

A STUDY ON PATTERN AND OUTCOME OF ACUTE POISONING IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Poison is defined as any agent that can injure, kill or impair normal physiological function in humans by producing general or local damage or dysfunction in the body by its chemical activity. There are various routes of exposure to poisons in which oral ingestion was the most common route of exposure. **Objective:** To Study the pattern and outcome of acute poisoning in a tertiary care hospital. **Materials and Methods:** This study was done as a retrospective hospital record-based descriptive study in Department of General Medicine at Trichy SRM Medical College Hospital & Research Centre. Patients of age group above 18 years and both sexes were admitted with confirmed diagnosis of acute poisoning and drug overdose were included in this study and patients with chronic poisoning or exposure, who were brought dead, patients with drug reactions and cases with incomplete or missing medical records were excluded from this study. A structured data extraction form was utilized to collect the information like Demographics, Clinical Details such as type of poison ingested, route of exposure, time elapsed between exposure and hospital admission, intent of Poisoning, treatment administered and outcome were recorded. **Results:** Among 137 patients, 114 were survived and 23 patients were expired. Among the 114 survivors 9 (7.9%) have developed severe post-poisoning clinical sequelae. These included irreversible paraquat-induced pulmonary fibrosis 4 (3.5%), organophosphate-induced delayed polyneuropathy (OPIDN) presenting as distal sensory axonopathy 3 (2.6%), and profound neuropsychiatric illnesses including severe depressive and post-traumatic syndromes 2 (1.75%). **Conclusion:** Agrochemicals (organophosphates and paraquat) and commercial rodenticides are the primary agents used. While early hospital presentation and standard supportive measures ensure high recovery rates for organophosphate exposures. Paraquat and yellow phosphorus rodenticides carry high case-fatality rates and cause significant long-term morbidity due to the lack of specific antidotes.

INTRODUCTION

Poison is defined as any agent that can injure, kill or impair normal physiological function in humans by producing general or local damage or dysfunction in the body by its chemical activity.^[1] There are various routes of exposure to poisons in which oral ingestion was the most common route of exposure.^[2] Poisoning and drug overdose are common medico-social problem all over the world which may result in morbidity & mortality.^[3]

Most of the poisoning is due to the intention of deliberate self-harm.^[4] Easy availability, low cost, and excessive popularity of Organophosphorus use as a pesticide have increased the incidence of ingestion,

resulting in increasing suicidal and unintentional poisoning.^[5] Organophosphates exert highly lethal toxic effects by irreversibly binding to and inhibiting acetylcholinesterase, leading to an acute cholinergic crisis characterized by severe bronchorrhea, respiratory depression, and multi-organ breakdown.^[6]

Accidental or intentional ingestion of paraquat leads to many local and systemic effects and the mortality rate is very high.^[7] This paper presents the pattern and outcome of acute poisoning cases for proper planning, prevention and management of these cases. Knowing the pattern will also help in designing training modules for primary care physicians to make

them aware about newer poisons and their management.

MATERIALS AND METHODS

This study was done as a retrospective hospital record-based descriptive study in Department of General Medicine at Trichy SRM Medical College Hospital & Research Centre from January 2024 to December 2025. The study protocol was approved by Institutional Ethics Committee of the hospital. Patients of age group above 18 years and both sexes were admitted with confirmed diagnosis of acute poisoning and drug overdose were included in this study and patients with chronic poisoning or exposure, who were brought dead, patients with drug reactions, cases with incomplete or missing medical records were excluded from this study. Data Collection of patients meeting the inclusion criteria were retrieved from the hospital's Medical Records Department. The permission to review the case records were obtained from the Medical Records Department. A structured data extraction form was utilized to collect the information like Demographics, Clinical Details such as type of poison ingested, route of exposure, time elapsed between exposure and hospital admission, intent of Poisoning, treatment administered and outcome were recorded.

Statistical Analysis

All extracted data profiles were cross-checked for missing fields, coded, and entered into a specialized

Microsoft Excel database. Statistical analysis was executed using the Statistical Package for the Social Sciences (SPSS) software, version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were heavily utilized to summarize the baseline findings. Continuous variables are reported as mean \pm standard deviation (SD), while categorical variables are expressed as absolute numbers (frequencies) and corresponding percentages. Cross-tabulations were performed to map toxicological types against mortality rates and clinical outcomes.

