International Journal of Medical Toxicology & Legal Medicine Volume 27, No. 3, 2024
e-ISSN: 0974-4614
p-ISSN: 0972-0448

"Analysis of patients of poisoning in a tertiary care teaching hospital in Assam: A retrospective study"

Madan Chandra Das[1], Rupsmita Buzarbaruah[2], Bhaskar Jyoti Dutta[3], Senjam Renuka Singh[4], Swopna Phukan[5], Diptimayee Devi[6], Subhajit Mitra[7]

[1]Department of Pharmacology, Gauhati Medical College & Hospital, Guwahati-32, affiliated to Srimanta Sankaradeva University of Health Sciences, Assam,India, Email: drmadan93@rediffmail.com
[2]Department of Sanskrit, Nalbari College,Nalbari,affiliated to Gauhati University,Guwahati-14,Assam,India, Email:rupsmitabuzarbaruah335@gmail.com
[3]Department of Pharmacology, Gauhati Medical College & Hospital,Guwahati-32, affiliated to Srimanta Sankaradeva University of Health Sciences, Assam,India, Email:dbhaskarjyoti@gmail.com
[4]Department of Pharmacology, Tinsukia Medical College & Hospital, Makum, Tinsukia-46, affiliated to Srimanta Sankaradeva University of Health Sciences, Assam,India, Email:renuka.senjam@gmail.com
[5]Department of Pharmacology, Gauhati Medical College & Hospital, Guwahati-32,affiliated to Srimanta Sankaradeva University of Health Sciences, Assam,India, Email:swapnaphukan@gmail.com
[6]Department of Pharmacology, Gauhati Medical College & Hospital, Gauhati-32, affiliated to Srimanta Sankaradeva University of Health Sciences, Assam,India, Email:drdiptimayeedevi1965@gmail.com
[7]Department of Medicine, Gauhati Medical College & Hospital,Guwahati-32,affiliated to Srimanta Sankaradeva University of Health Sciences, Assam,India, Email:subhajitrocks@gmail.com

Received: 14.08.2024 Revised: 10.09.2024 Accepted: 07.10.2024

ABSTRACT

Introduction: Acute poisoning is a national health reverence linked to legal issue across the globe. Distinct geographical places have distinct toxic substances as per socio-economic standard associated with psycho-social status, as well as variable wholesomeness and death rates.

Aim: To evaluate the mode and pattern of poisoning treated in a tertiary level medical hospital in north east India.

Methods: Following ethical approval, data of 591 acutepoisoning case records gathered within 24 months were sourced from the medical record department and analyzed. Except ethanol intoxication and snake bite cases, all cases of poisoning were included.

Results: Female group accounted corrosive poisoning at a higher (64.97%) rate (χ^2 = 48.979, df = 19, p-value=.000). Greatest number (63.28%) accounted in the age group of 15-30 (ANOVA, p=0.000<0.05). Month of September had a higher rate (13.62%). Pesticideand sedatives accounted for the majority in young female (45.34%). Familial disharmony and marital discord were most leading factors followed by depression (χ^2 =272.220, p =0.000). Approximately 578 individuals were reverted; 13 passed away. Poisoning with organophosphate (OP) proved highly fatal.

Discussion: Poisoning is a medico-legal emergency. Public awareness regarding fatality of toxic substances and prompt care of poisoning is crucial. Strict proven protocol on uses of toxic chemicals might reduce the mortality.

Keywords: Anxiety, organophosphate, poisoning, sedative, toxic chemicals.

