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Original Research Article

Pills over pesticides: the rising burden of pharmaceutical poisoning among young adults in urban south India

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ABSTRACT

Background: Acute pharmaceutical poisoning represents an emerging public health challenge in urban India, with limited contemporary data on clinical profiles and outcomes. This study aimed to characterize the epidemiological patterns, clinical presentations, and determinants of complications in patients with acute drug poisoning.
Methods: We conducted a prospective observational study over six months (June-December 2024) at a tertiary care center in Chennai, India. Adult patients (≥18 years) admitted with acute pharmaceutical poisoning were enrolled. Primary outcomes included organ dysfunction and in-hospital mortality. Secondary outcomes comprised length of stay and complication patterns. Multivariable logistic regression identified independent predictors of organ dysfunction.
Results: Among 80 patients (mean age 36.8±11.2 years, 55% female), intentional self-harm accounted for 92.5% of cases. Benzodiazepines (17.5%) and NSAIDs (13.8%) were most frequently implicated. The majority (76.3%) presented 7-24 hours post-ingestion. Organ dysfunction occurred in 22 patients (27.5%), with no mortality observed. Independent predictors of organ dysfunction included delayed presentation >24 hours (OR 15.2, 95% CI 2.1-109.8, p=0.007) and ingestion >40 tablets (OR 8.9, 95% CI 2.8-28.4, p<0.001). Median length of stay was 5 days (IQR 4-6). All patients survived to discharge.
Conclusions: Acute pharmaceutical poisoning predominantly affects young urban adults through intentional self-harm, replacing traditional pesticide poisonings. Early presentation and limiting ingested quantities are critical determinants of outcomes. These findings support the need for enhanced mental health services, medication safety measures, and public health interventions targeting pharmaceutical poisoning prevention.

Keywords: Acute drug poisoning, Clinical profile, Hospital outcomes, Organ failure, Pharmaceutical overdose, South India, Toxicology

INTRODUCTION

Toxic exposure to medications is a significant yet often underestimated global health problem. The World Drug Report estimates that drug poisoning leads to around 190,000 deaths annually.[1] In India, the issue has become increasingly prominent, contributing notably to emergency department visits and hospital admissions.[2] Historically, attention has centred on pesticide and chemical poisonings, especially in rural areas, but there is now growing awareness of the alarming rise of pharmaceutical overdoses in both urban and semi-urban populations.[3] This

paradigmatic shift is linked to factors such as widespread access to prescription and non-prescription drugs, insufficient regulatory measures, evolving psychosocial stressors and limited public understanding of the risks associated with self-medication and the simultaneous use of multiple medications.[4,5]

Recent epidemiological data indicate that drug poisoning has become the second leading cause of toxic exposure in India, following pesticides, and accounts for about 10% of poisoning cases seen in hospitals.[6] Therefore, acute drug poisoning remains a critical and escalating public health concern, often requiring hospital treatment and, in severe cases, admission to intensive care. Alarmingly, mortality rates associated with acute poisoning have been reported to be as high as 75%.[7] This problem is particularly pronounced among young adults and individuals facing psychological or social stressors, with a significant proportion of cases linked to intentional self-harm or suicide attempts.[8,9] The increasing prevalence of mental health disorders, coupled with greater access to psychotropic medications such as antidepressants, antipsychotics, and sedatives, has further complicated the landscape of drug-related toxicity.[10,11] Analgesics and non-steroidal anti-inflammatory drugs (NSAIDs) also feature prominently in poisoning statistics due to their widespread use and accessibility.[12]

The clinical presentation of drug poisoning is markedly diverse, ranging from mild, non-specific symptoms such as nausea and drowsiness to life-threatening complications including seizures, cardiac arrhythmias, respiratory depression, coma, and multi-organ failure.[13] The prognosis of affected individuals depends on multiple factors, such as the specific drug and dose consumed, the interval between ingestion and initiation of treatment, underlying comorbidities like diabetes or hypertension, and the quality and timeliness of medical intervention. Comprehensive laboratory and imaging evaluations play a vital role in determining the severity of poisoning, with derangements in haematological, renal, and hepatic profiles often providing invaluable prognostic insight.[14] Hence, early recognition of symptoms and prompt identification of the toxic substance are crucial for timely intervention, which can significantly improve patient outcomes.

