symptoms. This differential diagnosis can include CNS hemorrhage, acute schizophrenia, phencyclidine toxicity, hypoglycemia, anticholinergic toxicity, and neuroleptic malignant syndrome. [15]

### Investigations

If cocaine overdose is suspected rapid laboratory workup and imaging are requested to confirm cocaine usage and assess possible complications. Laboratory workup shall include complete blood count, troponin, B-type natriuretic peptide, chemistry panel, urinalysis, urine toxicology screen, and creatinine kinase. Imaging is useful for the detection of brain structural alterations that might be represented as an intracranial hemorrhage in CT, and further assessment of cardiovascular complications with electrocardiogram for example is warranted as well. [17, 18]

Cocaine is usually associated with acute kidney injury especially in cases of cocaine-induced rhabdomyolysis. Thus, rhabdomyolysis should be ruled out with a creatine kinase protein test. [19] Other illicit drugs must be recognized by urine drug screen immunoassays that are quick and affordable to detect false-positive and positive results of many persistent drugs in order to avoid possible complications. [20]

Cocaine-associated chest pain may result from myocardial infarction or other pulmonary causes. Thus, it is essential to rule out cardiac causes by obtaining a troponin test and performing ECG to rule out ischemia. A chest x-ray can be indicated to rule out aspiration pneumonia, pulmonary edema, and pneumothorax. [18, 21]

Since cocaine causes major functional impairments in the brain, a head CT scan is crucial for patients presenting with seizures. Lumbar puncture is also recommended to rule out possible intracranial hemorrhage and meningitis especially if the patient presents with altered mental defects and hyperthermia. [15]

### Management

Cocaine overdose is managed by a multidisciplinary approach and a professional team that is composed of an ER physician, internist, cardiologist, toxicologist, and a psychiatrist. ER physicians are concerned with the initial treatment of cocaine-related chest pain and stabilization of the patient with ABCDEs. [15] According to a 2016 systemic review, cocaine ER management must strictly focus all the efforts on supportive treatment and considering symptomatic therapy as the first line of management. Benzodiazepines sedative-hypnotics-drugs have been implemented as the first-line treatment in agitated patients. Nevertheless, benzodiazepines have higher risks of developing respiratory depression and over-

sedation so, the physician shall be careful. Combination therapy using benzodiazepines and antipsychotics such as olanzapine and haloperidol showed favorable results as well. [22] Nitroglycerin and dihydrouridine agents are avoided as they have shown greater risks in developing tachycardia. Unlike mixed beta/alpha-blockers, labetalol has been demonstrated by the AHA/ACC guidelines as an effectively safe drug for treating tachycardia, cocaine-induced hypertension and in methamphetamine intoxicated patients presented with unstable angina. [23] In cases of ventricular tachydysrhythmia administration of lidocaine and lipid emulsion has been effectively successful. If hyperthermia is detected the safest modality of treatment is by external cooling measures. [24]

### CONCLUSION:

Symptoms of cocaine abuse can be challenging to assess and diagnose in most drug overdose cases. As there is no drug to cure cocaine addiction, thus prevention of these devastating complications starts with community awareness about the associated risks. The emergency department physicians must consider taking a full history and positive clinical laboratory results. The critical care team must strictly focus all the efforts on supportive treatment and symptomatic therapy is the first line of management. Referral to other inter-professional associates after stabilization of the vitals to provide exquisite care and improve treatment outcomes for the patient is essential.

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