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ACUTE POISONING AMONG PATIENTS PRESENTING TO THE EMERGENCY DEPARTMENT OF A TERTIARY CARE CENTRE: A DESCRIPTIVE CROSS-SECTIONAL STUDY AT JINNAH POSTGRADUATE MEDICAL CENTRE, KARACHI

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Abstract

Objective: *To describe the demographic profile, toxic agents, exposure characteristics, clinical presentation, emergency treatment and immediate disposition of patients with acute poisoning at Jinnah Postgraduate Medical Centre (JPMC), Karachi.*

Study Design: *Descriptive cross-sectional study.*

Settings: *Accident and Emergency Department, JPMC, Karachi, Pakistan.*

Period: *December 2024 to April 2025.*

Material & Methods: *The supplied dataset contained 252 patients aged 12 years or older presenting within 24 hours of toxic exposure. A structured proforma recorded exposures, vital signs, toxidromes, treatment and end-of-ED-stay disposition. Frequencies, percentages and mean ± standard deviation were calculated. Toxic-agent categories were compared across age, gender and intent using chi-square analysis, with sparse-cell sensitivity checks.*

Results: *Mean age was 35.33 ± 15.74 years; 135 patients (53.6%) were female. Pharmaceuticals (79, 31.3%), household chemicals (54, 21.4%) and organophosphate/carbamate pesticides (39, 15.5%) were the leading groups. Oral exposure occurred in 215 (85.3%); 135 (53.6%) exposures were deliberate self-harm. Mechanical ventilation was documented in 18 (7.1%). A total of 113 (44.8%) were discharged, 38 (15.1%) entered ICU/HDU and eight (3.2%) died in the emergency department. Poison type was associated with exposure intent (χ^2=223.45; p<0.001), but not with age group (p=0.123) or gender (p=0.773).*

Conclusion: *Pharmaceutical exposures and deliberate self-harm predominated in this dataset. The findings support agent-specific readiness and integrated psychosocial assessment, pending verification of original patient dates and study approvals.*

INTRODUCTION

Acute poisoning is a heterogeneous emergency presentation involving pesticides, prescribed and non-prescribed medicines, household chemicals and other toxic substances. Its clinical consequences range from transient symptoms to respiratory failure and death. The global context is serious: the World Health Organization estimated 727,000 suicide deaths during 2021, although only a subset involved poisoning.[1] In the United States, the National Poison Data System recorded more than two million human poison-exposure encounters during 2023, illustrating the substantial

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surveillance and service burden.[2] The patterns observed in tertiary emergency departments, however, depend strongly on local access to toxic agents, economic circumstances and referral pathways.

Contemporary Pakistani evidence illustrates this variation. A five-year National Poison Control Centre analysis using records from JPMC, Karachi, included 4,936 poisoning cases and found pesticides to be the leading agents (25.4%), with 7.1% mortality across the recorded care episode.[3] A 2024 Karachi emergency-department study of 220 cases reported household chemicals in 18.2% and oral exposure in 80.5%.[4] A separate prospective Sindh cohort of 1,404 patients found pesticides in 56.1% and intentional poisoning in 67.5%.[5] Pharmaceutical exposures predominated in an Iranian hospital study, whereas a recent Nepalese emergency study reported a larger insecticide burden.[6,7] Pakistani deliberate-self-harm data additionally emphasise family and psychosocial circumstances as relevant to poisoning presentations.[8]

Although JPMC-affiliated historical poisoning data are available, an updated, questionnaire-based profile spanning demographic factors, all major poison classes, exposure intent, bedside presentation, emergency management and immediate ED disposition can add service-level detail. Studies from other low- and middle-income settings also show that clinical severity and immediate outcome may differ materially by the case mix and care pathway.[9] This study therefore aimed to describe the frequency and characteristics of acute-poisoning cases presenting to the JPMC Accident and Emergency Department and examine the prespecified relationships between poison type and age group, gender and intent.

