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Determining the factors which impact management of acute poisonings due to therapeutic medicines

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ABSTRACT

Background: In a developing country such as India, intentional poisoning is associated with a high degree of morbidity and mortality. Historically, the use of agricultural poisons for attempted deliberate self-harm (DSH) has taken precedence. However, urbanization and stringent laws governing sale of agricultural chemicals, in recent years, may have shifted the focus of seekers toward commercially available therapeutic medications. Further, urbanization, high health-care seeking behavior, and poor regulation on sale of medicines, in Kerala, provide a conducive environment for such attempts. **Aims and Objectives:** The objective of this study was to determine the contribution of therapeutic medication toward acute poisoning as a means of DSH and the factors contributing to the same. **Materials and Methods**: Patients who obtained treatment for acute poisoning after DSH, between 2017 and 2023, were screened, those who employed therapeutic medication for the same were further determined. Sociodemographic details, clinical profile, and history of previous such attempts and treatment history including toxicological screening report were gathered and analyzed. **Results:** In our study of 154 patients arriving at the emergency department with history of DSH, 41% used therapeutic medicines for the same. Majority were women (75%) and most had a high school education (64%) or above. The most common agents were determined as paracetamol (23%) and benzodiazepine (10.6%). Tox screen was performed for 45% of patients. Organ failure developed in 36% patients with drug levels above and 42% of those with levels below the therapeutic range. However, 48% of those who did not undergo toxicological screening developed organ failure. Organ failure developed in 42% of patients, with acute liver injury being the most common culprit (25%). Management was symptomatic unless an antidote was available. **Conclusion**: Prescription drugs utilization for DSH was common in women and patients with higher educational status. Over-the-counter drugs and psychiatric medication were frequently used. Lack of prompt access to healthcare may contribute to organ failure. Tox-screen is recommended for drug detection.

Key words: Deliberate self-harm; Therapeutic medicines; Poisoning; Toxicological screening

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INTRODUCTION

"All drugs are poisons; the benefit depends on the dosage." The emergency room is invaded with poisoning requiring immediate and resource exhaustive management. Poisoning may be intentional or accidental.

In developing countries where resources are limited, intentional poisoning is both common and associated with a high degree of morbidity and mortality with over 77% of global suicides occurring in low- and middle-income countries.[1] In India, a total of 164,033 suicides were reported in the country during 2021.[2]

In India, intentional poisoning using agricultural chemicals has historically been a major concern.[3] This choice of poison has been steered by ease of access, economic restraints, and poor regulatory control on

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these chemicals.[4] The xenobiotic used determines clinical presentation, management, and outcome in many patients. The high toxicity of these poisons along with sparsity of appropriate healthcare ensured high fatality from these poisons.

Accordingly, poison management in India has been directed toward the most common agricultural poisons.[5]

However, in recent years, the shift away from agricultural practices and the ban imposed on some of the most fatal agriculture poisons have limited their use.[4] This shift could be most apparent in Kerala, where urbanization has been rapid in the past decade.[6] The excessive health-care seeking behavior alongside rapid growth in private and public health-care facilities puts the people of this state at a high risk of attempting deliberate self-harm (DSH) using accessible therapeutic medicines.[7]

These trends have led the investigators to enquire into the exclusive use of therapeutic drugs as poisons.

The objective of this study was to understand the contribution of therapeutic medication toward acute poisoning as a means of DSH. We intended to determine the drugs commonly used by patients who attempt DSH, the clinical presentation of such patients, and their long-term sequelae after such an attempt. We also wish to highlight the populations at risk, the role of acute stressors, mental illness, and availability of commonly exploited medicines in such attempts. The appropriateness of current treatment guidelines for cases of acute poisoning by commercially available therapeutic medicines was also assessed.

Aims and objectives

The objective of this study was to determine the contribution of therapeutic medication toward acute poisoning as a means of DSH and the factors contributing to the same.

