

# A retrospective study on patterns of acute chemical poisoning in an urban tertiary hospital in Malaysia

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## ABSTRACT

**Introduction:** Acute poisoning is a frequent reason for emergency department (ED) visits, with varying patterns of presentation across different regions. This study examines the clinical characteristics, sociodemographic factors, and outcomes associated with acute chemical poisoning in a Malaysian population.

**Materials and Methods:** This is a retrospective case note review of acute chemical poisoning presenting to the ED of a tertiary government hospital in Malaysia from 2016 to 2018. Data were collected on sociodemographic details, clinical presentations, and outcomes, with multiple logistic regression used to identify factors associated with its complications.

**Results:** A total of 260 cases were included, with 168 (64.6%) being intentional poisonings and 92 (35.4%) accidentals. The majority of patients were single (60.8%), male (58.5%), and of Indian ethnicity (57.3%). The most common agents were pesticides (42.2%). The overall complication rate was 14.2%, and the mortality rate was 4.6%. The most frequent complications were respiratory insufficiency (11.5%) and renal failure (6.5%). Factors significantly associated with complications included intentional poisoning (AOR 3.18, 95% CI 1.05–9.66,  $p=0.042$ ), ethnicity (Chinese: AOR 12.85, 95% CI 1.40–118.35,  $p=0.024$ ; other races: AOR 25.99, 95% CI 2.34–238.00,  $p=0.004$ ), exposure during daytime hours (AOR 12.79, 95% CI 1.52–107.42,  $p=0.019$ ), and a delay of 2–12 hours before ED visit (AOR 2.30, 95% CI 1.02–5.20,  $p=0.045$ ).

**Conclusion:** Acute chemical poisoning is more common in single males with intentional exposures. Important factors associated with its complications include age, ethnicity, the time of exposure, and delayed presentation to the ED.

## KEYWORDS:

Poisoning; unintentional poisoning; chemical poisoning; emergency department; toxicology

## INTRODUCTION

Poisoning represents a significant public health issue worldwide and is among the leading causes of emergency department (ED) visits. It is defined as exposure to drugs or environmental substances that necessitates medical attention, even if the patient presents with no overt

symptoms.<sup>1</sup> Acute poisoning is defined as a single exposure, continuous exposure lasting less than 8 hours, or repeated exposures over a period of up to one week. Poisoning agents are categorized into two main groups: chemicals and pharmaceuticals. Chemical poisonings include household products, pesticides, alcohol, hydrocarbons, and gases, while pharmaceutical poisonings involve over-the-counter medications and prescribed drugs.<sup>2</sup>

In 2016, the World Health Organization estimated that unintentional poisonings resulted in over 100,000 deaths globally; however, the true incidence is likely higher due to underreporting.<sup>3</sup> The wide availability and accessibility of chemicals and their extensive use in medicine, industry, agriculture and daily life contribute to the increased risk of poisoning.

Understanding the epidemiology and determinants of patient outcomes in acute chemical poisoning is crucial for emergency physicians. This knowledge facilitates early diagnosis and prompt treatment, thereby reducing morbidity and mortality.<sup>1</sup> Additionally, it aids in predicting patient outcomes, which can enhance hospital resource utilization and reduce overall burden.

Despite numerous studies on acute poisoning, regional and national data can vary significantly. In Malaysia, research on acute poisoning remains sparse and insufficient.<sup>4</sup> Our study was conducted in the ED of a major public hospital in Malaysia, which handles approximately 175,000 annual ED visits. The objectives of this study were to determine the clinical and sociodemographic patterns of acute accidental and intentional poisonings, and its outcomes within this high-volume ED. The findings aim to assist emergency clinicians in identifying predictive factors for patients' severity, facilitating early recognition of complications, and guiding accurate treatment, ultimately benefiting patient care.

## MATERIALS AND METHODS

### Study design

This retrospective case note review study was conducted in the Emergency Department of Hospital Tengku Ampuan Rahimah, an urban tertiary public hospital in Selangor, Malaysia. Data were collected from medical records of patients with acute chemical poisoning presenting to the ED

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between January 2016 and December 2018. Cases with pharmaceutical agents or food poisoning, complicated by trauma, and those with incomplete data significant to the study were excluded. Data extraction used a standardized form, capturing sociodemographic details, clinical presentations, chemical agents involved, complications, and outcomes, including admission, hospital length of stay, and mortality.