MATERIAL & METHODS

Study design, setting and duration: This descriptive cross-sectional study was planned at the Accident and Emergency Department of Jinnah Postgraduate Medical Centre, Karachi, over four months from December 2024 to April 2025 following after approval from the institutional ethical review committee of JPMC.

Sample size and sampling: Sample size was calculated for a single proportion with 95% confidence, 5% absolute precision and an expected household-chemical frequency of 18.2% from the Karachi study by Irshad and colleagues.[4] The calculated minimum was 229, increased by 10% to a target of 252. The approved protocol specified non-probability purposive sampling. The analytic file supplied for this manuscript contained 252 records. Because the total number of ED visits during recruitment was not provided, this analysis estimates the distribution among enrolled poisoning cases rather than the prevalence among all ED attendees.

Eligibility and data collection: The approved inclusion criteria were patients of either sex aged ≥12 years with exposure to a toxic substance within 24 hours, compatible clinical manifestations and patient/guardian consent. Chronic toxic exposures without an acute event, adverse drug reactions at therapeutic doses, isolated alcohol intoxication, patients brought in dead, incomplete exposure histories and those declining consent were excluded. Trained clinical personnel were to use the approved structured proforma to record age, sex, residence, marital status, education, occupation, household income, agent category, suspected poison, route, intent, location, psychosocial precipitants, time from exposure to ED arrival, vital signs, Glasgow Coma Scale (GCS), pupils, toxidrome, decontamination, antidotes, ventilatory support and immediate disposition. Toxic-agent identification was based on the clinical/proforma record; confirmatory toxicological assays were not supplied.

Definitions and outcomes: Agent categories followed the protocol's ten-group taxonomy. Deliberate self-harm, accidental, occupational, homicidal and recreational exposures were distinguished by reported intent. The prespecified endpoint was the status at the end of the index emergency-department stay: discharged, admitted to ward, admitted to ICU/high-dependency unit (HDU), transferred, left against medical advice (LAMA) or died in the ED. ICU/HDU admission and death were not interpreted as 30-day or complete in-hospital outcomes.

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Statistical analysis: The supplied SPSS version 26 output was used for the descriptive and cross-tabulated results. Age, exposure-to-arrival interval, vital signs and GCS were described by mean ± standard deviation; categorical findings were presented as numbers and percentages. Selected proportions include Wilson 95% confidence intervals derived from the supplied counts. Planned Pearson chi-square tests compared the ten toxic-agent categories with age strata (12–18, 19–40, 41–60 and >60 years), gender and intent. Because many expected counts were below five, p-values from fixed-margin Monte Carlo resampling (10,000 draws, calculated independently of the SPSS Viewer output) and exploratory six-category pooling were examined as sensitivity analyses. Cramér's V was used for effect size. A two-sided $p<0.05$ was considered statistically significant; no multivariable mortality model was fitted because there were only eight ED deaths.

RESULTS

The supplied analytic file comprised 252 patient records with no missing values for the variables included in the SPSS frequency tables. The mean age was 35.33 ± 15.74 years (range 12–81); most patients were aged 19–40 years (160; 63.5%). Women represented 53.6% of records, and 62.3% were classified as urban residents (Table-I).

Table-I. Sociodemographic characteristics of patients with acute poisoning (n=252)

Characteristic	n (%) / summary
Age, years, mean ± SD	35.33 ± 15.74
— AGE GROUP	
12–18 years	22 (8.7)
19–40 years	160 (63.5)
41–60 years	50 (19.8)
>60 years	20 (7.9)
— GENDER	
Male	117 (46.4)
Female	135 (53.6)
— RESIDENCE	
Urban	157 (62.3)
Peri-urban	62 (24.6)
Rural	33 (13.1)
— MARITAL STATUS	
Single	89 (35.3)
Married	148 (58.7)
Divorced/widowed	15 (6.0)
— EDUCATION	
None	38 (15.1)
Primary	70 (27.8)
Secondary	105 (41.7)
Higher	39 (15.5)
— HOUSEHOLD INCOME (PKR/MONTH)	
<30,000	86 (34.1)
30,000–60,000	95 (37.7)
60,000–100,000	53 (21.0)
>100,000	18 (7.1)
— SELECTED OCCUPATIONS	
Student	65 (25.8)
Homemaker	44 (17.5)
Other occupations	143 (56.7)

Percentages use n=252 as denominator and may not total exactly 100% because of rounding. Occupation categories other than student and homemaker are combined for display.