MATERIALS AND METHODS

A retrospective study was performed on adult patients (age >18 years) who presented with history of poisoning at the emergency department of our institute between 2017 and 2023 after attainment of ethic clearance for the conduct of this study from the Institutional Ethics Committee.

Patients diagnosed with poisoning or DSH were screened from the hospital database. Patients who had attempted DSH by means other than poisoning by therapeutic medication were excluded from the study.

Individual patient details such as demographics, comorbidities, concomitant medications, history of previous DSH attempt, intentionality, and motive were collected from history provided at admission.

Therapeutic medication used for the attempt and any delay in access to health care were also noted.

At our institute, all poisoning cases are first evaluated and treated at the emergency department followed by transfer of those requiring specialized care to the respective departments. The blood and tissue samples for the toxicological screening are collected and sent to the toxicology department.

Records of first-line medical treatment, supportive care, antidote usage, duration of stay in hospital, development of organ damage, referral to specialty departments, patient outcome, psychiatric referral, and follow-up management were also obtained.

Toxicology report and changes made to treatment protocols due to the same were inquired. The toxicology report if available was used to determine the drug and its level in the tissue sample. The drug levels detected were compared with laboratory reference values and determined to be above or below the toxic level. The use of specific antidote was also noted. In cases of paracetamol poisoning, the appropriate usage of the Rumack–Mathew nomogram for determination of liver injury and treatment with N-acetyl cysteine was also determined.[8]

All the collected information was noted in individual case record forms and then transferred to an excel sheet for analysis.

In this study, the time of first contact with a health-care facility from the reported time of incident has been described as the delay in health-care access. Length of hospital stay has been calculated as the number of days from date of admittance to date of discharge. The occurrence of organ damage was corroborated with the final diagnosis by the concerned department to which the patient was transferred.

Statistical method: Based on the results of proportion of patients who took therapeutic medication for DSH (62.9%) observed in an earlier publication and with 20% relative precision and 95% confidence, the minimum sample size was calculated to be 57.[9]

The collected data were analyzed using SPSS statistics 21.0 software. The results have been expressed in percentage and frequency.

RESULTS

In our study, we identified 154 patients admitted with DSH using a poison, 41% among them used commercially available therapeutic medication for the same. Majority were women (75%) and most had a high school education or above (64%). This was their second attempt at DSH for 17% patients. Details of previous attempts were not available for any patient. Table 1 shows the demographic details and the prevalence of comorbidities among these patients.

Most of the patients were between 18 and 35 years of age (n=45), 10 were in the 36–59-year age bracket and 10 patients were older than 59 years. Even with the younger demographic profile of this group, the prevalence of comorbidities was relatively high (29.6%) with most having multiple comorbidities (52%).

The use of prescription medication was also relatively high among these patients (48%), especially among the older patients. These patients showed equal preference for cardiovascular drugs and benzodiazepines, whereas patients between 18 and 35 years of age were found to prefer over-the-counter drugs for DSH.

Most patients attempted DSH with a single drug (55%). Paracetamol (23%), benzodiazepine (10.6%), and non-steroidal anti-inflammatory drugs (6.2%) were the most common drugs used.

Table 1: Sociodemographic details and clinical profile

Variable	Number of cases	Percentage
Gender		
Female	48	75
Male	16	25
Age		
18–30	37	58
30–50	15	23
>50	12	19
Education school		
Secondary status	1	2
High school	5	8
Graduate	36	56
Unknown	22	34
Employment		
Unemployed	9	14
Student	23	36
Employed	16	25
Unknown	16	25
Outcome		
Death	2	3
Survived	62	97
Comorbidities		
Single	9	14
Multiple	10	15
Cardiovascular disease	16	25
Endocrinological disorder	8	12.5
Central nervous system disorder	4	6
Other comorbidities	9	14

Among our patients, 28% had a diagnosis of psychiatric illness before the attempt. The most common psychiatric illnesses were found to be emotionally unstable personality disorder in 36%, bipolar disorder in 21%, and anxiety and depression in 14% each.

The patients with a history of psychiatric illness were also found to use prescription drugs for DSH more often (67%).