### Statistical analysis

Data were analysed using SPSS version 26.0 (Chicago, IL, USA). Categorical variables are presented as frequencies and percentages, while numerical variables are reported as means and standard deviations. Univariate analysis was conducted using simple logistic regression to identify factors associated with complications. Variables with  $p < 0.25$  were included in the multiple logistic regression model. Odds ratios (OR) and 95% confidence intervals (CI) were calculated, with statistical significance set at  $p < 0.05$ .

### Ethical considerations

This study received ethical boards approvals from the Human Research Ethics Committee of USM (USM/JEPeM/18100589) and the Medical Research and Ethics Committee of Ministry of Health Malaysia (NMRR-18-3602-45200 (IIR)). The study followed all ethical standards for research without direct contact with human or animal subjects.

### Variables definition

Complication refers to an additional disorder or a new feature arising during the course of a disease, injury, or abnormality, which is not an inherent part of the primary condition but may result from it or occur independently.<sup>5,6</sup> In this study, we recorded all complications which included the respiratory system (such as respiratory distress, insufficiency), neurology (altered sensorium and coma, seizure, weakness, numbness), cardiovascular (circulatory shock, arrhythmia, cardiac arrest), gastrointestinal (vomiting, perforation), metabolic and blood disturbances, acute renal failure, and liver failure.<sup>7</sup> Severe complications in this study is defined as complications of Grade 3 (severe or life-threatening symptoms) and 4 (death) based on Poisoning Severity Score (PSS).<sup>8</sup> Intentional poisoning is defined as deliberate self-harm or suicide attempts through ingestion of toxic substances or excessive doses of medication.<sup>2</sup> Unintentional exposure refers to accidental or occupational exposure to harmful substances.

## RESULTS

Out of 349 identified patients with acute chemical poisoning, 50 were excluded for meeting the exclusion criteria and 39 for missing data. Thus, 260 cases were included in the study. Among these, 168 (64.6%) had intentional poisoning and 92 (35.4%) were accidental. The mean age of all participants was 44.63 years (SD 16.57). In the accidental poisoning, the mean age was 23.8 years (SD 17.7), with ages ranging from 1 to 75 years. In contrast, the intentional poisoning group had a mean age of 31.76 years (SD 13.12), with ages ranging from 14 to 77 years. The sociodemographic characteristics and clinical presentation of cases are summarized in Table I. The majority of patients were Indian (n=149, 57.3%),

followed by Malay (n=49, 18.8%) and Chinese (n=32, 12.3%). Other ethnicities included Kadazan (n=1, 0.4%), Iban (n=1, 0.4%), and several foreign nationals: Nepalese (n=11, 4.2%), Bangladeshi (n=10, 3.8%), Indonesian (n=4, 1.5%), and others (Pakistani, Burmese, and Filipino, n=1 each, 0.4%). Most patients presented to ED early (<2 hours from time of ingestion) (n=143, 55.0%) and having gastrointestinal symptoms (n=217, 79.6%).

This study categorized the chemical agents involved into acids, alkalis, hydrocarbons, gases, insecticides/repellents, herbicides, rodenticides, metals, and miscellaneous agents (e.g., rose water, calamine lotion). A small proportion of patients (n=5, 1.9%) ingested multiple substances. The most common agents were pesticides (n=112, 42.3%), divided into insecticides/repellents (n=52, 19.6%), herbicides (n=46, 17.4%), and rodenticides (n=14, 5.3%). Acids were the second most common group (n=79, 29.8%), with bleach being the most frequent (43 out of 58 intentional cases). Seven cases of accidental mercury poisoning were reported due to a broken thermometer. A summary of chemical agents involved in this study is provided in Table II.

Most of the patients (n=207, 79.6%) developed mild gastrointestinal symptoms such as abdominal pain, vomiting, and diarrhoea. Based on severe complications, the overall complication rate was 14.2%. Severe complications identified in this study are shown in Table III. More patients in the intentional group developed severe complications (n=29/168, 17.2%) compared to accidental poisoning (n=8/92, 8.7%). The highest severe complication was respiratory insufficiency requiring mechanical ventilation (n=30, 11.5%), followed by acute renal failure (n=17, 6.5%). There were 23 (8.8%) patients requiring admission to the Intensive Care Unit (ICU). The mean length of stay for the accidental poisoning was shorter, which was 2.63 days (SD 2.25) from 1 to 21 days compared to the intentional poisoning with 3.65 days (SD 3.75). The overall mortality rate was 4.6% (n=12) and majority died due to exposure to pesticides (paraquat and organophosphate) (n=8, 66.7%).

