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CLINICAL PROFILE OF PATIENT WITH AMITRAZ COMPOUND INTOXICATION ATTENDING EMERGENCY DEPARTMENT

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ABSTRACT

Background: Amitraz, a formamidine pesticide, has seen increasing use in veterinary and agricultural sectors. Cases of Amitraz poisoning have been rising, often mimicking symptoms of organophosphorus or clonidine toxicity. Despite its clinical significance, there is limited data on Amitraz poisoning in southern India.

Objectives: This study aimed to assess the clinical profile, complications, and treatment outcomes of patients presenting with Amitraz poisoning at a tertiary care facility.

Methods: Conducted as a prospective observational study at Sree Balaji Medical College and Hospital, Chennai, over 18 months (July 2019 to December 2019), the study included 50 adult patients with confirmed Amitraz ingestion. Data on demographics, clinical presentation, laboratory findings, management, and outcomes were analyzed using SPSS v21.0.

Results: The 18–30 age group represented the majority (52%), with males constituting 66% of the cohort. Farmers were most affected (44%). Suicidal ingestion accounted for 96% of cases. Vomiting (90%) was the predominant symptom, followed by nausea (66%) and dizziness (50%). Bradycardia occurred in 10%, tachycardia in 26%, and hypotension in 24%. Pupillary changes were noted in 42% of cases. Hyperglycemia and glycosuria were observed in 12% each. ABG analysis showed respiratory alkalosis in 6% and metabolic acidosis in 6%. Fourteen percent required ventilatory support.

Conclusion: Amitraz toxicity primarily impacts young adult males via suicidal ingestion. Common manifestations are gastrointestinal and autonomic. While severe complications are infrequent, timely supportive care is critical for favorable outcomes.

Keywords: Amitraz poisoning, α2-adrenergic agonist, pesticide toxicity, emergency medicine, clinical profile.

INTRODUCTION

Amitraz, a pesticide from the formamidine chemical class, is extensively employed as an ectoparasiticide in veterinary medicine for animals such as dogs, cattle, and sheep. It also sees considerable usage in agricultural settings, particularly for the treatment of fruit crops. The rising incidence of Amitraz poisoning in recent years is thought to be linked to its increasing application, especially as a substitute for organophosphorus compounds. The decline in the use of

organophosphates is largely driven by regulatory restrictions and concerns about their high toxicity profile **(1–3).**

Poisoning continues to be a pressing global health issue, contributing to the deaths of nearly 700 individuals each day. For every fatal case, thousands experience non-lethal toxic exposures, affecting individuals across various age groups and socioeconomic strata. In India, where agriculture forms a critical component of the economy and employs over 70% of the population either directly or indirectly, pesticide exposure remains a significant concern. It is estimated that between five to six individuals per one lakh population die from poisoning annually in the country **(4-6).**

Historically, organophosphorus agents have been the predominant cause of poisoning in India and similar developing countries. However, due to the proliferation of diverse pesticide formulations, toxicity cases involving non-organophosphorus compounds have shown a steady rise. Amitraz has emerged as one such toxicant gaining attention for its increasing incidence in clinical settings **(7,8).** Exposure to Amitraz can be either accidental or deliberate, occurring through ingestion, inhalation, or dermal contact. Clinically, it poses a diagnostic challenge due to its resemblance to clonidine poisoning, which is attributed to its α2-adrenergic agonist properties. Additionally, Amitraz toxicity may present with clinical features that overlap with those of organophosphate or carbamate poisoning, often leading to diagnostic confusion in acute care settings **(1,4–6).** Although its use and associated toxicity are becoming more common, particularly in regions where pesticide use is widespread, epidemiological data on Amitraz poisoning remain sparse in India. This underlines the necessity for more focused studies, such as the current investigation, to better characterize its clinical manifestations and treatment outcomes. The primary objective of this study was to evaluate the clinical profile of patients presenting with Amitraz compound poisoning to a tertiary care emergency department. Specifically, the study aimed to assess demographic patterns, presenting symptoms, vital signs, laboratory parameters, complications, and patient responses to treatment, with the goal of enhancing understanding of the toxicological and clinical spectrum associated with Amitraz exposure.

