Original Article

Clinical and Epidemiological Profile of Cases of Poisoning Brought to a Tertiary Care Centre Located in a Rural Border District of South Kerala

Saritha Ebeneezar[1], Vannya M.S[2]

[1]Assistant Professor of Forensic Medicine, Dr. Somervell Memorial CSI Medical College, Karakonam, Thiruvananthapuram, Kerala, [2]Assistant Professor of Community Medicine, Dr. Somervell Memorial CSI Medical College, Karakonam, Thiruvananthapuram, Kerala

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Abstract

Background: Poisoning remains a critical public health issue in India, with varying epidemiological and clinical characteristics across regions. Identifying demographic trends/types of poisoning/clinical presentations is crucial for improving prevention and treatment strategies. This study aims to analyze the general characteristics, clinical manifestations and trend patterns of poisoning cases in a hospital setting.

Methods: A retrospective study of 247 patients with a history of poisoning during the last 10 years was conducted. Data on patient demographics, type and manner of poisoning, clinical features and factors precipitating consumption of poisonous substances were collected from medical records. Descriptive statistical analysis was used to assess patterns and trends of poisoning cases.

Conclusion: The study highlights that poisoning incidents are predominantly reported among males and individuals aged 25–50 years, with a significant proportion being linked to suicidal intent. Drug-related poisoning was the most common and alcoholism was a prevalent comorbidity. These findings underline the need for targeted interventions, improved mental health support and effective management of poisoning cases to reduce the burden of toxicity in the population.

Keywords: Poisoning, clinical profile, suicidal poisoning, organophosphates, toxicology, retrospective analysis

Introduction

Poisoning is a significant global health issue, with its incidence and impact varying greatly, depending on geographic, social and economic factors. In developing countries like India, poisoning is still one of the major causes of morbidity and mortality, particularly in rural areas. The patterns in consumption of poison are largely influenced by the availability of the toxic substances, local practices and societal issues such as poverty, mental health crises and inadequate regulatory oversight in procurement/sale of toxic agents.[1]

In India, poisoning cases often involve consumption of agrochemicals/pharmaceutical

Corresponding Author: Saritha Ebeneezar, Assistant Professor of Forensic Medicine, Dr. Somervell Memorial CSI Medical College, Karakonam, Thiruvananthapuram, Kerala.

E-mail: Saritha.Ebz@Gmail.Com

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agents/household chemicals as well as bites/stings of venomous creatures. The increasing trend of misuse of pharmaceutical products and self-poisoning have become a matter of public health concern.[2,3]

Understanding the epidemiological and clinical features of poisoning is essential for designing targeted prevention strategies and improving clinical outcomes. This retrospective study aims to explore the demographic profile, clinical presentations and factors precipitating poison consumption in cases admitted to a tertiary care hospital. The trends in poisoning in this part of state are not seen studied in the recent years which may provide insight into the current underlying causes and may help propose measures for prevention and better management of poisoning cases in a rural area. Hence it was felt that the study of this kind would serve the above purpose.

Materials and Methods

Study Design and Setting: This was a retrospective observational study, after perusal of case records, conducted at a tertiary care hospital, in a rural setting of a border district of South Kerala, focusing on those patients admitted with a positive history of poisoning and treated in wards/ ICUs for more than 48 hours. The study period spanned from January 2013 to December 2023.

Study Population: The study included 247 patients who were admitted with a confirmed history of poisoning. Criteria for inclusion was a positive history of poisoning upon admission and in whom the clinical picture was similar to that of a toxidrome. Exclusion criteria included patients whose medical records were incomplete or in whom a clinical diagnosis of poisoning could not be confirmed.

Data Collection: Data was collected from the hospital's medical records, including patient demographics/type of poison consumed/manner of poisoning/clinical features/comorbidities/ precipitating factors/duration of hospital stay/ outcome/complications developed.

Statistical Analysis: Data was coded and entered into MS Office Excel and analysis was done by using SPSS version 27.Descriptive statistical methods were used to analyse the data.

