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Assessment of Poison Severity Scores and Patient Counselling in the Management of Acute Poisoning Patients

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Abstract

Acute poisoning continues to pose a serious public health challenge and contributes substantially to morbidity and mortality, especially in resource-limited settings. This prospective observational study was carried out to describe the clinical pattern of acute poisoning cases and to evaluate the usefulness of severity scoring systems along with patient counselling in improving clinical outcomes. The study was conducted over nine months in a tertiary care teaching hospital in India and included 310 patients with confirmed acute poisoning. Clinical severity was assessed using the Poison Severity Score, Acute Physiology and Chronic Health Evaluation II score, Sequential Organ Failure Assessment score, and Glasgow Coma Scale. Patients received either standard medical care alone or standard care with structured patient counselling. Household poisoning emerged as the most common cause, followed by organophosphate poisoning and venomous bites, with intentional exposure accounting for most cases. A large proportion of patients presented with severe poisoning and moderate to severe neurological impairment. The combined use of severity scoring systems helped in the early identification of high-risk patients and supported clinical decision-making. Patients who received counselling showed significantly better recovery outcomes compared to those receiving standard care alone ($p < 0.001$).

Major Findings: The findings suggest that incorporating systematic severity assessment together with patient counselling not only supports timely and appropriate management but also improves recovery by enhancing patient awareness, preventive behaviour, and adherence to follow-up care in acute poisoning cases.

Keywords: Household Poisoning, Organophosphates, Patient Counselling, Severity Scores (PSS, APACHE II, SOFA), Venomous Bites

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1. Introduction

Poisoning remains a major global public health concern and continues to contribute significantly to morbidity and mortality across all age groups. Exposure may occur accidentally through pesticides, household chemicals[1, 2], and venomous bites, or intentionally through self-harm involving toxic substances. The clinical presentation of poisoning varies widely depending on the type of toxin, dose, and route of exposure, often resulting in complex and unpredictable clinical scenarios that pose challenges to timely diagnosis and effective management. Recent literature highlights that poisoning continues to be a leading cause of emergency admissions in low- and middle-income countries, where delayed presentation and limited access to specialised care further worsen outcomes[1,3].

In India, acute poisoning is particularly prevalent in rural and semi-urban regions, with oral ingestion being the most common route of exposure. Organophosphate pesticides such as chlorpyrifos, malathion, and parathion are widely used in agriculture and are frequently implicated in poisoning due to unsafe handling and easy availability[4]. Common household poisons include rodenticides containing zinc phosphide or aluminium phosphide, household

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insecticides, mosquito repellents, phenyl-based disinfectants, kerosene, and corrosive cleaning agents such as acids and alkalis[2]. Snake envenomation, particularly from kraits and Russell's vipers, also contributes substantially to poisoning-related mortality in populations with limited access to timely medical care. Despite existing regulatory measures, inadequate awareness, unsafe storage practices, and psychosocial stressors continue to sustain a high burden of both accidental and intentional poisoning cases[3].

Accurate assessment of poisoning severity is central to improving clinical outcomes, yet a major gap remains in the consistent and integrated use of prognostic tools in routine clinical practice[5]. Several scoring systems are available to assess poisoning severity and prognosis, including the Glasgow Coma Scale (GCS) for neurological assessment, the Acute Physiology and Chronic Health Evaluation II (APACHE II) score for overall disease severity, and the Sequential Organ Failure Assessment (SOFA) score for organ dysfunction[6]. The Poison Severity Score (PSS) was specifically developed to classify the severity of poisoning; however, studies suggest that reliance on a single scoring system may be insufficient for optimal risk stratification. Recent literature supports the combined use of multiple scoring systems to enhance prognostic accuracy, enable early identification of high-risk patients, and support evidence-based clinical decision-making, yet such integrated approaches remain underutilised in many healthcare settings[7-9].

In addition to clinical assessment, patient counselling represents a critical yet often under-integrated component of poisoning management. While existing studies have independently evaluated clinical severity scores[10,11] or described epidemiological patterns of poisoning, limited evidence is available on the combined application of standardised severity scoring systems together with structured patient counselling in routine clinical practice[12]. The novelty of the present study lies in its integrated approach, which simultaneously evaluates multiple validated severity scoring systems and assesses the impact of structured patient counselling on recovery outcomes in acute poisoning cases[13]. By linking objective risk stratification with targeted patient education and follow-up, this study provides new evidence supporting a practical, patient-centred model for improving clinical outcomes and preventing recurrent poisoning. This combined strategy offers a scalable and implementable framework that can be incorporated into standard hospital practice, particularly in resource-limited settings where poisoning remains a major public health burden[14,15].