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Pharmaceutical agents constituted the largest recorded toxic-agent group (79; 31.3%, Wilson 95% CI 25.9–37.3%), followed by household chemicals (54; 21.4%) and organophosphate/carbamate pesticides (39; 15.5%) (Figure-1). Exposure was predominantly oral (215; 85.3%). More than half of the events were recorded as deliberate self-harm (135; 53.6%), and three-quarters occurred at home (189; 75.0%). Among the 135 cases classified as deliberate self-harm, interpersonal conflict was the leading recorded precipitant (37; 27.4%) (Table-II).

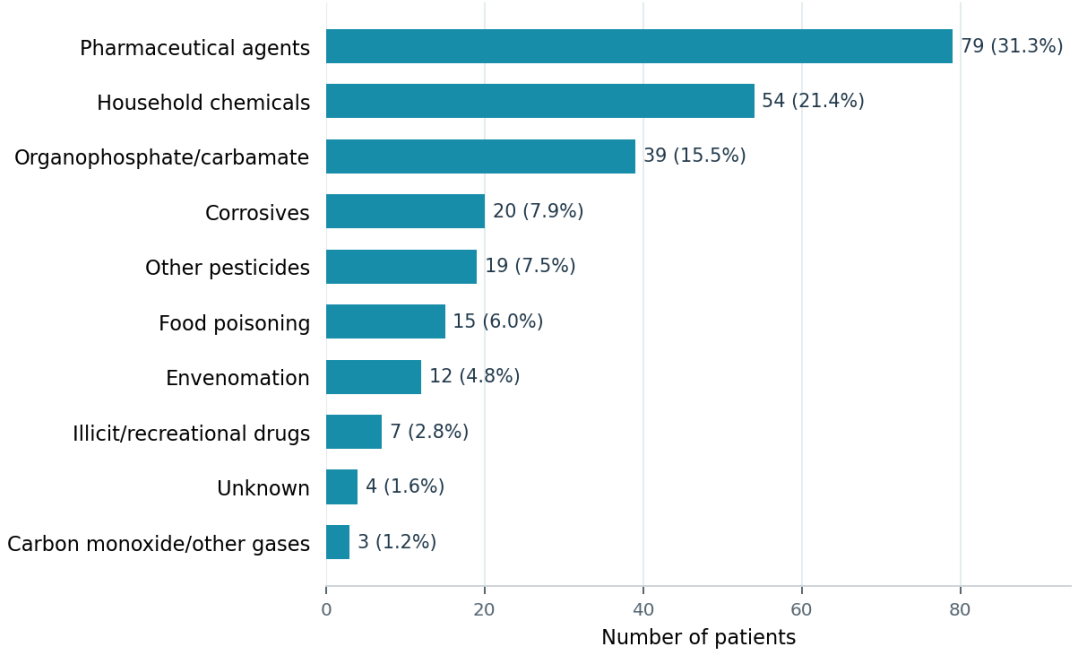


Figure-1. Distribution of the ten toxic-agent groups recorded in the approved protocol (n=252).