Ethical Considerations: The study was conducted following approval from the hospital's Institutional Ethics Committee, ensuring patient confidentiality and data security. No information revealing identity was used in the analysis or reporting of results.

Results

General characteristics of study subjects

247 patients with history of poisoning were enrolled in the current study. Their mean age was found to be 34.38±18.19 years with the youngest victim being 1 year of age and oldest,80 years. Nearly half (46.2%) of the poisoning cases affected age group of 25-50.More than half(57.1%) of the study subjects were males. Nearly one fourth(20.6%) of the study subjects gave history of addiction,98% of them being alcoholic. About half of the study subjects had comorbidity; more than half suffering from psychiatric/psychological disorder(52.5%) followed by hypertension(26.2%)(Table No.1).

Table No.1: Distribution of study subjects based on general characteristics(n=247)

General Characteristics	Frequency(%)
Age(years)	
<25	82(33.2)
25-50	114(46.2)
>50	51(20.6)
Gender	
Male	141(57.1)
Female	106(42.9)
Addiction	
Present	51(20.6)
Absent	196(79.4)
Type of Addiction(n=51)	
Smoking	10(19.6)
Alcoholism	50(98.0)
Substance abuse	5(9.8)
Comorbidity	
Present	122(49.4)
Absent	125(50.6)

Type of comorbidity(n=122)	
Bronchial Asthma	11(9.0)
COPD	5(4.1)
Diabetes Mellitus	23(18.9)
Hypertension	32(26.2)
Dyslipidemia	7(5.7)
CVD	11(9.0)
CKD	1(0.8)
Seizure disorder	8(6.6)
Hypothyroidism	19(15.6)
Psychiatric/psychological disorder	64(52.5)

Trend of poisoning

The incidence of poisoning appeared to be higher during the months of April/May/October (10.9% each) followed by September/November/December (9.3% each). About 18.2% of the cases with history of poisoning reported with history and symptoms of poisoning on Sundays followed by Wednesday (15.8%).Suicidal cases constituting nearly one fourth (20%) of the total cases reported on Wednesday followed by Tuesday (16.7%).No cases of suspected/ confirmed homicide were reported to this hospital during this period.

Pattern and manner of poisoning

All the cases were admitted with history of either ingestion of poison (70.8 %) or following bites by creatures (29.2%). Cases of poisoning by other routes were not observed in the present study.

Age Groups: The highest incidence of poisoning occurred in the 20-40 age group, among both genders.

Gender Distribution: A higher frequency of poisoning incidents among males was noted in certain categories, particularly among those with access to organophosphorus, rat poison and neurotoxic agents and among females in incidents related to drugs and cleaning agents like Harpic/Dettol.

Types of Poisons: Drug poisoning was prevalent among all age groups. Organophosphorus compounds and rat poison were more common in males(20-40 years).Ingestion of hydrocarbon, especially kerosene was more common among children(<20 years) in both genders. Accidental ingestion of sanitizer was observed in children especially male toddlers during the Covid period.

Manner of poisoning: Only accidental and suicidal poisoning cases were observed. There were substantial number of accidental poisonings, particularly in males (20-40 years) and females (40-60 years). Suicidal attempts were common in both genders (20-40 age range).

Table No.3: Distribution of study subjects based on pattern and manner of poisoning(n=247)

Age(years)	Male				Female			
	<20	20-40	40-60	>60	<20	20-40	40-60	>60
Type of poison								
Organophosphorus	0	6	5	1	0	2	1	0
Rat poison	0	13	1	0	3	5	0	0
Pyrethroid	0	0	1	4	2	1	0	0
Carbamate	3	4	7	1	2	1	1	0
Organochlorine	0	1	0	0	0	1	0	0
Paraquat	0	0	1	0	0	1	0	0
Hydrocarbon	4	2	1	1	3	0	0	0
Sanitizer	2	0	0	0	0	1	0	0
Enamel thinner	0	1	1	0	1	0	0	0
Mosquito repellant	2	0	0	0	0	0	0	0
Dettol	0	0	0	0	0	1	0	1
Harpic	0	0	0	0	1	2	0	0

Continue.....

