Case Report

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Amitraz Poisoning: A Review of the Literature and Case Report

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ABSTRACT

Background: *Amitraz poisoning, though rare, poses significant health risks, particularly in developing regions like Africa, where its use as an insecticide is widespread.*

Case Presentation: *A 24-year-old female in Uganda was brought to the Emergency Department after intentional ingestion of Amitraz. The assessment revealed somnolence, bradycardia, normotension, and respiratory distress. Despite decontamination, intravenous fluids, and atropine administration, the patient's condition deteriorated, necessitating intubation and ICU transfer.*

Discussion: *Amitraz toxicity manifests primarily through central α2 adrenergic receptor agonism, with symptoms including hypotension, bradycardia, altered mental status, and respiratory depression. Differentiating Amitraz poisoning from organophosphate poisoning is crucial due to overlapping features but distinct management strategies. Supportive care, including airway management, is essential.*

Conclusion: *This case highlights the need for understanding of Amitraz poisoning in resource-limited settings. Effective supportive care can lead to successful outcomes despite severe initial presentations. Further education and preventive measures are recommended to mitigate risks, especially among vulnerable populations.*

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1. Introduction

Amitraz is an insecticide and acaricide widely used in agriculture and veterinary medicine, particularly for the control of ectoparasites such as ticks and mites in livestock. Although Amitraz poisoning is relatively uncommon compared to other pesticide exposures, it poses a significant public health risk, particularly in regions where its use is prevalent, such as Africa and parts of Asia.1 The toxicity of Amitraz is primarily due to its action as a central α2 adrenergic receptor agonist, leading to clinical features that overlap with other types of pesticide poisoning, notably organophosphates. This overlap can create diagnostic and therapeutic challenges, especially in resource-limited settings where access to advanced diagnostic tools and intensive care facilities may be limited.

Amitraz poisoning typically presents with central nervous system depression, respiratory distress, bradycardia, and hypotension. In more severe cases, patients may develop respiratory failure, requiring advanced airway management and intensive supportive care. The management of Amitraz poisoning is largely supportive, as no specific antidote is available. Early recognition of the toxicity and differentiation from other pesticide poisonings, such as organophosphates, is crucial to guiding appropriate treatment.

This report presents a case of intentional Amitraz ingestion in a 24-year-old female in Uganda, highlighting the clinical features, diagnostic challenges, and management in a resource-limited environment. We also provide a review of the literature on Amitraz poisoning, focusing on its pathophysiology, clinical manifestations, and management strategies in the emergency setting.

2. Case report

A 24-year-old female was brought into the Emergency Department at a referral center in Southwest Uganda by her neighbors with a history of intentional Amitraz ingestion. She was last seen 1.5 hours before she arrived at the hospital, entering her house. She was subsequently found approximately 1 hour before the Emergency Department arrival by her neighbor on the ground in her room with a reduced level of consciousness and a 100ml empty bottle of Bimatraz (Amitraz) by her side (Figure 1). No other history was available from the patient's neighbor.

Fig 1: 100 mL bottle of Bimatraz (Amitraz) 12.5% emulsifiable solution

On initial evaluation, the patient was somnolent but aroused to sternal rub. Her temperature was 36.4 degrees Celsius; her heart rate was 60 beats per minute; her blood pressure was 143/87 mmHg; her respiratory rate was 20 breaths per minute; and her SpO2 was 100% on room air. Her airway was clear and patent without secretions. Lungs were clear to auscultation bilaterally. Extremities were warm and well-perfused. GCS was 12; pupils were pinpoint, symmetric, and sluggishly reactive to light bilaterally. There were no obvious signs of trauma to the head, neck, torso, or extremities. The skin was dry. There were no signs of urination or lacrimation. Intravenous access was established, and she was put on supplemental oxygen. The patient was decontaminated, and her clothes were removed. She was washed with soapy water. An NG tube was placed, and gastric lavage was performed with aspiration of 300ml of whitish residue mixed with gastric contents. A 500ml IV fluid bolus was administered. A fingerstick blood glucose was 3.3mmol/L (60mg/dL). The patient was given 25g of intravenous dextrose. A 12-lead EKG was performed, and normal sinus rhythm was demonstrated at normal intervals, with no signs of active ischemia. A urine pregnancy test was performed, and it was negative.

