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# Crystal Ice (Methamphetamine) Ingestion in a Toddler: A Case Report from Pakistan and Literature Review

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***Authors' contributions***

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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***Case Report***

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## ABSTRACT

Methamphetamine poisoning cases are increasing in the pediatric population secondary to its increased popularity among adults as a drug of abuse. We are reporting a case of one and half years old male toddler who presented in emergency with a history of ingestion of meth. After around 30 minutes of ingestion, he developed fits and was very irritable. On arrival in the emergency room, the patient was irritable with respiratory distress and tachycardia. The patient was given diazepam with a dose of 0.15 mg /kg at arrival. The patient needed two more doses of diazepam with a dose of 0.15 mg/kg. After the third dose, the baby's heart rate settled and he became relaxed. After around six hours, he again developed the same irritability with an increasing heart rate. So, diazepam doses were repeated and three doses were given again. After that, the patient remained vitally stable and was sent home after 24 hours of hospitalization.

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## 1. INTRODUCTION

Methamphetamine (commonly known as meth, crystal ice and speed), a derivative of amphetamine having highly addictive potentials, produces stimulant effects and causes euphoria [1]. Although first synthesized in 1887, medical use of amphetamines for nasal congestion, weight loss and sleep issues started in 1930s [2]. Reports of amphetamine abuse started occurring soon after that. Meth can be injected, ingested, smoked or snorted. Methamphetamine exerts its toxic effects primarily by enhancing the release of neurotransmitters such as dopamine, norepinephrine, and serotonin. Due to their developing physiology, children are more vulnerable to the toxic effects of these chemicals [3,4].

Worldwide, meth is the second most commonly used illicit drug (the first being cannabis). Southern Asia, along with the USA and some other states like Japan and the Philippines, has reached almost an epidemic in recreational usage of amphetamine derivatives, including methamphetamine [5]. United States data show that approximately five lac people use meth in a month, and around five per cent of its population has used it once in their lifetime [6]. Common risk factors for poisoning, including meth, in children include parental substance abuse, inadequate storage of drugs, and accidental ingestion due to mistaken identity of substances. Additionally, the socio-economic environment, prevalence of drug abuse in the community, and lack of awareness about the dangers of methamphetamine exposure to children play pivotal roles [7].

Methamphetamine poisoning cases due to accidental ingestion are increasing in the pediatric population, secondary to its increased popularity among adults as a drug of illicit use [8]. While the impact of methamphetamine abuse on adults have been extensively studied, there is a growing concern about the alarming rise in methamphetamine poisoning cases among children. This issue is particularly concerning due to the potentially severe consequences on a child's developing physiology and long-term cognitive function.

## 2. LITERATURE REVIEW

Methamphetamine possesses two methyl groups as compared to amphetamine, which has a single methyl group at the alpha position of the carbon chain, which increases lipophilicity and thereby increases CNS penetration [9]. It has a large volume of distribution (3-4L/kg) [2]. It exists in two stereoisomers i.e. L- and D- isomers, latter (i.e. dextroamphetamine) has 3-5 times more CNS activity. Illicitly used amphetamine is usually either D- isomer or a racemic mixture of both isomers and is available in a powder or crystalline form, well known as the “ice” or crystal meth” [10]. The onset of action of meth is dependent on the route of administration. Symptoms appear within seconds after smoking and injection but take around five minutes after intranasal and 20 minutes after oral routes of administration. Peak plasma concentrations are achieved in approximately 30 minutes after intravenous or intramuscular administration and up to two to three hours after ingestion. It has a half-life of about 12-34 hours, so symptoms may even persist after 24 hours [9].

Methamphetamine acts by stimulating the release of dopamine, noradrenaline and serotonin into the synapse because of its structural similarity to the dopamine transporter (DAT), noradrenaline transporter (NET) and serotonin transporter (SERT) and vesicular monoamine transporter-2 (VMAT-2). Methamphetamine also inactivates neurotransmitter reuptake transporter systems and blocks the metabolism of these neurotransmitters by inhibiting monoamine oxidase. All these effects result in the accumulation of the catecholamines in the synapse resulting in continuous stimulation of the postsynaptic receptors and thereby causing an adrenergic surge [9-11].

Signs and symptoms of meth poisoning are secondary to the stimulation of the receptor of monoamines. Alpha- and beta-adrenergic stimulation causes tachycardia, hypertension, hyperthermia and vasospasm, while alterations in mood and deranged responses to hunger and thirst are secondary to serotonergic stimulation. Dopaminergic receptor stimulation causes psychiatric symptoms along with drug-craving/drug-seeking behavior. Generally speaking, meth ingestion patients may present from completely asymptomatic to sympathomimetic crises (seizures, metabolic acidosis, and imminent cardiovascular failure). The most common findings identified at the emergency department are psychosis, agitation and tachycardia [9,12].