Drugs	5	19	8	2	9	22	6	3
Formic acid	0	2	0	0	0	3	1	0
Neurotoxic snake	3	0	0	0	0	1	3	0
Hemotoxic	0	2	1	1	0	1	2	1
Non-venomous	0	4	4	2	1	1	2	1
Unknown bite	3	6	2	1	2	3	7	2
Stings	2	3	4	3	1	0	0	2
Naphthalene	0	1	0	1	0	0	0	0
KMnO4	0	0	0	0	1	0	0	0
H2O2	0	0	0	0	0	1	0	0
Manner								
Accidental	18	19	12	9	12	7	13	7
Suicidal	6	45	24	8	14	40	10	3

Overview of Drug Poisonings

Age and Gender Distribution

Males: The 20-40 age group showed significant misuse/abuse of analgesics (50%) and antipsychotics (75%). No incidents of poisoning with antiepileptics/ antidepressants were noticed in the younger(<20) age groups. Occurrences of multidrug poisonings(20-40 age group) (63.6%) were also observed.

Females: Similar patterns of abuse/misuse with analgesics were also prominently found (66.7%) in the <20 age group. Abuse of antidepressants showed higher incidence in the 20-40 age group. Poisoning with eltroxin was more prevalent in the 20-40 age group (71.4%). Those in the younger age group (<20years) showed minimal exposure with cases reporting consequent to excessive intake of analgesics in 4 cases and homeopathic medication in 1 case only.

Types of Drugs involved: Antiepileptics misuse was minimum. Significant over consumption of analgesics was noticed in both genders(20-40 age group). Eltroxin poisoning was more prevalent in the females(20-40 age group). Antidepressant misuse/ Multi drug poisoning showed a worrying trend(20-40 age range) among both genders. Antipsychotic misuse was more prevalent (20-40 age group) in males. The combination of multidrugs involved mainly psychiatric medication along with analgesics/ antibiotics/ antihistamines/antihy pertensives. Incidence of ingestion of Homeopathic medicines/ oral hypoglycemic agents/bronchodilators though negligible was present.

Table no. 4: Incidence of drug poisonings among various age groups

Drugs	**Male**				**Female**			
	<20	**20-40**	**40-60**	**>60**	**<20**	**20-40**	**40-60**	**>60**
Antiepileptics	0	1	0	1	0	0	2	0
Analgesics	4	5	1	0	4	2	0	0
Antidepressants	0	3	1	1	0	5	1	0
Eltroxin	0	0	0	0	1	5	0	1
Antipsychotics	0	3	1	0	2	2	0	0
OHA	0	0	1	0	0	0	0	0
Multidrug	0	7	4	0	1	6	1	2
Homeopathic	1	0	0	0	0	0	0	0
Antihypertensive	0	0	0	0	0	1	2	0
Bronchodilator	0	0	0	0	1	0	0	0
Calamine lotion	0	0	0	0	0	1	0	0

Clinical features of poisoning

Symptoms of poisoning(n=247)

Almost three fourth 184(74.5%) of the study subjects presented with symptoms.

