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CLINICAL PRESENTATION AND OUTCOME OF AMITRAZ COMPOUND POISONING IN THE FIRST 24 HOURS OF ADMISSION AT A RURAL TERTIARY CARE HOSPITAL

Emergency Medicine

Dr. Bala Murugan S* Junior Resident, Department Of Emergency Medicine PESIMSR, Kuppam, Andhra Pradesh, India *Corresponding Author

Dr. Irshad Ahmed Assistant Professor, Department Of Emergency Medicine PESIMSR, Kuppam, Andhra Pradesh, India

Dr. Chandrashekar A. L Professor And Head, Department Of Emergency Medicine PESIMSR, Kuppam, Andhra Pradesh, India

ABSTRACT

Background: Amitraz is a formamidine compound widely used as an acaricide and insecticide in the veterinary and agricultural sectors. Its central alpha 2 adrenergic agonist activity renders it toxic upon ingestion, leading to central nervous system (CNS) depression, bradycardia, and respiratory depression. This study aimed to investigate the early clinical effects of Amitraz poisoning, evaluate the need for mechanical ventilator support and assess patient outcomes during the first 24 hours of intensive care unit admission. **Methods:** A prospective observational study was conducted over 18 months at a tertiary care hospital in Kuppam district. 60 participants exposed to Amitraz were enrolled. Clinical profiles, vital parameters, CNS status via Glasgow Coma scale, arterial blood gas analysis and mechanical ventilation requirement were evaluated. Laboratory investigations included blood glucose, serum Pseudocholinesterase and imaging studies. Patients were monitored for ventilator support, ICU stay duration and final clinical outcomes. **Results:** the mean age was 27.2 years, with 65% under 26 years. Suicidal ingestion accounted for 96.7% of cases. Bradyapnea (66.7%), hypoxemia (70%), abnormal GCS (< 11) in 66.7%, and respiratory acidosis (16.7%) were commonly observed. Mechanical ventilation was required in 66.7% of patients, while 98.3% showed favorable recovery. Only one mortality (1.7%) was recorded. **Conclusion:** Amitraz poisoning predominantly affects young adults through suicidal ingestion. Respiratory depression and CNS involvement necessitate ICU support. Early recognition and timely intervention lead to positive outcomes in most cases.

KEYWORDS

Alpha 2 adrenergic agonist, Amitraz, CNS depression, Mechanical ventilation.

INTRODUCTION:

Amitraz, a triazapentadiene compound from the formamidine class, is widely recognized for its efficacy as an acaricidal and insecticidal agent. It is extensively utilized in both veterinary medicine and agricultural practices to combat ecoparasites such as ticks, mites and lice as well as various crop pests.(1,2) Its active pharmacodynamic mechanisms hinge on its role as a central alpha 2 adrenergic receptor agonist, which induces a cascade of physiological effects, including profound sedation, bradycardia, hypotension, and respiratory depression. The compound exerts its toxic effects primarily through central nervous system suppression and autonomic dysregulation. Furthermore, a commercial formulation of Amitraz frequently incorporates solvents such as xylene, which amplify its systemic toxicity and contribute additional complications during poisoning events. (3, 4)

Despite the broad application of Amitraz across various domains, comprehensive data on its toxicological impact in humans remains notably sparse. Human poisoning cases are often underreported due to a combination of diagnostic ambiguity and low public awareness. Clinical diagnosis can be particularly challenging, given the overlapping symptomatology with other toxic syndromes, notably organophosphate poisoning. However, Amitraz poisoning typically presents with specific distinguishing characteristics such as hyperglycemia, pronounced miosis without muscle fasciculation, and unaltered serum cholinesterase levels, which can aid clinicians in differential diagnosis. (5)

The rapid and sometimes severe onset of CNS and Cardiovascular manifestations necessitates swift medical evaluation and intervention. In the absence of a targeted antidote, the cornerstone of management lies in robust supportive care strategies. These include securing the airway, proving respiratory support through mechanical ventilation if required and stabilizing the patient's hemodynamic status to mitigate further physiological deterioration. (6)

This study was conducted in response to increasing clinical encounters of Amitraz poisoning in rural healthcare settings. It seeks to characterize the early clinical features, the need for mechanical ventilation and short term patient outcomes in a tertiary care emergency setting. The study aimed to examine the clinical effects of Amitraz poisoning during the initial 24 hours and to evaluate the need for mechanical ventilation and the short term outcomes in ICU admissions.