Table-II. Exposure route, stated intent, location and precipitating factors

Characteristic	n (%)
— ROUTE (n=252)	
Oral	215 (85.3)
Inhalation	14 (5.6)
Cutaneous	4 (1.6)
Ocular	7 (2.8)
Bite/sting	12 (4.8)
— INTENT (n=252)	
Deliberate self-harm/suicidal	135 (53.6)
Accidental	94 (37.3)
Occupational	11 (4.4)
Recreational	12 (4.8)
— LOCATION (n=252)	
Home	189 (75.0)
Workplace	27 (10.7)
Public area	33 (13.1)
Other (farmland)	3 (1.2)
— PRECIPITANT, SELF-HARM ONLY (n=135)	
Interpersonal conflict/quarrel	37 (27.4)
Financial stress	21 (15.6)
Known mental illness	20 (14.8)
Failed relationship	17 (12.6)

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Characteristic	n (%)
Domestic abuse	12 (8.9)
Family disagreement	12 (8.9)
Academic failure	5 (3.7)
Substance use disorder	2 (1.5)
Not disclosed	9 (6.7)

No injection-route or homicidal-intent records appeared in this dataset. Precipitating-factor percentages use 135 deliberate-self-harm cases as denominator; other percentages use 252.

The mean interval between exposure and arrival was 4.25 ± 3.82 hours (range 0.25–22.35), and the mean GCS was 13.62 ± 2.61. A GCS below 13 was recorded in 47 (18.7%), oxygen saturation below 94% in 49 (19.4%) and systolic blood pressure below 90 mmHg in 27 (10.7%). Predominant toxidrome was coded as absent in 82 (32.5%) and mixed/unclear in 59 (23.4%). Antidotes were administered to 48 (19.0%) cases and mechanical ventilation to 18 (7.1%) (Table-III).

Table-III. Clinical presentation, ED treatment and immediate disposition (n=252)

Characteristic	n (%) / mean ± SD
— PHYSIOLOGY	
Exposure-to-arrival interval, hours	4.25 ± 3.82
Systolic BP, mmHg	111.73 ± 17.99
Pulse, beats/min	91.23 ± 14.91
Respiratory rate, breaths/min	18.91 ± 4.10
SpO_2, %	95.70 ± 4.66
Glasgow Coma Scale (/15)	13.62 ± 2.61
— SELECTED SEVERITY INDICATORS	
GCS <13	**47 (18.7)**
SpO_2 <94%	49 (19.4)
Systolic BP <90 mmHg	27 (10.7)
— PREDOMINANT TOXIDROME	
Cholinergic	39 (15.5)
Sedative-hypnotic	31 (12.3)
Corrosive	24 (9.5)
Other specified toxidrome	17 (6.7)
Mixed/unclear	59 (23.4)
None recorded	82 (32.5)
— ED TREATMENTS	
Activated charcoal	11 (4.4)
At least one antidote	48 (19.0)
Atropine (with or without pralidoxime)	34 (13.5)
Pralidoxime	23 (9.1)
Naloxone	5 (2.0)
N-acetylcysteine	7 (2.8)
Anti-snake venom	2 (0.8)
Mechanical ventilation	18 (7.1)
— IMMEDIATE ED DISPOSITION	
Discharged from ED	113 (44.8)
Admitted to ward	57 (22.6)
Admitted to ICU/HDU	38 (15.1)
Transferred	10 (4.0)
Left against medical advice	26 (10.3)

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Characteristic	n (%) / mean ± SD
Died in ED	8 (3.2)

Toxidrome "other specified" combines anticholinergic (8), opioid (8) and sympathomimetic (1) groups. Antidote rows overlap and should not be summed. ED death proportion: Wilson 95% CI 1.6–6.1%. BP=blood pressure; SpO_2=peripheral oxygen saturation; GCS=Glasgow Coma Scale; HDU=high-dependency unit.

Among the original ten poisoning categories, Pearson chi-square tests did not show significant associations with age group (χ^2=35.64, 27 degrees of freedom [df], p=0.123) or gender (χ^2=5.67, 9 df, p=0.773). Poison type was associated with exposure intent (χ^2=223.45, 27 df, p<0.001; Cramér's V=0.544). However, 70% and 67.5% of cells in the age and intent tables, respectively, had expected frequencies below five; supplementary fixed-margin Monte Carlo results are shown in Table-IV and pooled-category sensitivity checks are described beneath the table. For example, 52 of 79 pharmaceutical exposures and 26 of 39 organophosphate/carbamate exposures were recorded as deliberate self-harm; all 12 envenomation and all 15 food-poisoning records were classified as accidental.