In the group of patients (42%) who developed organ damage, 60% had received health care within the first 5 h of the attempt. Early access to healthcare (within 5 h of the attempt) was attainable for 51% of these patients, whereas 37% received medical care only within the 1st day (Figure 1).

Acute liver injury (45%), acute kidney injury (11%), and acute respiratory illness (11%) made the greatest contribution to organ failure.

Toxicological screening was performed for 45% of all patients and the most common drugs detected were

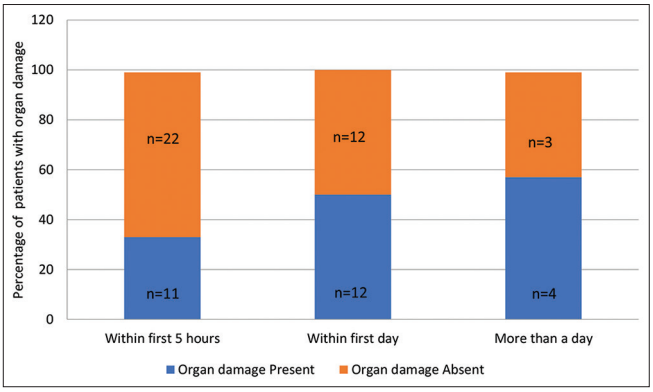

Figure 1: Percentage development of organ damage with respect to delay in access to health care

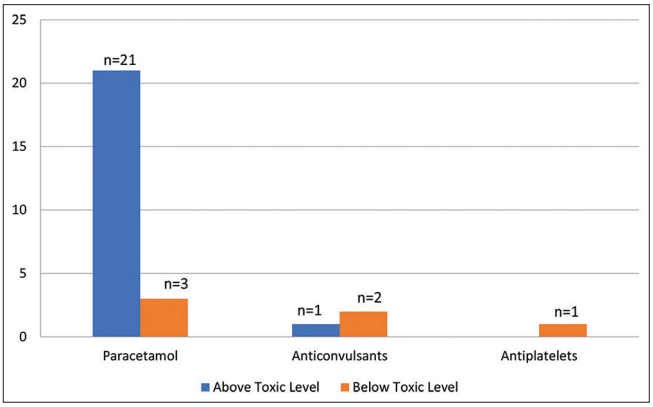

Figure 2: Drugs most commonly detected to be above toxic level

paracetamol (n=24) and anticonvulsants (n=3). However, drug levels above the therapeutic range were found most often for paracetamol poisoning (n=21) (Figure 2).

It was noted that 48% of those who did not undergo toxicological screening went on to develop organ failure.

However, we also found that organ failure developed in 36% of those with drug levels above toxic range and 42% of those with levels below toxic range (Figure 3).

Management of the patients was determined by the clinical status at arrival and included the administration of activated charcoal or gastric lavage along with symptomatic management (66%). The specific antidote was administered (34%) if the detected drug was found to be above the toxic range in the toxicology reports.

DISCUSSION

In India, poisoning poses a major health-care concern and as in other developing nations, it is often motivated by self-harm rather than accidental intake.[10] In our study, the investigators reported that 41% of all patients attempting suicide with poisons used therapeutic medicines for the same. This trend is in contrast to other studies conducted in India, where agricultural poisons continue to be the major culprit.[11]

Whereas in our study, females were seen to attempt suicide more often, country wide data suggests poisoning to be more common among males.[10] This could reflect a preference by female patients for commercially available medicines as poisons.