METHODOLOGY

This prospective observational study spanned 18 months (July 2019–December 2019) at Swamy Vivekanandha Medical College Hospital and Research Institute. It included 50 patients aged 18 years or older with confirmed Amitraz ingestion. Ethical clearance was obtained from the Institutional Ethics Committee, and informed consent was secured. All patients aged 18 years or older with a definitive history of Amitraz compound ingestion were included in the study. Patients were excluded if they were below 18 years of age, had ingested multiple poisons, or had consumed alcohol along with Amitraz, as these factors could confound the clinical presentation and outcomes. Data collected included demographic information, symptoms, vitals, lab investigations, treatments, and outcomes. Diagnostic workups comprised CBC, RFT, LFT, electrolytes, ABG, glucose parameters, ECG, and chest X-ray. SPSS v21.0 was used for analysis with $\alpha = 0.05$. The data was collected and compiled in MS Excel. Descriptive statistics has been used to present the data. To analyse the data SPSS (Version 21.0) was used. Significance level was fixed as 5% ($\alpha = 0.05$). Qualitative variables are expressed as frequency and percentages and Quantitative variables are expressed as Mean and Standard Deviation. To compare the proportion between variables, chi-square test was used.

RESULTS

The study enrolled 50 patients with confirmed Amitraz poisoning, and their demographic characteristics are detailed in **Table 1**. The majority of patients (52%, n=26) belonged to the 18–30 years age group, highlighting that young adults were the most commonly affected population. This may be attributed to occupational exposure, impulsive suicidal behavior, or limited awareness of pesticide toxicity. The 31–50 years age group comprised 36% (n=18) of the study population, while only 12% (n=6) were between 51 and 70 years, indicating a tapering trend in older individuals.

Table 1. Demographic profile of the study participants (n=50)

Category	Subgroup	Frequency	Percentage (%)
Age Group	18–30	26	52.0
	31–50	18	36.0
	51–70	6	12.0
Gender	Female	17	34.0
	Male	33	66.0
Occupation	Farmer	22	44.0
	Housewife	7	14.0
	Labourer	14	28.0
	Student	7	14.0

Male patients represented a significantly larger proportion, accounting for 66% (n=33), whereas females made up 34% (n=17) of the cohort. This male predominance may reflect occupational trends in pesticide handling, particularly in rural and agrarian communities, where men are more frequently involved in farming and field-related work. The occupational analysis further supports this pattern, with 44% (n=22) of participants being farmers. Labourers made up 28% (n=14), followed by housewives and students, each comprising 14% (n=7). These findings underscore the need for targeted preventive measures among high-risk occupational groups, especially those in direct contact with pesticides.

The clinical presentation of patients, as summarized in **Table 2**, revealed vomiting as the most frequently reported symptom, observed in 90% (n=45) of cases. This was followed by nausea in 66% (n=33), dizziness in 50% (n=25), and abdominal pain in a small proportion (6%, n=3). The predominance of gastrointestinal and neurological symptoms aligns with the known pharmacodynamic profile of Amitraz, a centrally acting α2-adrenergic agonist with effects on autonomic function.

Table 2. Clinical symptoms of the study participants (n=50)

Clinical symptoms	Frequency	Percentage (%)
Vomiting	45	90.0
Nausea	33	66.0
Dizziness	25	50.0
Abdominal Pain	3	6.0

Table 3 also outlines the clinical profile of the patients. Suicidal ingestion was the leading mode of exposure, with 96% (n=48) of cases being intentional, while accidental ingestion was noted in only 4% (n=2). Hemodynamic assessment showed that 24% (n=12) of patients presented with hypotension, a known effect of α2-receptor agonism leading to reduced sympathetic tone. The majority (76%, n=38) had normal blood pressure on presentation. Body temperature remained within normal limits in 94% (n=47), while 6% (n=3) experienced hypothermia, possibly due to Amitraz's central nervous system depressant properties.