Table-IV. Toxic-agent category associations: primary analysis and sensitivity checks (n=252)

Poison grouping × variable	χ^2 (df)	Pearson p	MC p	Cramér V
Ten categories × age group	35.64 (27)	0.123	0.128	0.217
Ten categories × gender	5.67 (9)	0.773	0.790	0.150
Ten categories × intent	223.45 (27)	<0.001	<0.001	0.544

MC=fixed-margin Monte Carlo sensitivity p-value (10,000 resampled tables, calculated independently of native SPSS output). Sensitivity pooling (six categories) gave χ^2=23.08, p=0.082 (MC 0.074) for age; χ^2=4.22, p=0.518 (MC 0.519) for gender; and χ^2=88.56, p<0.001 (MC <0.001) for intent. Sparse expected counts affected 70%/30%/67.5% of ten-category age/gender/intent tables; interpret asymptotic p-values cautiously. Unadjusted, noncausal associations.

In the prespecified immediate disposition measure, eight patients died in the ED (3.2%), 38 were admitted to ICU/HDU (15.1%), and 26 left against medical advice (10.3%). As an exploratory analysis, seven of the 18 mechanically ventilated patients died during the ED stay compared with one of the 234 patients not ventilated (Fisher's exact p<0.001). This is an unadjusted severity association subject to confounding by indication, and does not demonstrate a treatment effect.

DISCUSSION

The main observations in this series are that pharmaceuticals were the largest toxic-agent class, most exposures were oral and more than half were recorded as deliberate self-harm. The predominance of patients aged 19–40 years provides a relevant working-age service profile, while the sizeable proportion admitted to intensive or high-dependency care underlines the immediate resource burden. Importantly, the data differ from the JPMC-affiliated retrospective report by Ali and colleagues, in which pesticides accounted for 25.4% of 4,936 poison-centre cases.[3] The more recent prospective Sindh cohort reported a higher proportion of pesticide poisoning (56.1%), whereas a related 2026 analysis of the same 1,404 cases found organophosphates to be the leading individual agent class (42.8%).[5,10] These differing sampling frames and case definitions prohibit assuming a temporal change in local incidence from the current descriptive dataset.

The prominence of medication exposures in the supplied JPMC dataset is nevertheless plausible in the wider toxicology literature. Naseri and colleagues reported pharmaceuticals as 48.1% of 534 acute poisoning presentations in an Iranian tertiary hospital, with oral exposure in 93.1% of cases.[6] By contrast, Al-Mahbashi and Howilah found pesticides (30.5%) ahead of household products (22.0%) in a 177-patient Yemeni series, and an emergency-service analysis from Colombia also documented heterogeneous agents and changing local patterns.[11,12] The present findings therefore reinforce the need for

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locality-specific surveillance rather than extrapolation from single-agent reports or other national settings.

Over half of the exposures were classified as deliberate self-harm and the most common recorded precipitant was interpersonal conflict. This is consistent with the importance of psychosocial factors in the Pakistani emergency-department study by Imran and colleagues, where poisonous-substance ingestion comprised 95.1% of recorded deliberate self-harm methods.[8] However, not all medication exposure was deliberate, and not every patient presenting after intentional ingestion had a documented mental health disorder. Children and young adolescents also have different exposure patterns; Aryal and colleagues reported accidental poisoning in 54.4% of 57 paediatric cases admitted in Nepal, emphasising the need to distinguish age-defined populations when comparing studies.[13] Structured psychosocial assessment after medical stabilisation remains clinically relevant regardless of agent class.