1. **Common Symptoms Across Poison Types:** Nausea/vomiting were the most common symptoms across different poison types, particularly so with those who had ingested organophosphates/rat poison/pyrethroid/ organochlorine and certain drugs. Headache/ abdominal pain were also noticed to occur with moderate frequency, particularly in those who had taken organophosphates/rat poison/paraquat.
2. **Specific Poison-Related Symptoms**: Organophosphorus poisoning presented predominantly with neurological/ gastrointestinal symptoms. Symptoms like headache/ nausea/vomiting/abdominal pain/difficulty breathing were found to be predominantly prevalent among those who partook carbamates and organochlorines. Those brought with history of consumption of rat poison revealed symptoms of tiredness/headache/nausea/vomiting/ difficulty breathing. Pyrethroid poisoning was associated with headache and nausea but had a lower overall severity in symptoms compared to those who had ingested organophosphorus compounds. Patients who ingested Paraquat presented with severe respiratory distress along with burning sensation in the stomach/ abdominal pain. Intake of Hydrocarbons mainly caused headache/cough/difficulty breathing demonstrating heightened potential for developing aspiration pneumonia. Tiredness/dizziness/burning sensation in throat were common in those brought with sanitizer intake. Patients admitted with Dettol/Harpic poisoning showed relatively lower severity in symptoms, though they often manifested nausea/vomiting/occasionally difficulty in breathing. Tiredness/headache,/nausea/ vomiting were the common symptoms associated with various types of drug intake. Ingestion of Formic acid showed significant gastrointestinal involvement, particularly abdominal pain/vomiting and occasionally hemoptysis. Neurotoxic and hemotoxic snake bites showed a distinct pattern with localized pain and swelling at the site of bite along with systemic manifestations like numbness/confusion/drowsiness/ loss of consciousness in neurotoxic snake bites. Cases with history of bites or stings by unknown creatures presented with localized symptoms like itching/pain at the bite site/swelling/discoloration, along with occasional systemic effects like blurred vision/shivering/difficulty breathing and a few manifested with anaphylaxis showing periorbital edema/rashes over the body.

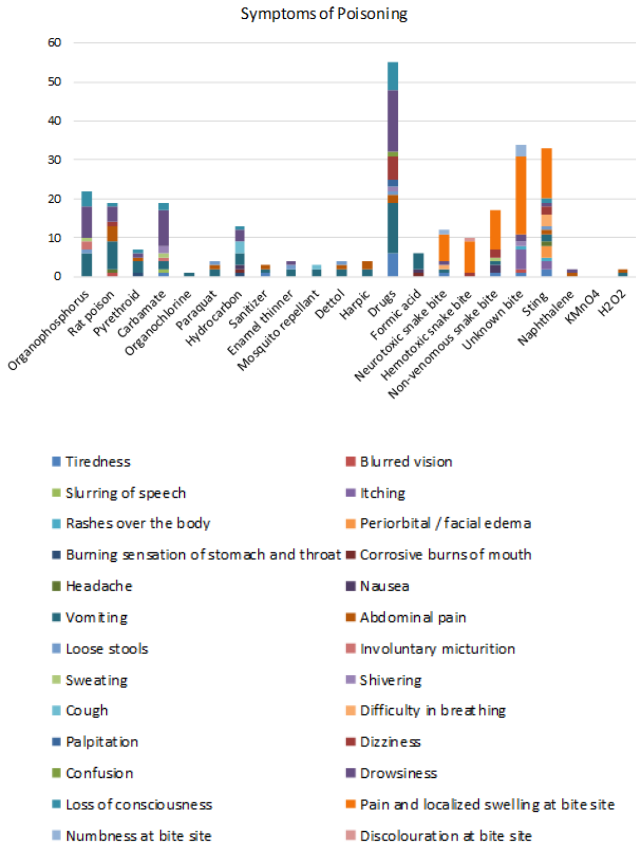

Figure No.1 Symptoms of poisoning(n=247)

Signs of poisoning

About 158(63.6%) of the study subjects presented with history, symptoms and signs of poisoning on the day of admission and among them, almost half of them presented with hypertension along with tachycardia(37.3%).