Despite the growing burden, research on drug poisoning in India remains limited compared to that on pesticide or industrial chemical exposures. Many published studies are retrospective, single-center analyses with inconsistent reporting of clinical features and outcomes, and there is a lack of large-scale, prospective research that systematically examines the clinical course, diagnostic findings, and the influence of comorbidities on patient outcomes.[15,16] Furthermore, post-discharge follow-up data are scarce, making it difficult to assess long-term recovery, relapse rates, and the need for ongoing psychological or medical support.[17]

In light of these critical knowledge gaps, we aimed to provide a comprehensive overview of patients admitted with acute drug poisoning by systematically documenting their epidemiological profiles, clinical features, and relevant laboratory and imaging findings. In addition, we seek to analyze how these clinical and diagnostic parameters relate to key treatment outcomes such as recovery, the development of complications, and in-hospital mortality.

METHODS

Study design and setting

This prospective observational study was conducted over a six-month period (June-December 2024) at the Institute of Internal Medicine, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai. The study aimed to evaluate the clinical profile, management, and outcomes of adult patients presenting with acute drug poisoning.

Study population

All patients aged 18 years and above, admitted to the toxicology ward with a history of acute drug poisoning, were screened for eligibility. Patients with or without comorbidities such as hypertension, diabetes mellitus, or depressive disorders were included, provided they gave informed consent. Exclusion criteria were patients who had consumed multiple types of poisons, those who did not provide consent, and individuals under 18 years of age.

Sample size

The sample size was determined using the formula $n=Z^2pq/d^2$, where p represented the estimated prevalence of acute drug poisoning (26%), q was 1-p, and d was the absolute precision (10%). A total of 80 cases were enrolled during the study period.

Data collection

After confirming eligibility, each participant underwent initial stabilization of airway, breathing, and circulation as per standard emergency protocols. Once stabilized, a detailed clinical history was obtained, including the type and quantity of drug ingested, time and intent of consumption (suicidal or accidental), demographic information, and presenting symptoms. A thorough clinical examination was performed to assess vital signs, neurological status, and the presence of specific symptoms such as abdominal pain, vomiting, altered mental status, seizures, jaundice, renal dysfunction, and cardiovascular instability.

All patients underwent a comprehensive panel of laboratory investigations, including complete blood count, renal and liver function tests, serum electrolytes, coagulation profile, arterial blood gas analysis, and urine

analysis. Additional diagnostic tests such as chest x-ray, electrocardiogram (ECG), echocardiogram, and toxicological screening were performed as indicated.

The type of poisoning was categorized as acute, chronic, subacute, or fulminant, based on the pattern and quantity of exposure. Identification of the specific poison was based on clinical history, physical evidence (such as empty containers or chemical spills), and toxicological analysis when available. During hospitalization, patients were monitored for the development of complications, requirement for intensive care, duration of hospital stay, and clinical outcome (recovery, morbidity, or mortality). Follow-up data were collected during the hospital stay and, when necessary, after discharge via telephone to assess delayed complications or outcomes.

Statistical analysis

For each patient, data were collected on age, sex, comorbidities, type and quantity of drug ingested, time to hospital presentation, intent of poisoning, vital signs at admission, laboratory results, clinical features, complications, interventions, length of hospital stay, and final outcome (discharge, referral, or death). All data were entered into a secure database and verified for accuracy.

Descriptive statistics were used to summarize patient characteristics and outcomes. Continuous variables were reported as mean±standard deviation or median (interquartile range), and categorical variables as frequencies and percentages. Group comparisons were performed using chi-square or Fisher's exact test for categorical variables, and Student's t-test or Mann-Whitney U test for continuous variables, as appropriate. A p-value <0.05 was considered statistically significant. Analyses were conducted using SPSS version 25.0 (IBM Corp., Armonk, NY, USA).

Ethical considerations

The study was approved by the institutional ethics committee of Madras Medical College and conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants prior to inclusion in the study. Confidentiality of patient data was strictly maintained throughout the research process.