Table 3. Clinical Profile of the study participants (n=50)

Clinical Profile	Subgroup	Frequency	Percentage (%)
Intention	Accidental	2	4.0
	Suicidal	48	96.0
Blood Pressure	Hypotension	12	24.0
	Normal	38	76.0
Body Temp	Hypothermia	3	6.0
	Normal	47	94.0
Urine Output	Normal	42	84.0

	Polyuria	8	16.0
Pupil Size	Dilated	5	10.0
	Miosis	12	24.0
	Mydriasis	4	8.0
	Normal	29	58.0

Urine output was normal in 84% (n=42), whereas 16% (n=8) of patients had polyuria, potentially indicating transient renal or osmotic effects. Pupillary examination revealed that 42% of the cohort displayed abnormal findings—24% (n=12) had miosis, 10% (n=5) had dilated pupils, and 8% (n=4) exhibited mydriasis. The remaining 58% (n=29) had normal pupil sizes. These findings reflect the compound's effect on autonomic nervous system function.

Vital signs and laboratory parameters, detailed in **Table 4**, showed a normal heart rate in 62% (n=31) of patients. Tachycardia was noted in 26% (n=13), and bradycardia in 10% (n=5), again highlighting the variable cardiovascular response induced by Amitraz toxicity. Hyperglycemia was recorded in 12% (n=6), which corresponded with glycosuria in the same number of patients. This pattern suggests stress-induced hyperglycemia or possible interference with glucose metabolism, as supported by literature citing the suppression of insulin and promotion of glucagon via α2-receptor stimulation.

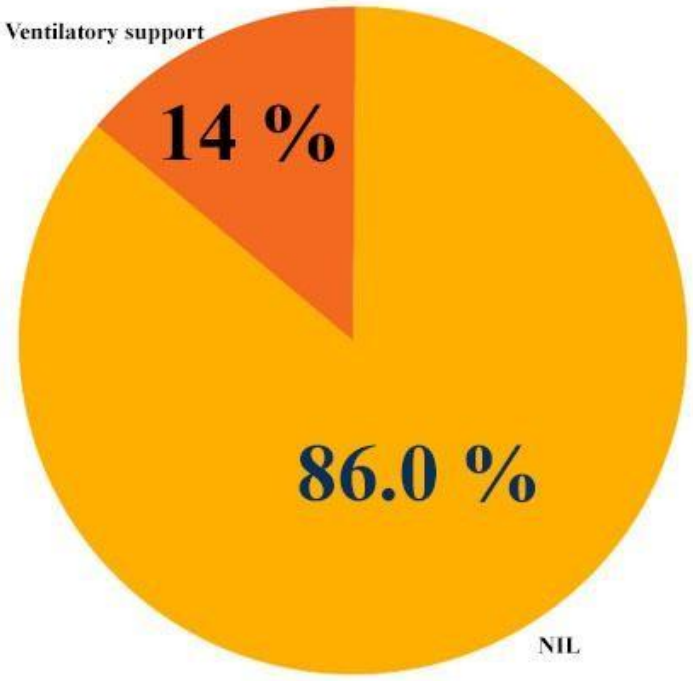
Table 4. Vital Signs and Lab parameters of the study participants (n=50)

Vital Signs and Labs	Subgroup	Frequency	Percentage (%)
Heart Rate	Bradycardia	5	10.0
	Normal	31	62.0
	Tachycardia	13	26.0
Blood Sugar	Hyperglycemia	6	12.0
	Normal	44	88.0
Urine Sugar	Glycosuria	6	12.0
	Normal	44	88.0
ABG	Metabolic Acidosis	3	6.0
	Respiratory Alkalosis	3	6.0

Arterial blood gas (ABG) analysis revealed that 88% (n=44) of patients had normal parameters. Metabolic acidosis was identified in 6% (n=3), and respiratory alkalosis in another 6% (n=3), indicating that a small subset of patients experienced significant acid-base disturbances secondary to poisoning.

Regarding clinical management, as shown in **Figure 1**, the majority of patients (86%, n=43) were successfully managed with supportive care alone. However, 14% (n=7) required ventilatory support, reflecting the potential for severe toxicity in a minority of cases. These findings emphasize the importance of early recognition and symptomatic management in achieving favorable outcomes in Amitraz poisoning.