2. Materials and Methods

2.1 Study Design & Ethical Approval

A prospective observational study was conducted over nine months, from July to March, in the Intensive Care Unit (ICU), Emergency Department, and General Medicine wards of a tertiary care teaching hospital in Hyderabad, Telangana, India. The study protocol received approval from the Institutional Ethics Committee of CMR College of Pharmacy (Approval No. CMRCP/IEC/2023-24/3).

2.2 Participant Selection

A total of 310 patients presenting with acute poisoning were enrolled based on predefined inclusion and exclusion criteria. Inclusion criteria encompassed patients aged 18 years and above with confirmed cases of acute poisoning. Exclusion criteria included patients with chronic poisoning, those who Left Against Medical Advice (LAMA), cases with incomplete data, and patients who did not survive.

2.3 Data Collection

Upon admission, comprehensive data were collected for each patient, including demographic information, vital signs, GCS scores, laboratory findings, and identification of the poisoning agent. Severity of poisoning was assessed using the PSS. To evaluate the risk of mortality and organ dysfunction, the APACHE II and SOFA scores were also calculated. Patient management and clinical assessment were carried out by qualified physicians from the Department of General Medicine, and data collection was performed in coordination with the treating physicians using hospital medical records.

2.4 Intervention

Participants were divided into two groups

Control Group: Received standard medical care as per hospital protocols.

Counselling Group: In addition to standard care, received structured counselling sessions focusing on

poison prevention, early symptom recognition, and the importance of follow-up care.

2.5 Follow-Up

Patients were followed up for a period of 1 to 3 months post-discharge to monitor for readmissions and long-term complications.

2.6 Statistical Analysis

Data were entered into Microsoft Excel and analysed using SPSS software version 30.0.0.0. Descriptive statistics, including means, percentages, and standard deviations, were used to summarise demographic and clinical characteristics. The Pearson Chi-Square test was employed to assess associations between group allocation (control vs. counselling) and recovery outcomes. A p-value of less than 0.05 was considered statistically significant.

Table 1. Patient data summary

Parameters	Category	No. of Patients	Percentage (%)
Age in years	<18	12	3.87%
	18-24	62	20%
	25-34	70	22.58%
	35-44	66	21.29%
	>45	100	32.25%
Gender	Male	230	74.19%
	Female	80	25.81%
Type of Poison	Organo phosphate	92	29.67%
	Household	172	55.48%
	Venomous Bites	46	14.83%

3. Results

During the nine-month study period, a total of 310 patients with acute poisoning were enrolled and randomly assigned into two groups: a counselling group (structured patient education) and a control group (standard care). The primary objective was to evaluate the impact of counselling interventions on clinical outcomes, including medication adherence, patient understanding, and overall management. Patients were followed up for up to 3 months to assess differences in morbidity, readmission rates, and recovery outcomes between the two groups. While morbidity profiles were evaluated during hospitalisation, the follow-up phase primarily focused on assessing recovery status. Notably, recovery outcomes were significantly better in the counselling group compared to the control group, highlighting the potential benefits of structured patient education. Data analysis further included the evaluation of vital parameters, GCS scores, severity scores (PSS, APACHE II, SOFA), and organ system involvement across different types of poisoning.

Table 1 indicates that among 310 patients, the majority (100 patients, 32.25%) are aged over 45 years, making this age group the most at risk of poisoning, followed by the 25-34 age group with 70 patients (22.58%). In terms of gender, males account for a significantly higher proportion of poisoning cases (230 patients, 74.19%) compared to females (80 patients, 25.81%). Regarding

Table 2. Manner of poisoning

Type	No. of Patients	Percentage (%)
Intentional	264	85%
Unintentional	46	15%

Table 3. Organ at risk and type of poisoning

Organ system	OP	Household	Venomous Bites	Total	Percentage (%)
CNS	32	8	28	68	21.94%
CVS	18	8	4	30	9.68%
GIT	20	72	8	100	32.26%
Renal	10	8	0	18	5.81%
Hepatic	0	8	0	8	2.58%
Respiratory	10	22	0	32	10.32%
Dermatology	8	24	4	36	11.61%
Hematologic	0	0	18	18	5.81%

the type of poisoning, household poisoning is the most common, affecting 172 patients (55.48%), followed by organophosphate poisoning in 92 patients (29.67%), and venomous bites in 46 patients (14.83%). This data suggests that older males are at higher risk, with household poisoning being the most prevalent cause.

Table 2 concludes that the majority of patients, 264 (85%) has more intentions towards poisoning, followed by patients-46 (15%) having unintentional poisonings among 310 patients.

Morbidity data were categorised by the type of poison and organ system involvement. The most frequently affected systems were the Central Nervous System (CNS), Gastrointestinal Tract (GIT), and the respiratory system. The following table summarises the distribution of morbidity based on the type of poison.