RESULTS

Demographic and socioeconomic profile

A total of 80 patients with acute drug poisoning were included in the study. The mean age was 36.8±11.2 years, with the majority (42.5%) in the 31-40-year age group (Figure 1). Females constituted 55% of the study population, and 55% of participants were from urban areas. Most patients belonged to the lower middle socioeconomic class (52.5%) and had completed either graduate (36.3%) or high school (35%) education (Table 1).

Table 1: Demographic and socioeconomic characteristics of study participants (n=80).

Variables	Category	Frequency	Percentage
Age group (years)	11-20	4	5
	21-30	14	17.5
	31-40	34	42.5
	41-50	17	21.3
	51-60	10	12.5
	61-70	1	1.3
Gender	Male	36	45
	Female	44	55
Locality	Rural	36	45
	Urban	44	55
Socioeconomic status	Lower	4	5
	Upper lower	15	18.8
	Lower middle	42	52.5
	Upper middle	19	23.8
Education	Graduate	29	36.3
	High school	28	35
	Middle school	20	25
	Illiterate	3	3.8

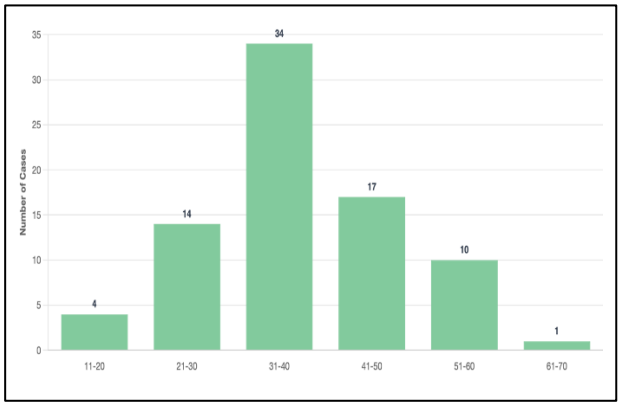

Figure 1: Age distribution of patients.
Peak incidence in 31-40 year age group (42.5% of cases).

Clinical and poisoning characteristics

The majority of patients (76.3%) presented between 7 and 24 hours after drug ingestion, while 22.5% arrived within 6 hours. Prereferral treatment was received by 48.8% of patients. Benzodiazepines (17.5%) and NSAIDs (13.8%) were the most commonly ingested drugs, followed by antihypertensives (10%), beta blockers (8.8%), and antipsychotics (7.5%) (Figure 2). The most frequent quantity of drug consumed was 21-30 tablets (36.3%), with a smaller proportion ingesting more than 40 tablets (21.3%) (Table 2).

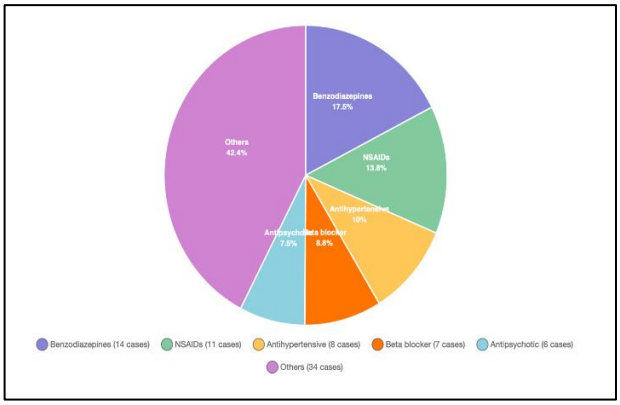

Figure 2: Distribution of drug types in poisoning cases.

Table 2: Clinical and poisoning characteristics among study participants (n=80).

Variables	Category/range	Frequency	Percentage
Time since consumption	1-6 hours	18	22.5
	7-24 hours	61	76.3
	>24 hours	1	1.3
Prereferral treatment	Yes	39	48.8
	No	41	51.2
Type of drug consumed	Benzodiazepines	14	17.5
	NSAIDs	11	13.8
	Antihypertensive	8	10
	Beta blocker	7	8.8
	Antipsychotic	6	7.5
	Others*	34	42.4
Quantity consumed (tablets)	10-20	19	23.8
	21-30	29	36.3
	31-40	15	18.8
	41-50	13	16.3
	51-60	4	5

*Others include anti-epileptics, vitamins, oral hypoglycemics, tricyclic antidepressants, etc.