1.INTRODUCTION

Poisoning is a potentially lethal medical emergency. Accidental or suicidalacute poisoning remains a significant global public health and emergent medico-legal concern, associated with morbidity as well as mortality in developing countries. [1] Any substance that poses a risk to an individual's life by consumption, inhalation, or contact is considered a poison. Poison means 'a medical poisonous drinking'. [2]It is also termed as Garala and Halahala in rural places of India. [3]Poison can be classified as pesticides, household chemicals, industrial chemicals, organic solvents, drugs of abuse, which are found prevalent specially in developing countries. [4]As incident of poisoning affects the demographic and socio-economic development of a country, World Health Organization statistics estimate that intentional poisoning claimed the lives of more than 15 million globally in 2016. Of those, 90% died in low- and middle-socioeconomic countries, accounting for 6.3 millionof healthy life lost annually.[5],[6] Death caused by poisoning rose by 17% in 2020, accounting for eight times morethan

recorded in 1999.[7][8][9] Depending on the accessibility of toxic substances and chemicals, different geographical places have distinct toxin types and related rates of illness and even death after consuming. In Asian nations like Malaysia, Indians are also more likely than any other race to become witnessed by poisoning or die from it as the majority of Indian farmers are exposed to, who use pesticides, herbicides and other agrochemicals. [10]As agood number of poisoning cases accounted in a tertiary level hospital revealsiceberg leading factor of suicidal intention,yet studies that go deeper into the acute poisoning happenings have not been found in depth in North-Eastern states of India.To implement the proper planning, preventive, and management protocols, it is critical to understand thepattern, severity, and treatment outcome ofcommitted patients of poisoning.
The study aims to analyze the kinds and mode of poisoning, vulnerable group, incidence, socioeconomic status, demographic factors, outcome of poisoning treatedin a tertiary level teaching hospital.

2.Methods

2.1 Retrospective observational study

Data of acute poisoning cases gathered in a period of two years (1stApril 2021 to 31stMarch 2023) were sourced retrospectively from hospital-based medical record following approval of the concerned Institutional Ethics Committee (No MC/190/2007/Pt-II/April-2023/4 dated May 24'2023). A total of 591 diagnosed case of poisoning were identified.

2.2 Inclusion Criteria

Poisoning of organophosphate (OP) compound, drug overdose,various common household chemicals, and other agrochemicals were accounted.

2.3 Exclusion Criteria

Patients record with snake bite, insect bite, food poisoning,ethanol and cannabis intoxication were excluded.

2.4 Data Collection

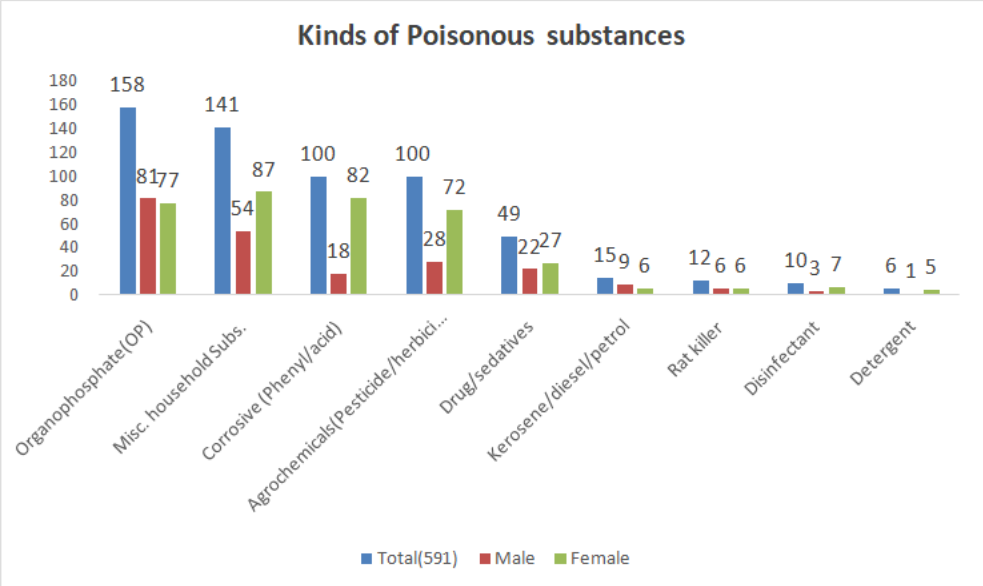
Data of age, sex, occupation, time and pattern of poisoning, kinds of toxic agent, length of hospital stay and outcome were compiled in tabulated form.