Simple logistic regression (Table IV) identified age, gender, race, circumstances of poisoning, and latency to ED presentation ( $p < 0.25$ ) as potential factors associated with complications. These variables were included in the multiple logistic regression (Table V). The analysis revealed significant associations between complications and circumstances of poisoning (intentional poisoning AOR 3.18, 95% CI 1.05–9.66,  $p=0.042$ ), Chinese ethnicity (AOR 12.85, 95% CI 1.40–118.35,  $p=0.024$ ), and other races (AOR 25.99, 95% CI 2.34–238.00,  $p=0.004$ ). In terms of clinical presentation, exposure time from 0800 to 1600 hours (AOR 12.79, 95% CI 1.52–107.42,  $p=0.019$ ), and latency to ED presentation of 2 to 12 hours (AOR 2.30, 95% CI 1.02–5.20,  $p=0.045$ ) were predictive of complications in acute chemical poisoning.

## DISCUSSION

Acute poisoning is a significant global health concern and a leading cause of emergency department visits and hospital admissions.<sup>1,9</sup> Our study found a 14.2% prevalence of complications from acute chemical poisoning, aligning with

**Table I: Sociodemographic and clinical presentations of acute chemical poisoning**

Variables	Accidental poisoning n=92 n (%)	Intentional poisoning n=168 n (%)	Total N=260 n (%)
Age (years), mean ± SD	23.80 ±17.70	31.67 ±13.12	44.63 ±16.57
Gender			
Male	58 (63.0)	94 (55.9)	152 (58.5)
Female	34 (37.0)	74 (44.1)	108 (41.2)
Race			
Malay	34 (36.9)	15 (8.9)	49 (18.8)
Chinese	12 (13.0)	20 (11.9)	32 (12.3)
Indian	24 (26.0)	125 (74.4)	149 (57.3)
Others	22 (23.9)	8 (4.7)	30 (11.5)
Marital status			
Single	64 (69.6)	94 (55.9)	158 (60.8)
Married	26 (28.3)	69 (41.0)	95 (36.5)
Widowed/divorced	2 (2.1)	5 (2.9)	7 (2.7)
Employment			
Employed	48 (52.2)	70 (41.7)	118 (45.5)
Unemployed	36 (39.1)	58 (34.5)	94 (36.2)
Student	8 (8.7)	40 (23.8)	48 (18.5)
Route of exposure			
Ingestion	63 (68.4)	160 (100)	231 (88.8)
Inhalation	18 (19.6)	0 (0)	18 (6.9)
Others †	11 (11.9)	0 (0)	11 (4.2)
Time of exposure			
0800-1600	44 (47.8)	48 (28.5)	92 (35.4)
1601-2400	42 (45.6)	93 (55.4)	135 (51.9)
0001-0759	6 (6.5)	26 (15.4)	32 (12.3)
Unknown	0 (0)	1 (0.6)	1 (0.4)
Number of agents exposed			
Single	91(98.9)	164 (97.6)	255 (98.1)
Multiple	1 (1.1)	4 (2.4)	5 (1.9)
Underlying medical illness	12 (13.0)	49 (29.2)	61 (23.5)
Underlying psychiatric illness	0 (0)	29 (17.3)	29 (11.2)
Latency time to ED presentation			
< 2 hours	58 (63.0)	85 (50.6)	143 (55.0)
2-12 hours	30 (32.6)	77 (45.8)	107 (41.2)
>12 hours	4 (4.3)	4 (2.4)	8 (3.1)
Unknown	0 (0)	2 (1.2)	2 (0.8)
Systolic blood pressure (mmHg)			
< 90 ‡	6 (6.5)	0 (0)	6 (2.3)
≥ 90	86 (93.5)	168(100.0)	25 (97.7)
Heart rate			
Normal (60-100)	57 (61.9)	109 (64.9)	166 (63.8)
Tachycardia (>100)	34 (36.9)	58 (34.5)	92 (35.4)
Bradycardia (<60)	1 (1.1)	1 (0.6)	2 (0.8)
Temperature (°C)			
Normal (36-37.5)	90 (97.8)	159 (94.6)	249 (95.8)
Hyperthermia (>37.5)	2 (2.2)	9 (5.4)	11 (4.2)
Hypothermia (<36)	0 (0)	0 (0)	0 (0)
Gastrointestinal symptoms	52 (56.5)	155 (92.3)	207 (79.6)
Respiratory distress	3 (3.2)	27 (16.1)	30 (11.5)
Altered consciousness	1 (1.1)	13 (7.7)	14 (5.4)