Presenting symptoms and laboratory findings

Vomiting (35%), giddiness (32.5%), and abdominal pain (21.2%) were the most common presenting symptoms. Altered sensorium was noted in 17.5% of cases. At admission, 17.5% of patients were hypotensive. Laboratory abnormalities included deranged liver function tests in 27.5% and positive urine toxicology in 41.3%. Most patients had normal arterial blood gas (92.5%) and ECG findings (93.8%) (Table 3).

Hospital course and outcomes

The majority of patients (72.5%) required hospitalization for 4-7 days, while 21.3% were discharged within 4 days. Comorbidities were present in 45% of patients, most commonly hypertension (21.3%) and diabetes mellitus (13.8%). A specific antidote was administered in 25% of cases. Organ failure developed in 27.5% of patients during their hospital stay. All patients survived and were discharged (Table 4).

Table 3: Presenting symptoms and key laboratory findings.

Variables	Category/result	Frequency	Percentage
Vomiting	Present	28	35
Giddiness	Present	26	32.5
Abdominal pain	Present	17	21.2
Altered sensorium	Present	14	17.5
Blood pressure at admission	Normal	66	82.5
	Hypotension	14	17.5
LFT	Normal	58	72.5
	Deranged	22	27.5
Urine analysis	Positive	33	41.3
	Negative	47	58.8
ABG	Normal	74	92.5
	Metabolic acidosis	5	6.3
	Respiratory acidosis	1	1.3
ECG	Normal	75	93.8
	QT prolongation	3	3.8
	Bradycardia	2	2.5

Table 4: Hospital course and outcomes among study participants (n=80).

Variables	Category/range	Frequency	Percentage
Duration of stay	<4 days	17	21.3
	4-7 days	58	72.5
	> 7 days	5	6.3
Comorbidities	Hypertension	17	21.3
	Diabetes mellitus	11	13.8
	Psychiatric disorder	8	10
	None	44	55
Specific antidote used	Yes	20	25
	No	60	75
Organ failure	Yes	22	27.5
	No	58	72.5
Outcome	Discharged	80	100

Table 5: Associations between key variables and organ failure.

Variables	Category	Organ failure (%)	No organ failure (%)	P value (Fisher's Exact)
Time since consumption	1-6 hours	5.5	94.5	0.02*
	7-24 hours	32.7	67.3	
	>24 hours	100	0	
Quantity consumed	10-20 tablets	5.2	94.8	<0.001*
	21-30 tablets	10.3	89.7	
	31-40 tablets	26.7	73.3	
	41-50 tablets	76.9	23.1	
	51-60 tablets	100	0	
Age group (years)	11-20	50	50	0.621
	21-30	35.7	64.3	
	31-40	29.4	70.6	
	41-50	23.5	76.5	
	51-60	10	90	
	61-70	0	100	
Pre-referral treatment	Yes	30.8	69.2	0.619
	No	24.4	75.6	

Note: *p<0.05.

Associations with organ failure

Statistically significant associations were observed between both the time interval from drug ingestion to hospital presentation and the quantity of drug consumed with the development of organ failure. Patients presenting later (>24 hours) or consuming larger quantities (41-60 tablets) had a higher risk of organ failure (p=0.02 and p<0.001, respectively) (Figures 3 and 4). No significant association was found between organ failure and age group or prereferral treatment (Table 5).

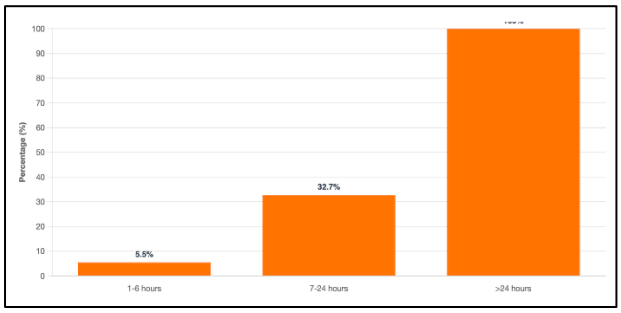

Figure 3: Time to hospital presentation versus organ failure rate.