Specific poison related signs

Organophosphorus poisoning cases presented with altered sensorium/bradycardia/tachycardia/

tachypnoea/fasciculations/ptosis. The most common signs in rat poisoning were altered sensorium/tachycardia/ptosis. Patients with Pyrethroid poisoning showed altered sensorium/ tachycardia/mild bradycardia. Those brought with history of Carbamate poisoning manifested with altered sensorium/tachycardia/fasciculations. Organochlorine poisoning caused tachycardia/ ptosis/fasciculations. Tachycardia/tachypnoea and signs of lung involvement were prevalent in Paraquat Poisoning. Patients who presented with history of Hydrocarbon poisoning showed tachycardia/ fasciculations. Sanitizer/Dettol/Harpic/Enamel Thinner poisoning cases presented with tachycardia. Mosquito repellant poisoning caused Tachycardia/ fasciculations/ crepitations. Those with drug overdose presented with tachycardia frequently. Formic Acid poisoning cases also revealed tachycardia and hypotension. Those who suffered Neurotoxic snake bites presented with tachycardia/ ptosis while those with Hemotoxic snake bites presented with tachycardia/hypertension/elevated BT/CT. Those who presented with Non-venomous/ unknown bites showed tachycardia predominantly. Chemical exposures (KMnO4/H2O2/Naphthalene) showed limited systemic signs.

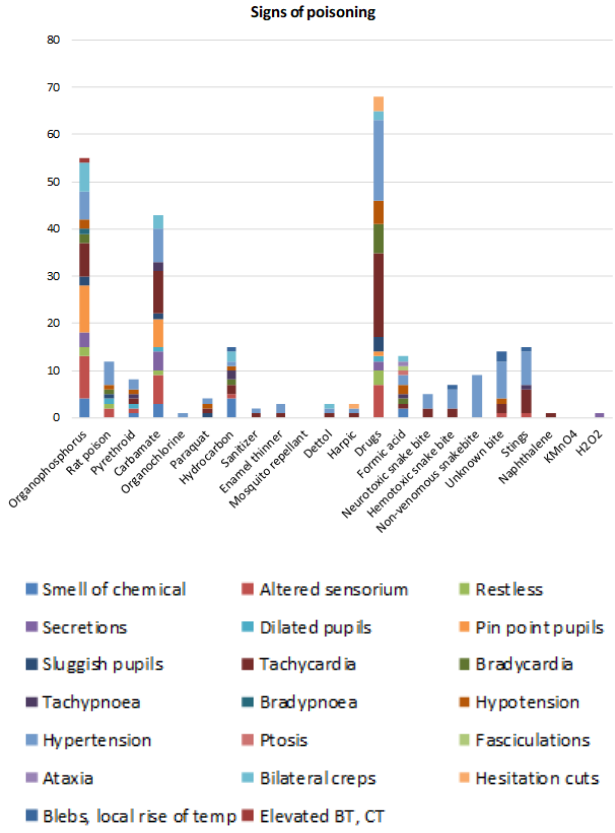

Figure No.2 Signs of poisoning(n=247)

Factors precipitating poisoning

On assessment of factors precipitating poisoning among suicidal cases, more than half (55.3%) of them were disinclined to reveal the specific triggering factor probably due to fear of the family or near ones being stigmatised. Family problems were reported as the precipitating factor by 16.7%.(Table No.5).

Table No.5: Factors precipitating poisoning(n=150)

Factors	Frequency(%)
Interpersonal stressors	7(4.7)
Problems in family	25(16.7)
Failure in love	6(4.0)
Disturbed marriage	23(15.3)
Financial crisis	6(4.0)
Not known	83(55.3)

Outcome of poisoning

A significant proportion of the patients (109 patients,44.1%) fully recovered from the effects of poisoning after treatment. However, a small but notable percentage of patients (8,3.2%) succumbed to the deleterious effects of the poison, particularly those treated following ingestion of organophosphates/ carbamates/paraquat/formic acid/hydrocarbon.13 patients (5.3%) were discharged at request, before complete recovery as they wanted to continue treatment elsewhere.

Table No. 6: Outcome of poisoning

Outcome	Frequency(%)
Recovered	109(44.1)
Improved	117(47.4)
Death	8(3.2)
Discharged at request	13(5.3)

Duration of Hospital Stay and the need for ventilatory support

Mean Duration in Ward and ICU

Patients brought with history and clinical features of poisoning with Organophosphates/ Carbamate/rat poison/pyrethroid/ hydrocarbon/ cleaning agents/drug ingestion/formic acid required an average stay of more than 2 days in the hospital.