2.5 Statistical analysis

Chi- square, ANOVA, descriptive statistics, including percentages, and means, association were employed to summarize the data.

3.RESULTS

Among 591 poisoning cases the most frequent kind of poisoning was OP poisoning (n=158, 26.73%), followed by common miscellaneoushousehold chemicals(n=141, 23.85%). Corrosives (n=82, 13.87%), pesticides or herbicides (n=72, 12.18%) and sedative drug (n=27, 4.5%) were the most prevalent kinds of substance used by female, while OP poisoning (n=81, 13.70%), kerosene and diesel (n=9, 1.5%) were the most common in male [Figure 1: Kinds of poisonous substances]



Female showed the higher number 388 (65.66%) while male manifested 203 (34.34%). Ratio of male and female in young age (15-30) group revealed 5:11 [Table 1]

Table 1: Age group distribution (15yr interval) and One-way ANOVA

Age Group In year	**Male**		**Female**		**Total**	
	Number of cases	**(%)**	**Number of cases**	**(%)**	**Number**	**(%)**
Below 15	12	2.0	37	6.3	49	8.3
>15-30	110	18.6	245	41.5	355	60.1
>30-45	40	6.8	66	11.2	106	17.9
>45-60	34	5.8	28	4.7	62	10.5
>60-75	5	0.8	8	1.4	13	2.2
Above 75	2	0.3	4	0.7	6	1.0
Total	203	34.3	388	65.8	591	100
ANOVA-One Way (Analysis of variance)						
	Sum of Squares	Degree of freedom	Mean Square	F	Sig.	
Between Groups	6720.104	3	2240.035	12.044	.000	Significant
Within Groups	109177.595	587	185.992			
Total	115897.699	590				

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Table 1: Majority of poisoning reveals in the age group of (15-30). Except group of (45-60) female dominance is noted in all groups. Overall, ratio of Male: Female is 1:2. One-way ANOVA (p-value= .000<0.05).

In this study, September had the higher rate while lowest in February [Table 2].

Table 2: Month wise and rural-urban distribution

Month	**2021 (n=268)**	**Expired 5**	**2022 (n=262)**	**Expired 7**	**2023 (n= 61)**	**Expired 1**
January			22(3.72%)	1	26(4.39 %)	
February			11(1.86%)	1	16(2.70 %)	
March			33(5.58%)	1	19(3.21 %)	1
April	17(2.87%)		25(4.23%)			
May	11(1.86%)		25(4.20%)			
June	23(3.89%)		25(4.23%)	1		
July	35(5.92%)	1	24(4.06%)	1		
August	43(7.27%)	1	28(4.90%)			
September	**51(8.62%)**		**41(6.93%)**	**2**		
October	37(6.26%)	1	41(6.93%)			
November	31(5.24%)	1	10(1.69)			
December	19(3.21%)	1	15(2.53%)			
Session and Rural urban wise						
Session	2021-2022 Total (%)		2022-2023 Total (%)	Rural		Urban
April-March	328(55.49%)		253(44.50%)	465(78.68%)		126(28.31%)

Table 2: Out of 591 patients 157 poisoning (26.56%) occurred in August and September in both sessions. In April-March, there have been a significant number of incidents in the session 2021-2022 (55.49%).