RESULTS

A total of 137 patients met the strict selection criteria and were analysed. Evaluation of the age metrics unveiled a massive concentration of cases among young adults, with the 18–25 years age group demonstrating the highest frequency 58 (42.3%), followed by the 25–40 years group 40 (29.2%). Taken together, young adults under 40 years comprised nearly three-fourths (71.5%) of the total cohort. A clear female predominance was documented, with females accounting for 78 (56.9%) and males accounting for 59 (43.1%). In relation to employment, 59 (43.1%) were actively employed, 49 (35.8%) were unemployed, and 29 (21.1%) were students. Marital indices revealed that 93(67.9%) of patients were married, whereas 44 (32.1%) were single. Table 1.

Table 1: Baseline Sociodemographic Characteristics

| Demographic Variable | Subcategory | Frequency (n) | Percentage (%) |
|----------------------|-------------|---------------|----------------|
| Age Group | 18–25 Years | 58 | 42.3% |
| | 25–40 Years | 40 | 29.2% |
| | 40–60 Years | 24 | 17.5% |
| | > 60 Years | 15 | 10.9% |
| Gender | Female | 78 | 56.9% |
| | Male | 59 | 43.1% |
| Occupation | Employed | 59 | 43.1% |
| | Unemployed | 49 | 35.8% |
| | Student | 29 | 21.1% |
| Marital Status | Married | 93 | 67.9% |
| | Unmarried | 44 | 32.1% |

Regarding the underlying aetiology, intentional self-harm via toxic consumption was the primary driver, identified in 130 (94.9%) of cases, compared to a small subset of accidental exposures 7 (5.1%). The oral route was the primary mode of entry for 134 (97.8%) of patients, with only 3 (2.2%) presenting with parenteral injection exposures. Analysis of the specific compound types demonstrated that agrochemicals dominated the toxicological landscape. Organophosphate and carbamate

pesticides represented the single most common class 31 (22.6%), followed closely by the non-selective herbicide paraquat 26 (19.0%). Household chemicals were also highly prevalent, including corrosive acids/alkalis 22 (16.1%) and commercial rat killers 19 (13.9%). Plant-based toxins (oleander seeds) accounted for 11 (8.0%), and ant killers constituted 11 (8.0%). The remaining subset comprised sedatives, paracetamol, antidepressants, and hydrocarbons. Table 2

Table 2: Toxicological Agents and Exposure Patterns

| Toxic Agent / Chemical Classification | Patient Count (n=137) | Proportion (%) |
|---|-----------------------|----------------|
| Pesticides (Organophosphates / Carbamates) | 31 | 22.6% |
| Herbicides (Paraquat) | 26 | 19.0% |
| Corrosives (Industrial/Household Acids & Alkalis) | 22 | 16.1% |

| | | |
|--|----|-------|
| Rat Killer (Yellow Phosphorus / Zinc Phosphide formulations) | 19 | 13.9% |
| Oleander Seeds (Plant Cardiac Glycosides) | 11 | 8.0% |
| Ant Killer Compounds | 11 | 8.0% |
| Sedatives-Hypnotics (Benzodiazepines / Barbiturates) | 6 | 4.4% |
| Paracetamol / Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) | 5 | 3.6% |
| Antidepressants / Antipsychotics Medications | 3 | 2.2% |
| Hydrocarbons (Kerosene / Gasoline fractions) | 3 | 2.2% |

Clinical Presentation and Physiological Status at Admission

A massive proportion of patients reached emergency services early, with 109 (79.6%) admitted within 6 hours of toxic exposure. Another 21 (15.3%) presented between 6 to 24 hours, while 7 (5.1%) presented after 24 hours. Symptomatically, gastrointestinal complaints (nausea, vomiting, loose stools, abdominal pain) were the most frequent manifestations, present in 110 (80.3%) of patients. Neurological presentation (altered sensorium, active seizures, focal limb weakness) occurred in 21 (15.3%), and respiratory signs (severe dyspnea, wheezing, productive cough) were observed in 6 (4.4%). Neurologically, 94 (68.6%) were fully conscious, 33 (24.1%) were drowsy, and 10 (7.3%) were comatose. Hemodynamic screening showed 117 (85.4%) were stable, while 20 (14.6%) were admitted in a state of refractory shock.