Table 4. Distribution of patients by risk level based on GCS scores

Severity	No. of patients	Percentage
Severe Brain Injury	114	36.77%
Moderate Brain Injury	120	38.70%
No brain Injury	76	24.51%

Table 3 shows that the majority of patients experienced gastrointestinal (32.2%) and CNS (21.9%) morbidity, with a relatively low readmission rate (3.9% within 1 month). Most patients (85.2%) achieved full recovery, while a small percentage (3.2%) had persistent morbidity. These findings highlight that timely intervention leads to favourable recovery outcomes, although a small portion of patients still face long-term challenges.

Table 4 concludes that the majority of patients, 120 (38.70%) has risk of moderate brain injury, followed by patients, 114 (36.77%), having a risk of severe brain injury, followed by patients, 76 (24.15%), having no brain injury based on GCS scoring among 310 patients

Patients were classified into high-risk (n=356) and low-risk (n=86) groups based on combined PSS, APACHE II, and SOFA scores, with high-risk patients being those classified as severe or fatal, and low-risk patients classified as mild or moderate.

Table 5 compares the severity of poisoning cases using three different scoring systems: clinical classification, PSS + APACHE II, and PSS + SOFA. The majority of patients fall under the severe category across all scoring methods, with a significant proportion classified as fatal by the PSS + SOFA system.

Table 5. Severity classification based on clinical scoring systems

Severity	No. of Patients (PSS)	Percentage (PSS)	No. of Patients (PSS + APACHE II)	Percentage (PSS + APACHE II)	No. of Patients (PSS + SOFA)	Percentage (PSS + SOFA)
Mild	8	2.58%	152	49.03%	6	1.93%
Moderate	78	25.16%	102	32.90%	20	6.45%
Severe	224	72.25%	56	18.06%	152	49.03%
Fatal	-	-	-	-	132	42.58%

Table 6. Statistical Analysis: Pearson Chi-Square test for assessing recovery rate between the control and counselling groups

	Value	Degree of freedom	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	117.220[a]	1	<.001		
Continuity Correction [b]	112.340	1	<.001		
Likelihood Ratio	126.370	1	<.001		
Fisher's Exact Test				<.001	<.001
N of Valid Cases	310				

χ^2_{cal} = 117.220 (with degree of freedom = 1)
χ^2_{tab} = 3.841
$\chi^2_{cal} > \chi^2_{tab}$ (117.220>3.841) at 5% level of significance.

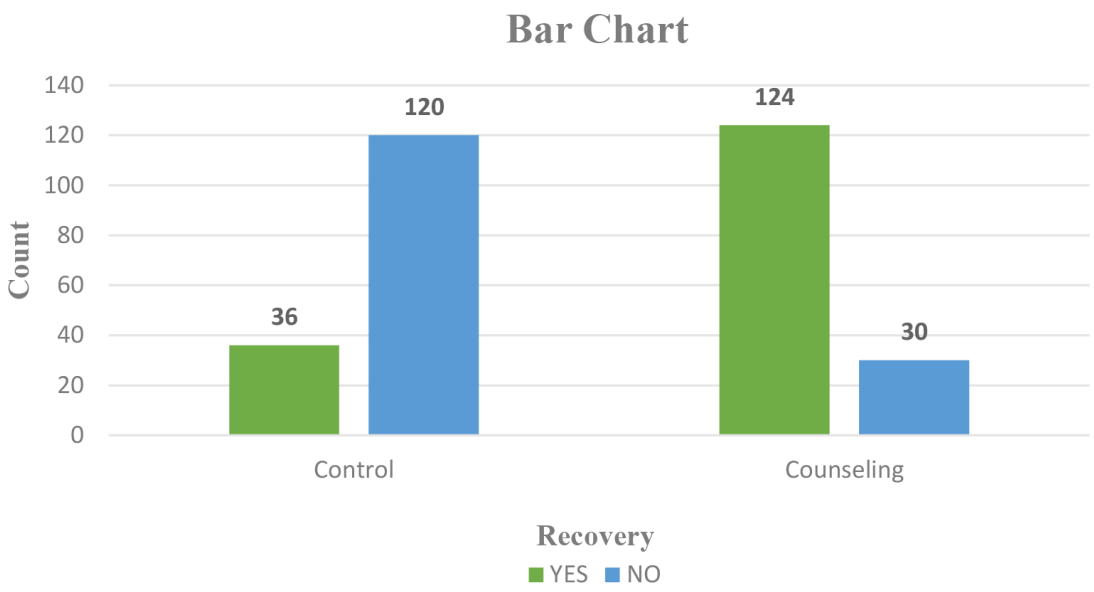


Figure 1. Impact of patient counselling on recovery.