The measured ED death proportion was 3.2% (8/252), but this is not an in-hospital case-fatality estimate. Ten patients were transferred and 26 left against medical advice, with no subsequent outcomes available; even among ward and ICU/HDU admissions, later mortality was not measured. An Ethiopian multicentre cohort reported 4.3% in-hospital mortality, and a specialist toxicology-centre report described different patterns of severe poisoning and treatment outcome.[9,14] A 2025 systematic review in Ethiopia estimated a pooled 16.1% prevalence of poor treatment outcomes, although that combined definition included death and disability across heterogeneous studies.[15] Such rates cannot be compared directly without common endpoints, referral mix and follow-up duration. Similarly, American poison-centre national surveillance records a very different ascertainment pathway and should not be interpreted as a direct benchmark for ED mortality at JPMC.[16]

Bedside severity deserves practical attention: 18.7% of patients had GCS below 13, 19.4% had oxygen saturation below 94% and 7.1% underwent mechanical ventilation. Seven of eight ED deaths occurred among patients requiring ventilation, but this association is expected to be strongly affected by underlying illness severity and the treatment indication. It neither establishes ventilation as a cause of death nor provides a reliable multivariable prognostic model with only eight events. Recent work on mortality in poisoning emphasises the relevance of physiological abnormalities and severe clinical manifestations, including in Pakistani and Ethiopian cohorts.[9,10] Clinical management should remain individualised by poison, airway status and patient presentation.

Recorded activated-charcoal use was low (4.4%), while 19.0% received at least one antidote. These proportions are descriptive markers of documented practice and should not be interpreted as under-treatment because indications, contraindications, doses, and treatment availability were not fully recorded. A 2026 clinical-toxicology consensus emphasised that activated-charcoal decisions require poison-specific and time-dependent assessment rather than routine administration.[17] The local distribution of atropine/pralidoxime administration also highlights the continuing need for emergency antidote stocking and protocol review. Aluminium phosphide poisoning in Pakistan has been associated with serious acid–base disturbance and adverse clinical outcomes, illustrating why individual high-risk substances can remain important even when they are not the most frequent overall group.[21]

From a public-health perspective, the predominance of oral and home-based exposures points to safe storage of medicines and household toxins, patient education and psychiatric liaison after deliberate poisoning. Restricting access to commonly used lethal means is recognised as an important component of suicide prevention.[18] A recent systematic review provided evidence supporting restrictions on highly hazardous pesticides in settings where pesticide self-poisoning contributes to preventable deaths.[19] Longer-term evidence from Sri Lanka also suggests that a subset of adolescents presenting after deliberate self-poisoning will experience recurrent self-harm, beyond the immediate outcomes captured by ED datasets.[20] Nevertheless, the mix of pharmaceuticals, chemicals and agricultural substances in this

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cohort argues for several complementary prevention strategies rather than a pesticide-only intervention.

Strengths of the supplied dataset include use of a detailed approved questionnaire, coverage of major toxin groups and documentation of immediate ED treatments and disposition. The major limitations are its single-centre descriptive design, non-probability sampling, absence of all-ED-attendance denominators, self-reported rather than toxicologically confirmed agent categories, sparse cells in contingency tests, no follow-up beyond the ED stay and only eight ED deaths. Although 252 records have no coded missing fields, clinical source documentation, consent, ethics approvals and the apparent future-dated exposure/arrival timestamps have not been independently verified. These points must be resolved before the findings can be presented as completed clinical observations. As an additional external comparator, hospital studies reporting poor poisoning outcomes have identified delayed presentation and complications as relevant factors, but such causal or adjusted risk estimates were not the objective of the present cross-sectional analysis.[22]

CONCLUSION

Pharmaceutical agents, oral exposures and deliberate self-harm were common in this 252-record emergency-department dataset; poison type varied significantly by intent but not by age group or gender. Agent-specific toxicology readiness and integrated psychosocial assessment are priorities. Clinical dates, ethical clearance and source records must be verified before publication.

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