Methodology:

A prospective observational study was conducted at the Emergency department (ED) of a tertiary care center in Kuppam district over 18 months. Patients aged 18 years and above presenting with a history or clinical signs of Amitraz poisoning were included after informed consent. Exclusion criteria were poisoning from other compounds, moribund patients or those with mixed poisoning. The calculated minimum sample size based on prevalence data and expected confidence interval was 57; but a total of 60 patients were finally enrolled using purposive sampling techniques to ensure representativeness.

A pretested and validated semi–structured questionnaire was employed to collect comprehensive data, including socio–demographic details such as age, gender, occupation, along with the mode and intension of poisoning. Vital parameters, including Pulse rate (7), Respiratory rate (8), Blood Pressure, oxygen saturation (SpO2) (9), and level of consciousness assessed using the Glasgow coma scale (GCS) (10) were recorded upon admission. Laboratory investigations included arterial blood gas analysis (ABG) (11, 12), random blood sugar level, and serum Pseudodicholinesterase levels (13) to aid in differential diagnosis and to assess the physiological status of the patients. The clinical outcomes, including duration of hospital stay, need for ventilator support and survival status, were meticulously documented.

Data collected were systematically entered into MS Excel and analyzed using IBM SPSS version 23. Descriptive statistics were applied to summarize the data. Categorical variables were expressed in terms of frequencies and percentages, whereas continuous variables were summarized using mean and standard deviations. Ethical clearance for conducting the study was obtained from the Institutional Ethics Committee (PESIMSR/IHEC/103 -23)

RESULTS:

The mean age was 27.27 ± 10.8 years, with the majority 65% being younger than 26 years. Males accounted for a slightly higher proportion (53.3%) of the study population. Occupational revealed that the largest group consisted of semi- professionals 44.1%. Regarding socio – economic status, most participants 73.3% belonged to the lower class.

About 96.7 % of cases are suicidal and only 3.3 % were attributed to accidental exposure of the compound substance. Most patients (98.3%) had a normal pulse rate (60–100 bpm), with a mean pulse rate of 64.57 ± 3.7 beats per minute. Abnormalities in respiratory function were prominent, as 66.7% of participants experienced bradypnea (<12 breaths per minute). The mean respiratory rate was 10.6 ± 2.4 breaths per minute. Hypoxemia (SpO2 < 90%) was observed in 70% of patients, with a mean SpO2 value of 83.45 ± 10.4%. Mean systolic and diastolic blood pressures were recorded at 117.8 ± 14.3 mmHg and 70.37 ± 10.02 mmHg, respectively.

Two-thirds of participants (66.7%) had an abnormal GCS score (<11), indicating significant neurological compromise, while 33.3% scored within the normal range (13–15). Pupil size varied among the participants following Amitraz poisoning, with 43.3% having a pupil size of 1 mm, 46.7% measuring 2 mm, and 10% displaying a pupil size of 3 mm.