Delayed hospital presentation (>24 hours) associated with 100% organ failure rate. P=0.02 (Fisher's exact test).

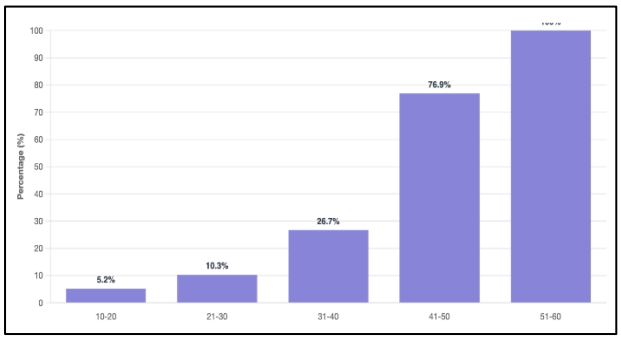

Figure 4: Drug quantity consumed versus organ failure rate.

Higher drug quantities significantly increase organ failure risk, p<0.001 (Fisher's exact test).

Independent predictors of organ dysfunction included delayed presentation >24 hours (OR 15.2, 95% CI 2.1-109.8, p=0.007) and ingestion >40 tablets (OR 8.9, 95% CI 2.8-28.4, p<0.001). This indicates that patients presenting after 24 hours had a 15-fold increased risk of developing organ failure compared to those presenting earlier, while patients consuming more than 40 tablets had nearly 9 times higher odds of organ dysfunction compared to those consuming fewer tablets. Median length of stay was 5 days (IQR 4-6).

DISCUSSION

This study provides a comprehensive contemporary profile of acute drug poisoning in a tertiary care hospital in South India, highlighting demographic patterns, clinical features, and risk factors for complications. The majority of our patients were young to middle-aged adults, with a slight predominance of females. This trend is consistent with other studies from South India, where the highest incidence of poisoning was observed in individuals aged 18-30 years and a significant proportion of cases involved females.[18]

Intentional self-poisoning emerged as the predominant pattern in our cohort, consistent with findings from other regional studies. These studies similarly highlight suicide attempts as the leading cause of poisoning, frequently associated with psychosocial stressors and interpersonal conflicts.[19] For instance, a retrospective analysis from Puducherry found that over 75% of cases were due to intentional ingestion, with women being more frequently affected.[19] Similarly, a study on adolescents in Southern India observed that most poisonings were impulsive acts secondary to family conflicts.[20]

In our study, benzodiazepines and NSAIDs were the most frequently implicated drugs, representing a clear shift towards easily accessible pharmaceutical agents. While our findings reflect an urban trend towards pharmaceutical overdoses, other studies in South India continue to report a high prevalence of pesticide and insecticide poisoning, especially in rural and adolescent populations.[21,22]

For instance, a study from Mangalore identified agrochemical pesticides as the most important agents (49%), followed by drugs (17%).[21] This contrast highlights the influence of regional drug availability and occupational exposures on poisoning patterns. Clinically, gastrointestinal and neurological symptoms such as vomiting, giddiness, and altered sensorium were most common in our cohort, consistent with the typical manifestations described in the literature. Laboratory abnormalities, including deranged liver function and positive toxicology screens, were observed in a subset of patients, emphasizing the need for comprehensive evaluation in all suspected cases.[21,22]

Our study reveals the concerning finding that organ failure developed in 27.5% of patients with acute drug poisoning, despite a 100% survival rate. Critically, delayed hospital presentation and ingestion of larger quantities of drugs were significantly associated with organ failure. These findings are consistent with previous research from both India and neighbouring countries, which have repeatedly demonstrated that timely medical intervention and the amount of poison consumed are critical determinants of outcome.