† Skin contact, eye splash

‡ Appropriate for age as they are paediatric population

Table II: Type of agents involved in accidental and intentional acute chemical poisoning

Type of agents	Accidental poisoning N=93 n (%)	Intentional poisoning N=172 n (%)	Total* N=265 n (%)
Acids <sup>a</sup>	21 (22.6)	58 (33.7)	79 (29.8)
Alkali <sup>b</sup>	10 (10.8)	12 (6.9)	22 (8.3)
Hydrocarbons <sup>c</sup>	21 (22.6)	12 (6.9)	33 (12.5)
Gases <sup>d</sup>	8 (8.6)	0 (0)	8 (3.1)
Insecticide/Repellant <sup>e</sup>	10 (10.8)	41 (23.8)	52 (19.6)
Herbicide <sup>f</sup>	8 (8.6)	38 (22.1)	46 (17.4)
Rodenticides <sup>g</sup>	6 (6.5)	8 (4.7)	14 (5.3)
Miscellaneous <sup>h</sup>	2 (2.2)	2 (1.2)	4 (1.5)
Metal <sup>i</sup>	7 (7.5)	1 (0.6)	8 (3.0)

\*Total number of agents is more than number of patients as some patients took multiple agents

a Includes fertilizer, disinfectant (Dettol, flavin, iodine solution), cleaning agent, anti-rustic agent, metal cleaner, toilet bowl cleaner, bleach

b Includes glass cleaner, fertilizer, detergent, hair product, drain opener, battery

c Includes thinner, paint, gasoline, diesel, kerosene, paraffin, acetone, glue, degreaser, toluene, cosmetic, shampoo, soap, moth ball (naphthalene)

d Includes carbon monoxide, cooking gas, smoke

e Includes organophosphosphate (malathion, chlorpyrifos, acephate), carbamate, pyrethrin/pyrethroid/neonicotinoids, amitraz, DEET

f Includes paraquat, glyphosate

g Includes non-anticoagulant (zinc phosphide) and anticoagulant (warfarin/super-warfarin)

h Includes rose water prayer, calamine lotion

i Includes mercury

Table III: Outcome of patients with acute chemical poisoning

Variables	Accidental poisoning n=92 n (%)	Intentional poisoning n=168 n (%)	Total N=260 n (%)
Severe complication	8 (8.7)	29 (17.2)	37 (14.2)
Respiratory insufficiency	4 (4.3)	27 (16.1)	30 (11.9)
Cardiac arrhythmia/arrest	2 (2.2)	1 (0.6)	3 (1.2)
Renal failure	4 (4.3)	13 (7.7)	17 (6.5)
Coma	1 (1.1)	13 (7.7)	14 (5.4)
Liver failure	0 (0)	6 (3.6)	6 (2.3)
Circulatory shock	0 (0)	2 (1.2)	2 (0.8)
Intermediate syndrome	0 (0)	6 (3.6)	6 (2.3)
Coagulopathy with bleeding	0 (0)	1 (0.6)	1 (0.4)
Admitted			
General ward	87 (94.5)	148 (88.1)	235 (90.4)
Intensive care unit (ICU)	3 (3.3)	20 (11.9)	23 (8.8)
Not admitted	2 (2.2)	0 (0)	2 (0.8)
Length of stay (days) (mean SD)	2.63 (2.25)	3.65 (3.75)	3.29 (3.34)
Final outcome			
Survival	89 (96.7)	159 (94.6)	248 (95.4)
Death	3 (3.3)	9 (5.4)	12 (4.6)

Heyerdahl et al.'s findings of 18%.<sup>7</sup> The fatality rate in our study was 4.6%, predominantly due to pesticide agents (paraquat and organophosphates) which contributed to 66.7% of overall mortality, similar to Eddleston et al.'s report where 60% of deaths were caused by organophosphates.<sup>10</sup> In contrast, Khudair et al.'s study in Qatar reported a lower fatality rate (1.2%), possibly due to better facilities at their teaching hospital, though the specific chemical agents were not detailed.<sup>2</sup>