Among the ABG outcomes, nearly two-third of the patients (73.3%) had normal values, whereas 16.7% showed respiratory acidosis and 10% had metabolic acidosis. (Figure 1) A total of 56.7% of patients exhibited a pH within the normal range (7.35–7.45), while 43.3% displayed pH values below 7.34, indicating acidosis. In terms of partial pressure of oxygen (PAO_2), 66.7% of patients maintained normal levels (80–100 mmHg) and elevated bicarbonate levels were observed in 60% of the patients (Table -1)

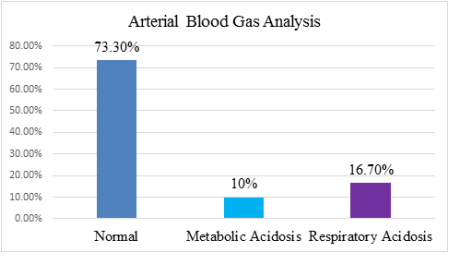

Figure 1: Arterial Blood Gas Analysis following Amitraz poisoning among study participants (N = 60)

Table -1: Effect Of Amitraz Poison On Arterial Blood Gas Analysis Of The Study Participants (N = 60):

Variables	Subcategory	Frequency (N = 60)	Percentage (%)
pH	7.35 – 7.45 ≤ 7.34	34 26	56.7 43.3
PAO2	< 80 Normal (80 - 100)	20 40	33.3 66.7
PCo2	< 35 35 – 45 > 45	02 21 37	3.3 35.1 61.6
Bicarbonate	16 – 22 > 22	24 36	40.0 60.0

Blood glucose levels revealed hyperglycemia in only 3.3% of participants. The diagnostic evaluation included the administration of the pseudo–cholinesterase assay, a critical diagnostic marker for organophosphorus toxicity assessment. Analysis revealed that the patient's pseudo cholinesterase levels were within physiological parameters (range: 4000 – 11000units/L), effectively excluding organophosphorus compound exposure as the etiological factor in the presented cases.

Regarding the hospital stay, majority were admitted for four days 60% (Figure - 2). A significant proportion of patients 66.7% required mechanical ventilation. ICU stay duration was predominantly two days in 66.7%, followed by one day in 31.7% (Table -2)

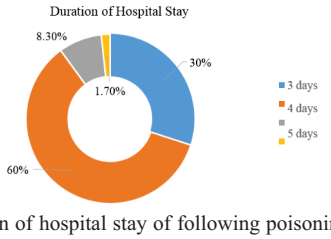

Figure – 2: Duration of hospital stay of following poisoning among the study participants (N = 60)

Table -2: Effect of Amitraz poison on the outcome of the study participants (N = 60):

VARIABLES	SUBCATEGORY	FREQUENCY (N = 60)	PERCENTAGE (%)
Mechanical ventilation	Yes No	40 20	66.7 33.3
ICU stay	1day 2 days > 7 days	19 40 1	31.7 66.7 1.7
Death	Yes No	01 59	1.7 98.3

DISCUSSION:

The mean age of the participants was 27.2 + 10.8 years, with 65% under 26 years, suggesting that young adults are particularly vulnerable. This trend mirrors the findings of Avsargullari et al (14) who reported a higher mean age of 38.6 + 19.8 years and a broader age range from 16 to 78 years and Jalwadi et al (3) who noted a bimodal age pattern. Gender – wise, our study found a slight male predominance 53.3%, consistent with Kumar et al (15) 70% and Bhandarwal et al (5) 55%.

In terms of exposure, 96.7% of cases were due to suicidal ingestion, in line with Avsargullari et al (14), who documented 6 of 7 cases involving impulsive suicidal intake. All exposures in our study were oral, similar to the pediatric cases documented by Aydin et al (16), though Yilmaz et al (17) reported dermal and inhalational routes.