All children who present in emergency with sympathomimetic symptoms must be asked regarding drug exposure including drugs of abuse like methamphetamine. Whenever suspected, urine for toxicology can be considered but complete reliance on this can be disastrous as false positive and false negative cases are quite common in case of amphetamine poisoning cases. As methamphetamine can affect many organs some baseline investigations may be done in selected cases like serum electrolytes, serum creatine phosphokinase, serum lactate, liver enzymes, electrocardiogram and cardiac enzymes, clotting profile, renal functions and urinalysis [1,9].

There is no FDA-approved antidote for meth poisoning [1]. The first line of treatment for methamphetamine poisoning is benzodiazepine. Repeated and escalating doses may be needed. As in our case, we have to give multiple doses and after around six hours have to repeat the doses of diazepam. As the half-life is prolonged so may have to repeat doses multiple times. Chronic methamphetamine users may be resistant to benzodiazepine treatment. Other treatment options include haloperidol and some other antipsychotics (like olanzapine). As dystonia and akathisia are common side effects, diphenhydramine is often used in combination with antipsychotics (especially haloperidol) to decrease the chances of these effects and it also potentiates sedation [9,13,14]. Labetalol (combined alpha- and beta-blocker) has very good effects if the patient has persistent tachycardia and hypertension. If the patient has persistent tachycardia without hypertension then only beta 1-blockers like metoprolol should be used. Labetalol and metoprolol both are lipophilic drugs, so they also help antagonize the central effects of methamphetamine poisoning [15]. All symptomatic patients with meth poisoning must be given copious intravenous fluids to enhance urinary excretion of the poison and to prevent acute kidney injury [1].

## 3. CASE REPORT

One-and-a-half-year-old male toddler presented to the emergency department at around 1400 hours with a history of ingestion of some whitish powder approximately an hour and a half ago. After approximately 30 minutes of ingestion of that powder, he developed fits and was very irritable. Patient was found with some powder in his hands in paternal uncle's room, who was known drug abuser and used to take multiple substances of abuse. On arrival in the emergency room, patient was irritable with signs of respiratory distress and tachycardia. Although, patient was maintaining saturation. Respiratory rate at the arrival was 42 breaths / minute while heart rate was 165-170 beats/ min. At arrival, finger prick random blood sugar level was 87mg/dl, and capillary refill was three seconds with good peripheral and central pulses. Temperature at arrival was 37 degrees Celsius, and skin was pale looking without any rash. Patient was given intravenous diazepam with a dose of 0.15 mg /kg at arrival, keeping in view the case of poisoning to control irritability. Parents were asked to call baby's uncle to confirm the drug of abuse that this toddler has accidentally ingested. It became clear after phone call to uncle that it is powder of crystal ice that is methamphetamine. Patient was given two more doses of intravenous diazepam with the same dose. After third dose, toddler's heart rate settled to 120-125beats / minute, and he was relaxed with no signs of irritability. Latter-on, patient was advised admission. After around six hours, patient again developed same irritability with rising heart rate. Except for irritability patient's conscious level was intact. Case discussed with toxicologist, and doses of diazepam repeated thrice as per advice. After that, patient remained vitally stable and discharged from ward after around 24 hours of hospitalization. Patient lab workup sent was unremarkable. Complete blood count showed only iron deficiency anemia, renal functions, liver functions and electrolytes were within normal range. ECG and Cardiac enzymes were also normal.

## 4. DISCUSSION

With an increase in use of drugs of abuse, we are seeing more and more pediatric patients poisoned with these substances. Sometimes, we are unaware of the substances, their symptoms and treatment options. In developing countries, Pediatric toxicologists are also not always available at majority of the toxicology centers. Over it, at times, literature/studies on pediatric population are also not available. It was the first case of ice ingestion in the hospital where annual patient turn-out is over one million. When we searched for the literature, there were no case reports on meth ingestion in children from Pakistan and very little international data.

Kim JH et al reported a case of a 17-year-old adolescent girl who presented with QT

prolongation and was diagnosed as a case of methamphetamine drug abuser [16]. Our patient presented with a history of fits and irritability without any changes in ECG except for sinus tachycardia. A comparatively larger study done by Farnaghi F et al, showed that the most common symptoms were agitations and tachycardia, and they used diazepam to control these effects followed by a single dose of clonazepam or lorazepam to control relapse of toxicity [17]. Our patient was also treated with diazepam. His symptoms were well controlled, but as we did not give clonazepam or lorazepam (due to availability issues at the center) following diazepam, symptoms recurred after around six hours, and our patient needed further dosing of diazepam.

## 5. CONCLUSION

In conclusion, with a recent increase in the drugs of abuse and their easy availability, drugs like methamphetamine ingestion cases are increasing in children. So, in pediatric emergencies, we need to be ready to face such cases and must teach our residents and faculties to suspect cases of drugs of abuse and take detailed history regarding substances of abuse easily available to the child. Also, healthcare professionals, policymakers, and the community must pay attention to this serious and growing public health problem.

## DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

## CONSENT

As per international standards, parental written consent has been collected and preserved by the author(s).

## ETHICAL APPROVAL

As per international standards or university standards written ethical approval has been collected and preserved by the author(s).

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES


1. Richards JR, Laurin EG. Methamphetamine toxicity. In StatPearls StatPearls Publishing; 2022. Available:https://www.ncbi.nlm.nih.gov/books/NBK430895/
2. Chiang WK. Amphetamines. In: goldfrank's toxicologic emergencies, 9th ed, Nelson LS, Lewin NA, Howland MA. (Eds), McGraw-Hill, New York. 2011; 1078
3. Miller DR, Bu M, Gopinath A, Martinez LR, Khoshbouei H. Methamphetamine dysregulation of the central nervous system and peripheral immunity. Journal of Pharmacology and Experimental Therapeutics. 2021;379(3):372-85. DOI: 10.1124/jpet.121.000767
4. Takasu S, Maebashi K, Matsumoto S, Murofushi M, Sakamoto K, Iwadate K. Fatal intoxication due to transrectal methamphetamine overdose: A case report. Legal Medicine. 2021;52:101904.
5. World Drug Report. United Nations; 2015 Accessed On:2023 Jun 26. Available:https://www.unodc.org/documents/wdr2015/World_Drug_Report_2015.pdf
6. Results from the 2014 National survey on drug use and health. Results from the 2014 National Survey on Drug Use and Health; 2015. Accessed On:2023 Jun 26. Available:https://www.samhsa.gov/data/sites/default/files/NSDUH-FRR1-2014/NSDUH-FRR1-2014.pdf
7. Yule AM, Martelon M, Faraone SV, Carrellas N, Wilens TE, Biederman J. Examining the association between attention deficit hyperactivity disorder and substance use disorders: A familial risk analysis. Journal of Psychiatric Research. 2017;85:49-55. DOI: 10.1016/j.jpsychires.2016.10.018
8. KOLECKI P. Inadvertent methamphetamine poisoning in pediatric patients. Pediatric Emergency Care. 1998;14(6):385-7. Available: https://journals.lww.com/pec-online/Abstract/1998/12000/Inadvertent_methamphetamine_poisoning_in_pediatric.1.aspx
9. W Boyer E, Hernon C. Methamphetamine: Acute intoxication. Wolters Kluwer; 2023 Accessed On:2023 Jun 26. Available:https://www.uptodate.com/contents/methamphetamine-acute-intoxication

10. Courtney KE, Ray LA. Methamphetamine: an update on epidemiology, pharmacology, clinical phenomenology, and treatment literature. Drug and alcohol dependence. 2014;143:11-21.
DOI: 10.1016/j.drugalcdep.2014.08.003
11. Cruickshank CC, Dyer KR. A review of the clinical pharmacology of methamphetamine. Addiction. 2009;104 (7):1085-99.
DOI: 10.1111/j.1360-0443.2009.02564.x
12. Gray SD, Fatovich DM, McCoubrie DL, Daly FF. Amphetamine-related presentations to an inner-city tertiary emergency department: a prospective evaluation. Medical Journal of Australia. 2007;186(7):336-9.
DOI: 10.5694/j.1326-5377.2007.tb00932.x
13. Zun LS. Evidence-based review of pharmacotherapy for acute agitation. Part 1: Onset of efficacy. The Journal of Emergency Medicine. 2018;54(3):364-74. 10.1016/j.jemermed.2017.10.011
14. Yang X, Wang Y, Li Q, Zhong Y, Chen L, Du Y, He J, Liao L, Xiong K, Yi CX, Yan J. The main molecular mechanisms underlying methamphetamine-induced neurotoxicity and implications for pharmacological treatment. Frontiers in molecular neuroscience. 2018; 11:186.
DOI: 10.3389/fnmol.2018.00186
15. Richards JR, Albertson TE, Derlet RW, Lange RA, Olson KR, Horowitz BZ. Treatment of toxicity from amphetamines, related derivatives, and analogues: a systematic clinical review. Drug and Alcohol Dependence. 2015;150:1-3.
DOI: 10.1016/j.drugalcdep.2015.01.040
16. Kim JH, Jung JY, Park JW, Lee EJ, Lee HN, Jue JH. A case of methamphetamine intoxication in an adolescent. Pediatr. Emerg. Med. J. 2022;10(1):41-4.
DOI: 10.22470/pemj.2022.00584
17. Farnaghi F, Rahmani R, Hassanian-Moghaddam H, Zamani N, McDonald R, Gholami N, Gachkar L. Oral clonazepam versus lorazepam in the treatment of methamphetamine-poisoned children: a pilot clinical trial. BMC pediatrics. 2020; 20(1):1-8.
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