In terms of sociodemographic, our study found that the majority of patients at our centre were males, which contrasts with other Malaysian studies that report a higher incidence of poisoning among females.<sup>11,12</sup> Additionally, our study identified the Indian ethnicity as having the largest number of poisoning cases, consistent with findings by Fathelrahman

et al., where Indians had the highest admission rates for poisoning, even in Penang, where the Chinese population is the majority.<sup>4</sup> This observation aligns with a systematic review on suicide and self-harm in Malaysia, which also indicates a higher prevalence among the Indian ethnic group.<sup>13</sup>

Our study found that the majority of patients intentionally ingested poisonous substances due to various reasons, such as suicidal intent and emotional stress. This aligns with other studies where suicide attempts are the most common cause of poisoning.<sup>14</sup> Ingestion was the most common route of exposure in both accidental and non-accidental cases. In contrast, inhalation was predominantly associated with accidental poisoning, often linked to occupational exposure, particularly among factory workers and cleaners.

**Table IV: Simple logistic regression for factors associated with complications in acute chemical poisoning**

Variable	Regression coefficient, (b)	Wald (df)	Crude OR (95% CI)	p-value
Age	0.028	6.41 (1)	1.03 (1.01,1.05)	0.011
Gender				
Male	0		1	0.057
Female	-0.75	3.62 (1)	0.47 (0.22,1.02)	
Race				
Malay	0		1	
Chinese	1.88	5.04 (1)	6.58 (1.27,34.08)	0.025
Indian	1.29	2.89 (1)	3.64 (0.82,16.19)	0.089
Others	2.15	6.65 (1)	8.55 (1.67,43.62)	0.010
Marital status				
Single	0		1	
Married	0.34	0.85 (1)	1.40 (0.69,2.85)	0.358
Divorced	0.14	0.16 (1)	1.15 (0.13,10.06)	0.899
Employment				
Employed	0		1	
Unemployed	-0.55	1.89 (1)	0.58 (0.27,1.26)	0.169
Student	-0.93	2.60 (1)	0.40 (0.13,1.22)	0.107
Circumstances				
Accidental	0		1	
Intentional	0.78	3.44 (1)	2.19 (0.96,5.02)	0.063
Route of exposure				
Ingestion	0		1	
Inhalation	-0.32	0.17 (1)	0.72 (0.16,3.29)	0.676
Others*	-0.55	0.26 (1)	0.58 (0.72,4.67)	0.608
Time of exposure				
0800-1600	0		1	
1601-2400	-0.59	2.51 (1)	0.55 (0.27,1.15)	0.113
0001-0759	-1.29	2.78 (1)	0.27 (0.06,1.26)	0.095
No of agent exposed				
Single	0		1	
Multiple	-19.43	0.00 (1)	0.00 (0.00,0.00)	0.99
Latency time to ED presentation				
< 2hours	0		1	
2-12 hours	0.98	6.40 (1)	2.67 (1.25,5.70)	0.011
>12 hours	1.29	2.20 (1)	3.64 (0.66,20.1)	0.138
Underlying medical illness				
Yes	0		1	
No	0.41	1.04 (1)	1.51 (0.69,3.31)	0.309
Underlying psychiatric illness				
Yes	0		1	
No	-0.198	0.12 (1)	0.82 (0.26,2.57)	0.734

Abbreviation: OR Odd Ratio, CI Confidence Interval

\*Skin contact, eye splash

**Table V: Multiple logistic regression for factors predictive of complications in patients presented with acute chemical poisoning**

Variable	Regression coefficient, b	Wald (df)	Adjusted OR (95% CI)	p-value
Circumstances				
Accidental	0		1	
Intentional	1.16	4.153 (1)	3.18 (1.05, 9.66)	0.042
Race				
Malay	0		1	
Chinese	2.55	5.08 (1)	12.85 (1.40, 118.35)	0.024
Others	3.26	8.31 (1)	25.99 (2.84, 238.00)	0.004
Time of exposure				
0001-0759	0		1	
0800-1600	2.55	5.51 (1)	12.79 (1.52, 107.42)	0.019
Latency time to presentation				
<2 hours	0		1	
2-12 hours	0.83	4.01 (1)	2.30 (1.02, 5.20)	0.045

Abbreviation: OR Odd Ratio; CI Confidence Interval

Constant: -7.064

Backward LR elimination method was applied

No multicollinearity and no interaction

Hosmer Lemeshow test, p-value= 0.653

Classification table 87.2% correctly classified

Area under Receiver Operating Characteristic (ROC) curve was 79.0%

In our study, pesticides were the most common chemical agents involved, accounting for 42.3% of cases. This finding is consistent with other studies identifying pesticides as a leading cause of acute poisoning.<sup>4,10</sup> Similarly, a study on drug and chemical poisoning admissions in a Malaysian teaching hospital found that pesticides, particularly insecticides, were the most frequent agents, likely due to their widespread use in households and agriculture, which is a major economic activity in Malaysia.<sup>15</sup> Among the intentional poisonings involving acids, bleach was the most common, reflecting its widespread availability and common use in Malaysian households.