The highest mean duration of ICU stay was seen in Organophosphate poisoning followed by ingestion of formic acid and carbamate.

Ventilatory Support

Mean ventilatory support of more than 2 days were required for organophosphate and paraquat poisoning. Carbamate poisoning required mean ventilatory support for more than 1.5 days.

Table No. 7: Mean duration of hospital stay and the need for ventilatory support

Type of poison	Mean duration in ward	Mean duration in ICU	Ventilatory support (Days)
Organophosphorus	2.47±1.68	5.53±4.64	2.53±4.27
Rat poison	2.73±1.91	1.82±0.50	-
Pyrethroid	2.13±1.25	2.13±2.10	-
Carbamate	3.26±3.29	4.32±4.39	1.63±2.98
Organochlorine	1.50±0.71	0.50±0.71	-
Paraquat	1.00±1.41	3.50±2.12	2.50±3.54
Hydrocarbon	3.18±3.82	2.73±3.32	0.18±0.60
Sanitizer	0.67±0.58	1.33±0.58	-
Enamel thinner	1.33±0.58	1.33±0.58	-
Mosquito repellant	2.00±0.0	1.00±1.41	-
Dettol	2.50±2.12	0.50±0.71	-
Harpic	3.00±3.46	2.33±1.53	-
Drugs	2.38±2.06	1.47±1.10	0.14±0.83
Formic acid	2.17±1.33	4.67±2.66	-
Neurotoxic	1.57±1.33	1.57±1.51	0.71±1.89
Hemotoxic	1.25±1.03	1.63±0.52	-
Non-venomous bite	1.53±0.99	1.07±0.59	-
Unknown bite	1.92±0.79	1.27±1.34	-
Sting bite	2.67±1.72	1.53±1.88	-
Naphthylamine	1.00±0.0	1.00±0.0	-
KMnO4	1.00±0.0	1.00±0.0	-
H2O2	1.00±0.0	2.00±0.0	-

Complications developed in various types of poison

Organophosphorus poisoning resulted in complications in 33.3% of patients, that included aspiration pneumonia and intermediate syndrome. In those who had consumed rat poisons, 13.6% of patients experienced liver dysfunction. Aspiration pneumonia was the primary complication noted in both pyrethroid and carbamate poisoning. Paraquat poisoning led to complications such as alveolitis/liver dysfunction/multi-organ dysfunction syndrome. Kerosene ingestion/mosquito repellent exposure resulted in chemical pneumonitis, while turpentine

ingestion was associated with acute kidney injury. Formic acid ingestion caused complications in 50% of individuals, which included acute kidney injury/ liver dysfunction/metabolic acidosis/hyperkalemia. Neurotoxic bites were complicated by necrotizing fasciitis/gangrene/acute kidney injury with hypoxic ischemic encephalopathy observed in one patient. Hemotoxic bites led to cellulitis, while wasp stings resulted in rhabdomyolysis. An insect bite reaction resulted in bronchiolitis in one individual.

Discussion

This study presents a comprehensive analysis of poisoning cases admitted to a tertiary care centre in a rural border district of South Kerala over the past decade.

Demographics and Patterns of Poisoning

The predominance of poisoning cases among males (57.1%) and individuals aged 25-50 years (46.2%) aligns with existing literature. The elevated incidence of suicidal poisoning attempts, accounting for 20% of cases, underscores a pressing mental health crisis prevailing in this demographic segment. This raises concern and suggests that societal factors, such as relationship stressors and economic hardships may contribute to high rates of suicidal behaviour.