Despite initial resuscitation, the patient's mental status and respiratory status continued to decline. One hour after the initial presentation, her GCS was 8, she had sonorous respirations with crackles in bilateral lung fields, SpO2 had decreased to 80% on 4L by nasal cannula, and her respiratory rate had increased to 40. Blood pressure was 139/90 mmHg, and heart rate was 113 beats per minute. An oropharyngeal airway was placed. Given the reduced level of consciousness and miosis as well as her initial presenting bradycardia, it was felt there could potentially be a concern for co-ingestion with organophosphate, and as such, she was given 2mg of Atropine, which was doubled until reaching 16mg, at which point she was felt to be atropinized. She was subsequently placed on a non-rebreather, and her oxygen saturation initially improved to 94%, but this was transient, and shortly thereafter, she was again hypoxic shortly thereafter. The decision to intubate the patient was complicated by resource limitations, specifically the fact that there were no available intensive care unit (ICU) beds at the hospital at that time. An ICU bed was ultimately secured at an outside facility, and the patient was immediately intubated and sedated with ketamine. She was transferred to the outside facility ICU without complication, but her follow-up care was unobtainable.

3. Discussion

Amitraz is an insecticide and acaricide commonly used worldwide, including widespread use in Africa[1]. The majority of Amitraz poisonings occur through ingestion; however, toxicity is also possible through inhalation and dermal absorption. Following oral administration, Amitraz is absorbed rapidly in the GI tract, has a wide distribution, and its metabolites are excreted in the urine. In addition to Amitraz's toxicity, it is often prepared in hydrocarbon solvents like xylene[1]. Ingestion of hydrocarbons alone can cause CNS depression, respiratory depression, coma, and ataxia. Aspiration during hydrocarbon ingestion can also cause significant pulmonary toxicity. A 2-year survey conducted in South Africa demonstrated that poisoning most often occurred in children, with most ingestions being accidental. Poisoning rates were lower among adults; however, a significant portion of adult ingestions (60%) were intentional([2].

Numerous mechanisms have been proposed for Amitraz toxicity. These include α2 adrenergic receptor agonism, voltage-dependent calcium ion (Ca2+) channel agonism, prostaglandin synthetase inhibition, monoamine oxidase (MAO) inhibition, adenylyl cyclase inhibition, and the generation of reactive oxygen species.[3] In humans, the primary manifestation of Amitraz toxicity, and indeed morbidity and mortality, is through central α2 adrenergic receptor agonism, behaving similarly to the antihypertensive medication clonidine[(3)].

Clinical manifestations of Amitraz poisoning typically involve hypotension, bradycardia, miosis (more commonly, but mydriasis has also been reported), altered mental status, vomiting, convulsions, polyuria, gastrointestinal hypomotility, and hyperglycemia.[(1)] The majority of these actions are likely through agonism of the central α2 adrenergic receptors, although it is hypothesized that inhibition of H1 receptors can contribute to decreased intestinal motility, cell death, seizures, and anti-inflammatory effects[(3)].

There is no specific antidote for Amitraz poisoning, and management mainly consists of supportive and symptomatic care [(4)].Maintaining a patent airway and adequate ventilation is one of the most important measures. Supportive therapy includes the administration of supplemental oxygen, airway management, fluid resuscitation, and vasopressor support if needed. Inotropic agents may be used if hypotension is refractory to fluid repletion. Transient peripheral α2 receptor antagonism may also occur, resulting in transient hypertension, which is typically short-lived and will progress back to hypotension[(5)]. As this hypertension is typically a brief, transient effect, we do not recommend the routine treatment of hypertension in Amitraz overdose. Atropine may be added to the treatment regimen if hemodynamically significant bradycardia occurs. Benzodiazepines or barbiturates may be useful in cases of seizures[(5)].In cases of profound somnolence, patients may require intubation; however, the patient's mental status frequently improves with tactile or auditory stimulation, which may help avoid unnecessary intubations, which is significantly beneficial in resource-limited settings.