Regarding the presentations of acute poisoning, most patients in our study presented with gastrointestinal symptoms, predominantly vomiting and abdominal pain. These symptoms are common due to gastric irritation caused by the chemical agents while vomiting, a protective mechanism, is the body's attempt to expel harmful substances.<sup>16</sup>

The most common severe complication in our study is respiratory insufficiency. It is a common complication in pesticide poisoning, often resulting from direct toxicity to the alveolar epithelium, as seen in paraquat poisoning.<sup>17</sup> Additionally, cholinergic crisis leading to acute respiratory failure, by central and peripheral mechanisms, are suggested causes following exposure to organophosphates.<sup>18</sup> Renal failure is also a common complication for pesticide group and patients with paraquat poisoning associated with renal injury have high mortality rate.<sup>19,20</sup> One of our patients with accidental organophosphate poisoning developed cardiac arrhythmia which can be due to its direct toxic effect on myocardium.<sup>21</sup>

Our multivariate analysis identified several factors associated with the development of complications: intentional poisoning, Chinese and other races, exposure time (0800-1600), and latency to ED presentation (2-12 hours). Previous studies demonstrate that intentional poisoning is associated with more severe complications and mortality compared to accidental poisoning.<sup>22,23</sup> Those with intentional self-harm often choose more lethal agents or larger doses deliberately designed to cause harm. Common examples include paraquat and organophosphates with high case-fatality rates.<sup>22</sup> In contrast, accidental poisonings usually involve smaller quantities or less toxic household chemicals, leading to milder presentations. Many intentional cases involve chemicals that are far more lethal and concentrated than those in domestic settings, as seen in this study. For example, paraquat ingestion frequently leads to irreversible pulmonary fibrosis and multi-organ failure, even after minimal exposure. Regulatory measures restricting access to such agents have been shown to reduce pesticide-associated mortality and suicide rates.<sup>23</sup>

Although the Indian population comprised the largest group in our study, complications were more common among Chinese patients, consistent with a Singapore study indicating higher medical lethality among Chinese individuals.<sup>24</sup> The higher complication rate among Chinese may be attributed to the lower likelihood of timely

intervention, as Indians often attempt suicide in the presence of family, leading to higher rescue rates. Other races, particularly foreign workers in agricultural and chemical industries, are exposed to more harmful industrial-grade or agricultural chemicals. Latency to ED presentation of 2-12 hours was a significant predictor of complications compared to earlier presentation, likely as it limits the effectiveness of early interventions, resulting in more severe systemic toxicity and complications. However, further studies are needed to explore how exposure time affects patient outcomes.

#### LIMITATIONS

This study has several limitations. It was conducted at a single centre with a small sample size, which may not accurately represent the broader Malaysian population. Additionally, data on the exact amount of chemical substance involved were not available. Information on the treatments received was also lacking, potentially impacting the outcomes. The multiple logistic regression model demonstrated evidence of instability. This finding likely caused by the limited number of outcome events ( $n = 37$  complications). Consequently, the adjusted odds ratios derived from this model should be interpreted with great caution. Larger datasets will be needed to obtain more stable and precise estimates of effect. Future studies should involve a larger sample size, involving multiple centres and nationwide, and include detailed data on the quantity of chemicals involved, and account for the treatment modalities to better understand their effects on patient outcomes.

#### CONCLUSION

Managing acute chemical poisoning can be challenging to prevent complications. Our retrospective study indicates that acute chemical poisoning is more common among males, Indians, and younger individuals, with pesticides being the most frequent chemical agent involved. The study found a 14.2% complication rate and a 4.6% mortality rate. Predictive factors for complications included intentional poisoning, Chinese and other races, time of exposure, and latency to ED presentation. These findings could inform future management strategies for acute chemical poisoning. However, a larger, well-designed study is needed to more accurately define predictive factors for complications in these patients.

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