Management Profile and Interventions

Standardized supportive care measures—comprising intravenous fluid resuscitation, antiemetics, and proton pump inhibitors—were administered universally to all 137 patients (100.0%). Active decontamination via gastric lavage was selectively performed in 114 (83.2%) of patients who met timing and safety criteria. Targeted pharmacological reversal utilizing specific antidotes (such as Atropine/Pralidoxime for organophosphates or N-acetylcysteine/specific agents) was completed for 82 (59.9%) of cases, whereas the remaining 55 (40.1%)

were treated symptomatically. Invasive respiratory support via mechanical ventilation was required for 33 (24.1%) of the patients, and extracorporeal metabolic support via hemodialysis was done for 10 (7.3%).

Recovery Timelines, Mortality, and Long-Term Sequelae

Outcomes for the 137 patients showed that 105 (76.6%) experienced rapid clinical recovery and were successfully discharged within 7 days. An additional 9 (6.6%) recovered and were discharged within 14 days, while 23 (16.8%) of patients expired due to severe toxic complications. Cross-tabulation of mortality against toxic agents revealed a severe concentration of deaths linked to specific chemicals. Paraquat herbicide toxicity was the single most lethal agent, accounting for 12 (52.2%) of all deaths, translating to a case-fatality rate of 46.2% within its group. Commercial rat killers caused 8 (34.8%) of total deaths (case-fatality rate: 42.1%), and organophosphates were responsible for 3 (13.0%) of deaths (case-fatality rate: 9.7%). Among the 114 survivors, 9 (7.9%) patients have developed severe post-poisoning clinical sequelae. These included irreversible paraquat-induced pulmonary fibrosis 4 (3.5%), organophosphate-induced delayed polyneuropathy (OPIDN) presenting as distal sensory axonopathy 3 (2.6%), and profound neuropsychiatric illnesses including severe depressive and post-traumatic syndromes 2 (1.75%). Table 3.

Table 3: Toxic Compound Class and its Case Fatality Rate

| Toxic Compound Class | Total Ingested (N) | Survived (n) | Expired (n) | Case-Fatality Rate (%) |
|-------------------------------|--------------------|--------------|-------------|------------------------|
| Herbicides (Paraquat) | 26 | 14 | 12 | 46.15% |
| Rat Killer (Rodenticides) | 19 | 11 | 8 | 42.11% |
| Pesticides (Organophosphates) | 31 | 28 | 3 | 9.68% |
| All Other Combined Agents | 61 | 61 | 0 | 0.00% |
| Total | 137 | 114 | 23 | 16.79% |

DISCUSSION

The clinical epidemiological trends identified in this retrospective audit provide critical, concrete insights into the contemporary toxicological challenges facing tertiary medical institutions in Southern India. Among 137 subjects include in our study, 98 (71.5%) subjects were young individuals of aged 18–40 years have showed greater incidence of poisoning. This was significant as study done by Prajapati H, et al

showing that the younger adults, highly productive segment of society is disproportionately vulnerable to poisoning.^[8] This vulnerability is primarily driven by acute interpersonal turmoil, economic distress, academic stressors, and psychological vulnerabilities. Among 137 individuals, females 78 (56.9%) had higher incidence than males, this was significant with the study done by Rajashree GR et al, which showed higher female predominance and high proportion of married individuals 93 (67.9%) emphasize that acute relational stressors and

domestic conflicts are major triggers for deliberate self-harm in our local clinical population.^[9]