One of the main clinical challenges with Amitraz poisoning is the overlapping clinical features of other toxic ingestions, including organophosphates. Both Amitraz and organophosphate ingestion cause hypotension, bradycardia, altered mental status, and miosis, which can lead to misdiagnosis and mismanagement of the intoxication[(6)] .However, the presence of hyperglycemia, hypothermia, and reduced gastrointestinal motility, along with the absence of salivation, lacrimation, perspiration, and diarrhea, help to distinguish Amitraz ingestion from organophosphate poisoning[(6)]. In our clinical experience, the administration of atropine to patients with Amitraz toxicity frequently results in significant tachycardia and hypertension. As in our case, this distinction can be challenging, and the treating team was ultimately concerned about possible organophosphate co-ingestion and, therefore, attempted atropine administration. In retrospect, all of the patient's clinical features were consistent with Amitraz ingestion, and co-ingestion with organophosphates was unlikely given the lack of persistent bradycardia, hypotension, salivation, lacrimation, perspiration, and diarrhea. Nevertheless, the initial decision to decontaminate the patient was made as organophosphate ingestion was on the initial differential diagnosis and therefore it was felt prudent to do so. Regarding the patient’s tachypnea and respiratory distress, which are atypical for pure Amitraz ingestion, we felt this

was likely due to aspiration. In the setting of Amitraz poisoning, aspiration is secondary to either the presence of hydrocarbon solvent within Amitraz solution or simply from the patients' prolonged obtundation resulting in aspiration. In either event, tachypnea and respiratory distress are not classic features of pure Amitraz ingestion, and when present, the possibility of an alternate diagnosis, co-ingestion, and/or aspiration must be considered.

Data regarding Amitraz intoxication in humans is limited, and ingestions are mainly seen in accidental ingestions in pediatrics and suicidal ingestions by adults. Herath, Pahalamagame et al. reported a case of a 20-year-old female who presented to the hospital following ingestion of Amitraz. Gastric lavage, intravenous fluids, and intravenous dopamine were given to the patient, who fully recovered within 48 hours[7]. Another case report by Shilpakar, Karki et al. reported a 27-year-old male who presented to the hospital with Amitraz intoxication. The patient recovered and was discharged following supportive management with intravenous fluids and atropine[8].

Amitraz poisoning is a worldwide problem that disproportionately affects the developing world. The majority of these ingestions are unintentional by children, but more significant morbidity and mortality are associated with intentional ingestion by adults. Although Amitraz ingestion is rare, it can lead to serious cardiovascular and neurological complications. Treatment is generally supportive in nature, and there is no specific antidote. Despite potentially life-threatening complications, according to case reports in the literature, patients can be managed successfully with good supportive cardiovascular and respiratory care.

4. Conclusions

Amitraz poisoning, though rare, can lead to life-threatening complications, particularly in resource-limited settings where diagnostic and therapeutic options may be constrained. This case demonstrates the importance of early recognition and differentiation from other pesticide poisonings, such as organophosphates, due to overlapping clinical features but distinct management protocols. The patient’s progression to respiratory failure underscores the need for vigilant airway management and close monitoring of respiratory status in cases of severe poisoning.

Although there is no specific antidote for Amitraz poisoning, prompt supportive care—particularly airway management and hemodynamic support—can lead to favorable outcomes, even in severe cases. Further education on the risks of Amitraz exposure, as well as preventive measures to limit accidental or intentional ingestion, is essential, particularly in regions where its use is widespread. This case and review highlight the need for improved awareness and preparedness to manage pesticide poisonings effectively, particularly in resource-constrained environments where these exposures may be more common.

Abbreviation

GCS: Glasgow Coma Scale
IV: Intravenous
NG tube: Nasogastric tube
EKG: Electrocardiogram
SpO2: Peripheral capillary oxygen saturation
ICU: Intensive Care Unit
CNS: Central Nervous System
MAO: Monoamine Oxidase
H1 receptor: Histamine 1 receptor
Ca2+: Calcium ion

Conflict of Interest

The authors declare that they have no competing interest

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