Figure 2. Management of the study participants (n=50)



DISCUSSION

In the present investigation, 50 patients with confirmed Amitraz intoxication were evaluated. The highest proportion (52%, n = 26) belonged to the 18–30-year age group, reinforcing the observation that young adults constitute the most frequently affected demographic. A substantial number (36%, n = 18) were between 31 and 50 years of age, while only a minority (12%, n = 6) were aged between 51 and 70 years. These findings are comparable with the study by Dange et al. **(9),** which reported a mean age of 32.4 years, with 50% of cases below 30 years, 34% between 30–50 years, and 16% over 50 years. Likewise, Ilyas et al. (6) reported a 40-year-old male with suicidal ingestion. Jalawadi et al. (10) found the most affected group to be 20–29 years (36.8%), while Addepalli et al. (11) documented that 75% of cases were under 30 years, further corroborating the vulnerability of the younger population, likely due to impulsivity, psychosocial distress, or occupational exposure.

Our study demonstrated a marked male predominance, with 66% (n = 33) of patients being male and 34% (n = 17) female. This trend could be attributed to men's predominant role in pesticide-related occupations such as farming. In contrast, Dange et al. (9) reported a female majority (58%), while Jalawadi et al. (10) and Addepalli et al. (11) observed an equal male-to-female ratio, indicating regional variability in gender exposure patterns.

Occupational analysis revealed that farmers comprised the largest group (44%, n = 22), followed by labourers (28%, n = 14), with housewives and students each constituting 14% (n = 7). In comparison, Dange et al. (9) identified students (37%) and farmers (34%) as primary affected groups. Addepalli et al. (11) found a broader occupational mix, with daily wagers and students each contributing 25%, alongside smaller proportions of farmers and sales workers. These variations underline that although occupational exposure remains a key determinant, non-occupational and domestic exposures are also significant.

A striking 96% (n = 48) of patients in our cohort had consumed Amitraz with suicidal intent, and only 4% (n = 2) were cases of accidental ingestion. This mirrors the high suicidal ingestion rate of 86% reported by Dange et al. (9), underscoring the urgent need for public health strategies addressing pesticide regulation and mental health support in vulnerable communities.

Vomiting was the most prevalent clinical symptom, occurring in 90% (n = 45) of patients, followed by nausea (66%, n = 33), dizziness (50%, n = 25), and abdominal pain (6%, n = 3). These findings reflect the known toxicodynamic effects of Amitraz on the gastrointestinal and central nervous

systems. These trends are consistent with findings from Jalawadi et al. (10), who reported vomiting in 90.8% of patients, and Addepalli et al. (11), where vomiting was also the most common symptom, occurring in 75% of cases.

In this study, 24% (n = 12) of individuals presented with hypotension, while 76% (n = 38) maintained normal blood pressure. Hypotension is consistent with the pharmacological action of α2-adrenergic agonists, which reduce sympathetic tone and lower systemic vascular resistance. Additionally, Amitraz often contains xylene, a CNS depressant that can exacerbate hypotensive responses (18). Our findings align with Jalawadi et al. (10), who reported hypotension in 32.9% of cases.

Normal body temperature was observed in 94% (n = 47) of patients, while 6% (n = 3) exhibited hypothermia. This may be attributed to metabolic suppression from Amitraz's sedative effects. Comparable observations were reported by Ertekin et al. (19) and Ulukaya et al. (20), who documented hypothermia in 9.33% and 33% of patients, respectively.

Regarding urinary output, 84% (n = 42) of patients had normal urine volumes, while 16% (n = 8) demonstrated polyuria. These alterations could be related to transient renal tubular effects or osmotic diuresis. Pupillary examination showed normal pupils in 58% (n = 29), while 24% (n = 12) had miosis, 10% (n = 5) had dilated pupils, and 8% (n = 4) showed mydriasis, indicative of the neuro-autonomic effects of Amitraz. Similar pupillary abnormalities were observed by Jalawadi et al. (10), with miosis being the most common finding.

Cardiac assessment showed normal heart rates in 62% (n = 31), tachycardia in 26% (n = 13), and bradycardia in 10% (n = 5). Avsarogullari et al. (17) reported bradycardia in 8.7% of patients, in line with our findings. These variable cardiac presentations l ikely reflect the dual influence of parasympathetic and sympathetic systems modulated by Amitraz. Dange et al. (9) similarly noted bradycardia in 22%, dizziness in 17%, and hypotension in 12% of their cases.