The determined statistical value surpasses the corresponding tabulated value, with a p-value of 0.001. The counselling group shows a recovery rate much higher than expected, which contributes to the strong significance.

4. Discussion

The present study highlights the clinical usefulness of integrating multiple severity scoring systems in the assessment and management of acute poisoning cases. The combined application of the Poison Severity Score, Acute Physiology and Chronic Health Evaluation II score, and Sequential Organ Failure Assessment score provided a comprehensive evaluation of toxicity severity, physiological derangement, and organ dysfunction. While each scoring system has established value individually, their combined use enhanced risk stratification and facilitated early identification of high-risk patients, as reflected in the severity distribution and outcome measures presented in the Results section (Tables 4 and 5). These findings support previous reports suggesting that the integration of multiple prognostic tools improves clinical decision-making and outcome prediction in poisoned patients[3].

The demographic and clinical profile observed in this study is consistent with patterns reported in earlier studies. Middle-aged individuals and males were disproportionately affected, which may be attributed to occupational exposure, psychosocial stressors, and greater accessibility to toxic substances. Similar trends have been observed as a higher incidence of poisoning among middle-aged males[1,16]. Household poisoning was the most common type, followed by organophosphate poisoning and venomous bites, reflecting the widespread availability of household chemicals and agricultural pesticides[2]. The predominance of intentional poisoning observed in the present study further emphasises the growing burden of self-harm-related poisoning and highlights the need for targeted preventive strategies, awareness programs, and mental health interventions[3].

Neurological involvement was a prominent finding, with a substantial proportion of patients presenting with moderate to severe impairment based on Glasgow Coma Scale assessment (Table 4). This observation is consistent with previous studies reporting a strong association between lower Glasgow Coma Scale scores and adverse neurological outcomes, including delayed neurological sequelae. The combined use of the Poison Severity Score with Acute Physiology and Chronic Health Evaluation II and Sequential Organ Failure Assessment scores demonstrated improved prediction of mortality and organ dysfunction, particularly among patients requiring intensive care. These findings are in agreement with studies that emphasised the prognostic value of these scoring systems in poisoned patients[8,11,12]. The high proportion of severe and fatal cases identified using the Poison Severity Score and Sequential Organ Failure

Assessment underscores the importance of early organ dysfunction assessment in guiding timely intervention[5].

A key novel aspect of this study is that, while individual severity scoring systems have been widely studied in poisoning management[17], their integrated application in routine clinical practice remains limited. The present study addresses this gap by evaluating the combined utility of multiple validated severity scores alongside structured patient counselling, thereby providing a practical and patient-centred approach to improving risk stratification and clinical outcomes in acute poisoning cases. Patients who received counselling showed significantly better recovery outcomes compared to those receiving routine care alone, as demonstrated by the statistical analysis presented in the Results section (Figure 1 and Table 6). These findings align with previous reports indicating that patient education, counselling, and mental health support play a critical role in reducing complications, improving adherence to follow-up, and preventing recurrence of poisoning. Few studies similarly highlighted the importance of counselling and awareness programs in poisoning prevention and outcome improvement[13-15]. Despite these strengths, the study has certain limitations, including its single-centre design and relatively short follow-up period, which may limit generalizability. Future multicentre studies with larger populations and longer follow-up durations are warranted to further validate the benefits of integrating severity scoring systems with structured patient counselling in the management of acute poisoning.

5. Conclusion

This study demonstrates that the combined application of the Poison Severity Score (PSS), Acute Physiology and Chronic Health Evaluation II score (APACHE II), and Sequential Organ Failure Assessment score (SOFA) is effective in categorising acute poisoning patients into high- and low-risk groups. Although each scoring system provides valuable information individually, their integrated use improves risk stratification and supports timely clinical decision-making, which is essential for appropriate patient management. A key finding of this study is that structured patient counselling was associated with significantly better recovery outcomes compared to standard medical care alone. Counselling improved patient and caregiver awareness regarding potential risks, preventive measures, and the importance of adherence to follow-up care, thereby reducing complications during recovery. In addition to improving individual patient outcomes, this approach highlights the importance of combining objective clinical assessment with patient-centred interventions. Overall, the findings suggest that integrating validated severity scoring systems with structured patient counselling offers a practical and effective strategy for improving clinical outcomes in acute poisoning and can be feasibly implemented in routine hospital practice.

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Author Contributions

Karra Geetha served as the project guide and provided overall guidance and scientific input throughout the study. Ch. Abhiram made the major contributions to the conception, data analysis, manuscript preparation, and overall execution of the study. Suddala Anusha and Tungala Hanisha assisted in data compilation and supportive research activities. Ch. Manoj Reddy contributed to case identification and data collection. Tadikonda Rama Rao supervised the study and provided institutional oversight and support. All authors reviewed and approved the final manuscript.

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