It was noticed that patients with comorbidities were in the extremes of age, in our study. In another study conducted in poisoning among young adults, comorbidities were found to play a significant role in development of suicidal ideation.[12]

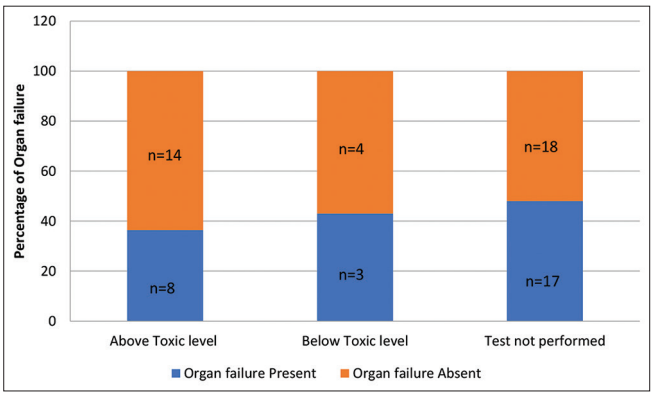

Figure 3: Percentage development of organ failure with respect to drug levels as in tox-screen reports

Prescription use among patients in our study also shows an age-dependent pattern, with most young patients using over-the-counter drugs whereas the elderly show a preference for prescription drugs. A study in UK also showed a similar age-related pattern for prescription drug misuse.[13]

Further, the elderly showed a preference for either psychiatric medication or cardiovascular drugs. The choice of drug reflects a pattern seen in another study on geriatric patients. The poison of choice in this group is influenced by the accessibility, which behaves as a temptation at hand.[14]

Paracetamol and benzodiazepines were the most frequently abused drugs among our patients. They were found as the agent of choice in studies conducted in countries where DSH with therapeutic medicines is on the rise.[9,15] The choice of poison was either over the counter drug or prescription medicines due to their accessibility.

A history of psychiatric illness was seen in less than a third of the patients with the most common types of psychiatric illnesses being Emotionally Unstable Personality Disorder and Bipolar Disorder. They also had a very high propensity for the use of prescription medication (67%). A study conducted in Denmark also found that patients with psychiatric illness had increased frequency of self-harm using prescription medicines.[16]

Despite the high urbanization in the state of Kerala, the delayed access to health care was consistent with results in other Indian states.[5] The patients with greater delay in treatment were also seen to develop organ failure more often.

Tox-screen results were available for 45% of patients. In our study, the development of organ failure was more common among those not undergoing tox-screen. However, it was seen that drug levels detected to be below the toxic level could not rule out the development of organ failure. Our results were in accordance with routine guidelines which suggest that clinical judgment outweighs toxicological reports in cases of acute poisoning.[17] However, these tests are a pre-emptive measure to help identify the drug and take the punitive specific action when an antidote is available, as is the case for many of the common therapeutic medicines.[18]

Poisoning cases at our hospital were managed first with administration of activated charcoal or by performing gastric lavage followed by assessment of clinical status which determined further management. The timely toxicological screening allowed administration of antidote for detected drug.

The tox-screen reports were found to be especially helpful in cases of paracetamol poisoning where the risk of development of acute liver injury was predicted using the Rumack–Mathew nomogram.[19] Current guidelines for paracetamol poisoning also suggest the use of this tool for determining risk of liver injury and to titrate treatment with the specific antidote, N-acetyl cysteine.[20]

The investigators recommend the use of tox-screen for each case of acute poisoning due to therapeutic medications to allow immediate definitive antidotal therapy and avoid development of organ failure.

Limitations of the study

As it was a retrospective study, it should be noted that certain aspects of our work are limited by the absence of follow up, such as the role of psychiatric care in preventing repeat attempts.

CONCLUSION

Analgesics and benzodiazepines were the most frequently abused drugs among patients in this study. Comorbidities were common in extremes of age and such patients had greater prescription abuse. The role of chronic comorbid health conditions may warrant greater scrutiny of the mental state of these patients by the prescribing physician. The complete recovery and absence of long-term complications may suggest that current treatment protocols are adequate. However, the role of toxicological screening in allowing immediate definitive therapy should be considered.

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Authors' Contributions:
AS- Prepared study protocol, implementation of study protocol, data collection, data analysis, prepared first draft of manuscript and submission of article; **PLP-** Concept, design, clinical protocol, manuscript preparation, editing, and manuscript revision; **MJ-** Data collection, design of study, statistical analysis; and **SB-** Review manuscript.

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