Hyperglycemia was detected in 12% (n = 6) of patients, with a matching prevalence of glycosuria. These alterations may result from α2-receptor-mediated suppression of insulin secretion and increased glucagon release, mechanisms supported by Deepak et al. (14) and biochemical studies (15,16). In contrast, Dange et al. (9) reported hyperglycemia in only 3% of patients, while Addepalli et al. (11) observed it in 25% with a mean blood sugar of 173 mg/dL. Jalawadi et al. (10) also noted mild, transient hyperglycemia.

In arterial blood gas (ABG) analysis, 88% (n = 44) had normal values, with 6% (n = 3) showing metabolic acidosis and another 6% (n = 3) respiratory alkalosis. This relatively low incidence of acid-base disturbance contrasts with Jalawadi et al. (10), who reported metabolic acidosis in 39.5% and respiratory acidosis in 9.2%. Addepalli et al. (11) recorded metabolic acidosis in 75% of cases. Other studies by Kalyoncu et al. (13) and Surendra et al. (12) also reported diverse ABG abnormalities, underscoring the variable metabolic impact of Amitraz toxicity.

Finally, 14% (n = 7) of patients in our cohort required ventilatory support, while 86% (n = 43) were managed conservatively. This indicates that most cases of Amitraz poisoning are mild to moderate and can be effectively treated with symptomatic care. Nonetheless, a small but significant proportion presents with severe manifestations requiring intensive intervention. This is comparable to data from Jalawadi et al. (10), where 28.9% required mechanical ventilation, and Addepalli et al. (11) reported ventilatory support in 25% of their patients. Surendra et al. (12) also noted a 37.5% rate of mechanical ventilation. These comparisons highlight the need for readiness in managing complications, despite a generally favorable prognosis.

Limitations

This study, while informative, has certain limitations that should be acknowledged. Firstly, the sample size was relatively small (n=50), which may limit the generalizability of the findings to broader populations. Secondly, as a single-center study conducted in a specific geographic region, local socio-economic and occupational factors may have influenced the demographic and clinical trends observed. Additionally, due to the observational nature of the study, causality between clinical variables and outcomes could not be established. The lack of long-term follow-up also precluded assessment of delayed or chronic complications of Amitraz poisoning.

Recommendations

Given the findings and limitations, the following recommendations are proposed:

Awareness and Training: Healthcare providers, especially in rural and agricultural regions, should receive targeted training to recognize and manage Amitraz poisoning promptly and effectively.

Regulatory Oversight: There is a need for stricter regulation over the distribution and labeling of Amitraz-containing compounds to reduce accessibility, particularly for suicidal intent.

Mental Health Integration: Mental health screening and counseling should be integrated into primary healthcare, especially in areas with high pesticide availability and suicide risk.

Public Education: Community-level education campaigns can inform the public about the dangers of pesticide misuse and the importance of safe handling and storage practices.

Future Research: Larger, multi-center studies with extended follow-up periods are essential to better understand the full clinical spectrum, prognostic markers, and long-term outcomes associated with Amitraz toxicity.

CONCLUSION

This study demonstrates that Amitraz poisoning predominantly affects young adult males, with suicidal ingestion constituting the principal mode of exposure. Gastrointestinal symptoms, particularly vomiting and nausea, were the most common clinical presentations, accompanied by variable cardiovascular and autonomic disturbances in a subset of cases. Although complications such as hypotension, bradycardia, and hyperglycemia were observed, the majority of patients exhibited favorable outcomes with timely and supportive care. The relatively low requirement for ventilatory support underscores the effectiveness of conservative management in most instances. These findings emphasize the critical role of early identification, symptomatic treatment, and public health awareness in mitigating the impact of Amitraz toxicity.

RECOMMENDATIONS

Based on the study findings, there is a need to increase awareness among healthcare providers regarding the clinical presentation and supportive management of Amitraz poisoning. Efforts should be made to educate agricultural workers and rural communities about the risks of exposure and safe handling of chemical compounds like Amitraz. Additionally, mental health screening and counseling services should be strengthened, especially in areas where pesticide-related suicides are prevalent. Future studies with larger sample sizes, multi-center involvement, and long-term follow-up are recommended to better understand the spectrum, prognosis, and prevention strategies for Amitraz intoxication.