Vitals sighs on presentation revealed a mean pulse rate of 64.57 + 3.7 bpm, with 98.3% maintaining normal heart rates. This contrast with Kalyoncu et al (18), who observed 16.3% bradycardia and 41.9% tachycardia in children. Respiratory depression was significant in our study, with bradyapnea seen in 66.7% of patients, similar to Aydin et al (16) findings of respiratory depression in 62.5% of pediatric cases. Hypoxemia was common, present in 70% of cases, echoing Bansal et al (1) case where SpO2 fell from 89% to 69% and Shilpakar et al (19) report of 76% SpO2. Blood pressure findings showed mean SBP of 117.8 + 14.3 mmHg and DBP of 70.37 + 10.02 mm Hg, with 63.3% and 83.3% having SBP and DBP below normal thresholds respectively. These are supported by Shilpakar et al (19) case f 80/60 mm Hg and similar reports by Atabek et al (20) and Chakraborty et al (21)

Neurological assessment revealed significant CNS depression with 66.7% of patients showing GCS score below 11. These observations are corroborated by Herath et al (22) (GCS 8/15) and Varma et al (23) (GCS 3/15). Miosis was prominent in our cohort, with pupil size of 1 – 2 mm in 90% of patients, aligning with Herath et al (22) Beyaztas et al (24), although Yilmaz et al (17) observed both miosis and mydriasis in different cases.

Laboratory findings showed 73.3% of ABG results were normal, while 16.7% had respiratory acidosis and 10% had metabolic acidosis. These trends compare with Demirel et al (25), who found 9.2% respiratory acidosis and Avsargullari et al (14) reported 39.5% metabolic acidosis. Mixed acid – base disorders were documented by Kalyoncu et al (18) and Sowmya et al (15) with the latter finding metabolic acidosis in 75% of cases. Blood glucose levels in our study averaged 131.92 +22.5 mg/dL, with hyperglycemia in only 3.3% of patients. Deepak et al (26) reported a nearly identical mean value of 132.18 mg/dL, whereas Sowmya et al (15) recorded a higher average of 173 + 66.97 mg/dL. Avsargullari et al (14) and Shitole et al (27) found higher incidences of hyperglycemia, at 66% and 60% respectively.

Pseudocholinesterase levels were normal in all patients, which is essential for differentiating Amitraz poisoning from organophosphate toxicity. This findings is consistent with Akshay et al (28) and Batra et al (29) emphasized the diagnostic utility of Pseudocholinesterase in distinguishing between these toxicities. Organophosphates typically cause marked cholinesterase inhibition, whereas Amitraz does not.

Management of these patients often required ventilator support, with 66.7% undergoing mechanical ventilation. This is significantly higher than 25% reported by Sowmya et al (15) 28.9% by Jalwadi et al (3) and 37.5% by Surendra et al(30). Ulukaya et al (31) described 5 patients requiring ventilator support for less than 24 hours. Hospital stay in our study averaged 3.83+ 0.7 days, comparable to Jalwadi et al (3) 4.83+ 2.4 days but longer than Ertekin et al (32) 2.1 + 1.1 days. ICU stay was generally brief, averaging 1.77 + 0.83 days, with Demirel et al (25) noting ICU durations from 2 to 15 days.

One death (1.7%) was recorded in our study, aligning closely with 1.9% case fatality rate reported by Sachdeva et al (33). Demirel et al (25) documented full recovery in all cases, while Beyaztas et al (24) reported one death after 5 days despite intensive care. The low mortality observed reinforces the importance of prompt intervention and aggressive supportive care, particularly mechanical ventilation.

This study affirms that Amitraz poisoning primarily affects young adults through suicidal ingestion and presents with hallmark signs of CNS and respiratory depression, as well as acid – base disturbances. With early diagnosis and supportive treatment, including ventilator support, the majority of cases can achieve full recovery. Regional differences and varied clinical practices across published literature emphasize the need for standardized treatment protocols and greater awareness among clinicians managing such toxic exposures.

CONCLUSION

Amitraz poisoning presents with characteristic features of CNS and respiratory depression, requiring intensive monitoring and supportive care. Early recognition, especially in the emergency setting, can significantly reduce morbidity and mortality. Future research should explore specific antidotes and establish standardized protocols for managing Amitraz toxicity.

Acknowledging: Nil
Conflict Of Interest: Nil

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