The study also revealed a significant association between substance addiction and poisoning incidents. This emphasizes the interconnection between substance use disorders and the propensity for poisoning, often linked to impulsive behaviour in stressful situations.[4,6]

Types of Poisoning

Drug-related poisoning was identified as the most common among all categories, particularly involving analgesics and antipsychotics. The higher incidence of drug poisoning among the 20-40 age group points to pharmaceutical agent misuse, especially as this demographic segment also reported a considerable number of multidrug poisonings. This signifies the importance of regulating pharmaceutical misuse/the necessity for the implementation of stricter regulations surrounding the prescription and availability of certain medications, alongside enhanced public education on safe usage and identification of factors triggering their misuse.

Organophosphates emerged as a notable contributor to poisoning incidents, particularly among males. The widespread use of these agrochemicals in rural regions underscores the need for better education on their safe handling and storage, with alongside efforts to reduce accessibility and misuse.[5]

Trends in Incidence

The analysis revealed seasonal peaks in poisoning cases during specific months, particularly April, May, October (pre-monsoon period). This suggests that environmental or societal factors, such as setbacks in agricultural activities/economic crises during festive periods, may influence the seasonal rise in poisoning incidents.[7]

Precipitating Factors

The assessment of precipitating factors for suicidal poisoning cases indicated that a significant proportion (55.3%) were disinclined to reveal the real triggering cause, possibly out of fear of stigmatization of family or loved ones, while interpersonal and family problems were noted in a smaller fraction of cases. This highlights the complexities involved in identifying the real cause of suicidal behaviour and the multifaceted nature of factors leading to poisoning incidents. Enhancing mental health support systems and community mental health outreach programs could help address underlying issues and reduce the incidence of suicidal behaviour.[4]

Clinical Presentation and Outcomes

Clinical symptoms varied depending on the poison type, with nausea/vomiting being the most prevalent across cases. Organophosphate poisoning frequently led to neurological sequelae, illustrating the serious implications of exposure to these toxic agents. Respiratory distress was notably high in cases involving paraquat and hydrocarbons, indicating the need for timely and effective management strategies in emergency settings.

In terms of outcomes, nearly half of the patients(44.1%) admitted fully recovered, while a small percentage (7.9%) succumbed to poisoning, particularly in cases involving highly toxic substances like organophosphates and paraquat. This underscores the critical nature of poisoning by these

substances and the need for specialized immediate medical interventions, along with the importance of early recognition of poisoning symptoms in improving patient outcomes.

The average duration of hospital stay for patients varied depending on the severity of poisoning, with mild cases typically requiring 1-3 days, while more severe cases, particularly those involving organophosphate and paraquat poisoning, necessitated prolonged hospitalization of 5-10 days.[8,9]

Complications Developed

Complications related to poisoning were observed in several patients, with respiratory failure, acute renal injury and neurological deficits being the most common. These complications highlight the importance of follow-up care and rehabilitation for affected individuals and the necessity of implementing community mental health programs to mitigate long-term health issues.[10,11,12]

Conclusion and Recommendations

This study highlights the multifactorial nature of poisoning cases in South Kerala, with distinct demographic patterns, prevalent substance use issues and significant clinical implications. It calls for comprehensive public health strategies, including enhanced mental health support/stricter regulations on toxic substances and targeted educational campaigns about safe medication use and the risks associated with careless handling of agricultural chemicals. By addressing these factors, it may be possible to reduce the burden of poisoning and improve overall community health outcomes.

Limitations of this study

The population represented is restricted to a rural area bordering Kerala and Tamil Nadu. Cases of poisoning of profound severity usually seek to get treatment from very high tech tertiary care centres or government medical colleges which is a peculiar treatment seeking behaviour to this part of the state. Even if fulminant cases report for treatment initially, they seek referral probably due to other social pressures. Financial constraints of the less privileged was also cited as a reason for seeking referral to other centres.

Ethical Clearance: Dr. Somervell memorial CSI medical college, Karakonam, Thiruvananthapuram (Re-Reg.No. ECR/178/Inst/KE/2013/RR-20) Date -27.02.2024 No. SMCSIMCH/EC(PHARM)01/01/18

Conflicts of interest statement: nil

Funding Sources: nil

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