REFERENCES

1. Filazi A, Yurdakok-Dikmen B. Amitraz. InVeterinary Toxicology 2018 Jan 1 (pp. 525-531). Academic Press.
2. Pugliese N, Circella E, Cocciolo G, Giangaspero A, Horvatek Tomic D, Kika TS, Caroli A, Camarda A. Efficacy of λ-cyhalothrin, amitraz, and phoxim against the poultry red mite Dermanyssus gallinae De Geer, 1778 (Mesostigmata: Dermanyssidae): an eight-year survey. Avian pathology. 2019 Sep 13;48(sup1):S35-43.
3. Erika LR, Angela CR. Organophosphate Toxicity. Treasure Island (FL): StatPearls Publishing; 2019.
4. Sachdeva S, Mohan G, Singh P. Amitraz poisoning: an emerging and yet underestimated poison-A review. AMEI's Curr Trends Diagn Treat. 2019;4:21–5.
5. Bhartiya M, Hans B, Sundaray S, Sagar A. Amitraz poisoning: the not so (un)common poisoning. Cureus. 2019;11:5438.
6. Ilyas WM, Gadkari C, Pundkar A, Gaur U. Severe Amitraz Poisoning: A Case of Successful Emergency Intervention. Cureus. 2014 Jun 26;16(6):e63228.

7. Jeyaratnam J. Acute pesticide poisoning: a major global health problem. World Health Stat Q. 1990;43(3):139–44.
8. Federal Insecticide, Fungicide, and Rodenticide Act [As Amended Through P.L. 110-246, Effective May 22, 2008]. Sec 2 (7 U.S.C. 136). Definitions. p. 8–10.
9. Dange S, Gondhali M, Hase S. Clinical profile and outcome in Amitraz compound poisoning. J Cardiovasc Dis Res. 2013;14(12):15–17.
10. Jalawadi VM, Potkar S, Yadav UP, Hiremani MS. Managing Amitraz Poisoning: Epidemiological Data and Clinical Insights From a Tertiary Care Hospital in Southern India. Cureus. 2014 Nov 3;16(11):e72915.
11. Addepalli NS, Patel AK, Santhi M, Nagarjuna M. Clinico-socio-epidemiological profile of amitraz poisoning: a case series. J Nutraceut Health. 2014;2(1):6–12.
12. Surendra EM, Shamanur K, Manjunatha BH, Angadi B. Amitraz (Acaricide) Poisoning: A Study of this Unusual Emerging Poison. Indian J Emerg Med. 2017;3(1)27-31.
13. Kalyoncu MU, Dilber E, Ökten A. Amitraz intoxication in children in the rural black sea region: analysis of forty-three patients. Hum Exp Toxicol. 2002;21(5):269-272.
14. Deepak K, Nobul Rao, Rama Devi, Muneeswar Reddy, Jaya Bhaskar. Case series: amitraz poisoning: clinical profile and management: is stomach wash an antidote? Int J of Adv Res. 2011;9(1):200-202.
15. Abu-Basha EA, Yibchok-Anun S, Hopper DL, Hsu WH. Effects of the pesticide amitraz and its metabolite BTS 27271 on insulin and glucagon secretion from the perfused rat pancreas: involvement of alpha2D-adrenergic receptors. Metabolism. 1999;48(11):1461-1469.
16. Sabzghabaee AM, Eizadi-Mood N, Gheshlaghi F, Adib N, Safaeian L. Is there a relationship between admission blood glucose level following acute poisoning and clinical outcome? Arch Med Sci. 2011;7(1):81-86.
17. Avsarogullari L, Ikizceli I, Sungur M, Sözüer E, Akdur O, Yücei M. Acute amitraz poisoning in adults: clinical features, laboratory findings, and management. Clin Toxicol (Phila). 2006;44(1):19-23.
18. Hsu WH, Kakuk TJ. Effect of amitraz and chlordimeform on heart rate and pupil diameter in rats: mediated by α2-adrenoreceptors. Toxicol Appl Pharmacol. 1984;73(3):411-415.
19. Ertekin V, Alp H, Selimoğlu MA, Karacan M. Amitraz poisoning in children: retrospective analysis of 21 cases. J Int Med Res. 2002;30(2):203-205.
20. Ulukaya S, Demirag K, Moral A. Acute amitraz intoxication in human. Intensive Care Med. 2001;27(5):930-933.