An important finding is the high rate of intentional self-harm, which accounted for 130 (94.9%) of cases. This proves that poisoning in this region is primarily an issue of deliberate self-harm rather than accidental exposure. This was significant with the study done by Nair SJ et al, which shows high rate of poisoning was intentional self-harm.^[10] The oral route was the primary mode of entry for 134 (97.8%) of patients. This was significant with the study done by Palimar V et al, which shows oral route of ingestion was seen predominant.^[11] The choice of chemical agent is directly tied to retail availability and local household accessibility. Agrochemicals—pesticides and herbicides—accounted for 57 (41.6%) of all presentations. Organophosphate pesticides remained the most common toxic substance 31 (22.6%). This was similar to the study done by Allichandi R et al, which showed that Organophosphate compounds was the most common toxic substance.^[12] While organophosphates were highly prevalent, they carried a relatively low case-fatality rate of 9.7% (3 deaths out of 31 cases). This favourable outcome can be attributed to the early arrival of patients (79.6% within 6 hours), rapid gastric decontamination, and the immediate availability of effective antidotes like atropine and pralidoxime. In sharp contrast, herbicide paraquat presented a severe clinical crisis. Paraquat poisoning demonstrated a case-fatality rate of (46.2%) accounting for 52.2% (12 out of 23) of all study deaths. This was statistically significant with the study done by Mohan A et al, shows high mortality rate in paraquat poisoning.^[13] It stems from paraquat's rapid absorption and its destructive mechanism of action, which involves cyclic redox reactions that generate massive amounts of free radicals and cause multi-organ damage. Because there is no specific antidote, treatment relies on supportive care and preventing absorption. Furthermore, paraquat caused long-term problems among survivors, with 4 (3.5%) patients developing permanent, restrictive pulmonary fibrosis due to myofibroblast proliferation.

Commercial rodenticides (rat killers) also presented a high clinical risk, resulting in 8 deaths among 19 patients (a case-fatality rate of 42.1%). Modern over-the-counter rodenticide formulations in Southern India frequently contain yellow phosphorus, a potent hepatotoxin. Yellow phosphorus ingestion typically causes a silent period during the first 24 to 36 hours, followed by fulminant hepatic failure, severe coagulopathy, and cardiovascular collapse. This was significant with the study done by Iyyadurai et al, which shows high mortality in rat killer poisoning.^[14] The absence of a specific antidote for phosphorus means that delayed presentation or consuming a large amount often leads to high mortality. This highlights the urgent need for public education and stricter regulations on the sale of yellow-phosphorus-based pastes.

Regarding neurological complications, 3 (2.6%) patients developed organophosphate-induced delayed polyneuropathy (OPIDN). OPIDN is a well-documented but relatively rare complication that typically appears 2 to 3 weeks after severe exposure to specific organophosphorus compounds. It is caused by the inhibition and aging of neuropathy target esterase (NTE), which leads to Wallerian degeneration of distal axons in peripheral nerves. This was significant with the study done by Rao et al, well documented 2 cases who developed OPIDN.^[15] Patients present with distal weakness, sensory loss, and a foot drop, requiring long-term physical rehabilitation. Additionally, 2 (1.75%) patients required continuing psychiatric care for long-term neuropsychiatric sequelae. This highlights the clear need to integrate formal psychiatric evaluations and mental health support into standard medical treatment for all survivors of deliberate self-harm.

CONCLUSION

This retrospective analysis demonstrates that acute poisoning represents a major medical emergency at our tertiary institution, primarily affecting young adults and frequently presenting as deliberate self-harm. Agrochemicals (organophosphates and paraquat) and commercial rodenticides are the primary agents used. While early hospital presentation and standard supportive measures ensure high recovery rates for organophosphate exposures. Paraquat and yellow phosphorus rodenticides carry high case-fatality rates and cause significant long-term morbidity due to the lack of specific antidotes.

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Recommendations

1. **Regulatory Restrictions:** Implement strict legislative restrictions on over-the-counter sale and distribution of highly lethal compounds, particularly paraquat and yellow-phosphorus-based rodenticide pastes, encouraging safer alternatives.
2. **Clinical Training Modalities:** Develop updated toxicological training programs for primary care and emergency physicians to facilitate rapid identification, initial stabilization, and timely triage of less common or highly toxic compounds.
3. **Mandatory Psychiatric Support:** Establish mandatory, integrated psychological counselling and psychiatric assessment protocols for all patients admitted with intentional self-harm to address underlying stressors and reduce recurrence rates.
4. **Public Awareness Campaigns:** Run community-level educational initiatives highlighting the extreme dangers of domestic chemical misdirection and promoting toxic security inside agricultural households.

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