Reddy et al reported from Andhra Pradesh that the mean time to hospital admission was 6.4 hours, and mortality was significantly higher among those with delayed presentation and low Glasgow Coma Scale scores at admission. Their overall mortality rate was 16.2%, and organophosphorus compounds were the most common agents, but drug overdoses were also a significant

contributor to morbidity and mortality.[23] Similarly, a study by Kolli et al found that patients who arrived at the hospital more than 12 hours after poisoning had a significantly higher risk of in-hospital mortality, reinforcing the importance of early treatment regardless of the poison involved.[24]

Our results also reflect a dramatic and evolving poisoning profile in urban India, with a decrease in pesticide-related cases and a rise in pharmaceutical overdoses. This trend is supported by findings from a tertiary center in South India, where 78% of poisoning cases were intentional and pharmaceutical agents were increasingly implicated, especially in urban areas.[2] However, the pattern remains different in rural and agricultural regions.

Rao et al. in Kona Seema, Andhra Pradesh, found that insecticide and pesticide poisoning-particularly organophosphorus compounds remained the leading cause among pediatric patients, influenced by local agricultural practices.[17] Likewise, Singh et al. in Warangal, Telangana, reported that over a two-year period, the majority of their 3200 poisoning cases involved pesticides, with a fatality rate of 18.7%. Males were more commonly affected, and the highest incidence was in the 20-30-year age group. Early hospital presentation was again linked to better survival.[25]

These findings underscore the importance of tailoring prevention and intervention strategies to local epidemiological patterns. While urban centers are experiencing a shift toward pharmaceutical overdoses, rural and semi-urban areas continue to struggle with the burden of pesticide and agrochemical poisoning. Across all settings, early access to medical care and limiting the quantity of the toxic agent ingested remain the most important modifiable factors for reducing morbidity and mortality.

The robust statistical associations demonstrated in our study, with odds ratios of 15.2 for delayed presentation and 8.9 for high-quantity ingestion, provide compelling evidence for the critical nature of these risk factors.

This study has several limitations that should be acknowledged. First, as it was conducted at a single tertiary care hospital, the findings may not be generalizable to other regions or healthcare settings, particularly rural areas where patterns of poisoning and access to care may differ. The relatively small sample size may limit the statistical power to detect associations between less common variables and outcomes. Additionally, much of the data regarding the type and quantity of drug ingested relied on patient or bystander recall, which introduces the possibility of recall bias and inaccuracies, especially in cases involving altered mental status or incomplete histories. The absence of universal toxicological confirmation due to resource constraints may have led to misclassification or underestimation of certain poisoning agents.

Despite these limitations, our study provides invaluable insights into the shifting trends of acute drug poisoning in South India. We observed that pharmaceutical overdoses are increasingly replacing traditional agents like pesticides, especially in urban populations. This change highlights the need for updated prevention strategies, including stricter regulation of prescription and over-the-counter medications, as well as targeted public education about the risks of drug misuse.

Prompt hospital presentation and minimizing the quantity of drug consumed emerged as key factors in reducing serious complications such as organ failure. These findings underscore the importance of early intervention and rapid access to medical care in improving patient outcomes.

Looking forward, there is an urgent and clear need for broader, multi-center studies with larger and more diverse populations to better capture the full spectrum of poisoning cases across different settings. Incorporating routine toxicological screening and follow-up would enhance the accuracy and depth of future research. In parallel, public health efforts should focus on strengthening mental health services, promoting responsible medication prescribing and dispensing practices, and implementing effective regulatory measures to limit access to potentially dangerous substances. Such comprehensive strategies are essential for reducing the burden of acute poisoning and improving the safety and well-being of the community.

CONCLUSION

The findings of this study reveal a changing pattern of acute drug poisoning in South India, with pharmaceutical overdoses becoming more common than traditional pesticide-related cases, especially in urban settings. Early arrival at the hospital and reduced amounts of drug consumption were strongly linked to better outcomes and fewer complications such as organ failure. These results highlight the importance of timely medical care and the need for increased awareness about the dangers of drug misuse.

To address these challenges, there is a clear need for improved mental health resources, careful prescribing and dispensing of medications, and stronger regulations to restrict access to potentially dangerous substances. Expanding future research to include multiple centres and larger, more varied populations will help to better understand regional differences and guide more effective prevention and treatment strategies. By combining prompt clinical intervention, community education, and policy measures, it is possible to reduce both the incidence and severity of acute poisoning in the community.

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