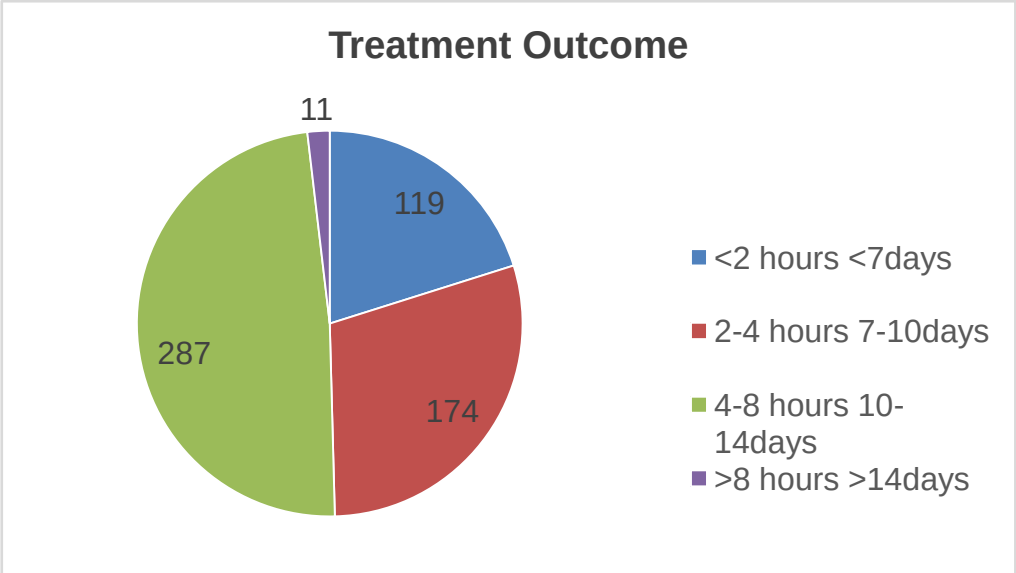
In the investigation towards occurrence, the most incident of poisoning found in housewives (n=260, 44%) followed by student group (n=174, 29.4%), skilled worker and farmer. Majority of poisoning were due to suicidal intention (97.29%). The most common leading factors were familial disputes (n=356, 60.23%) followed by marital discord (n=158, 26.73%) and failure in academic upgrade (n=52, 8.79%) [Table 3]

Table 3: Occupation and factor leading to poisoning

Occupation	**Total**	**Factors**	**Total**	**%**
Housewife	260(43.99%)	Family matter	356	60.21
Student	174(29.44%)	Love/marital discord	158	26.73
Skilled labour	46(7.78%)	Failure in Exam	52	8.79
Farmer	45(7.61%)	Accidental	14	2.30
Business	28(4.73%)	Depression	8	1.35
Elderly	14(2.36%)	Homicidal	2	0.3
Service holder	11(1.86%)	Financial	1	0.16
Driver	7(1.18%)			
Daily wage worker	6(1.01%)			
Chi-square test between occupation and factors				
	Value	Degrees of freedom	p-value	
Pearson Chi-Square	322.113	56	.000	Significant
Likelihood Ratio	306.626	56	.000	Significant
N of Valid Cases	591			

Table 3: Housewives shown higher associating familial disharmony. Chi-Square test between occupation and the factors of poisoning resulted p-value of 0.000

On account of outcome as in treatment of poisoning, 89% underwent Gastric lavage, followed by an antidote and other prophylactic support. Around 578 patients (97.8%) were uneventfully discharged, while 13 patients (2.19%) expired in ICU(intensive care unit). Around 119 patients revealed hospital stay less than a week whereas 11 were required treatment beyond two weeks. Majority of poisoning cases were hospitalized for 10-14 days [Figure 2: Outcome]



4.DISCUSSION

In the study, Organophosphate (OP) poisoning is most common followed by miscellaneous household chemical substances.Study done in north and south India showed higher rate of poisoning of pharmaceutical product and OP compound (88.97%) respectively.[11],[14]Poisoning with corrosives had accounted for 10.4% while Agrochemicals for 44.4% cases. [12],[13] The variation in the poisoning observed across the country might be caused by variations in substance accessibility. Drug overdoselike benzodiazepine and other sedatives are

mostly occurred as it is mostly prescribed in anxiety and sleep disorders as well as accessible in the periphery pharmacies . [15]

According to this study, adolescents and young adults were most likely to commit poisoning, around 245 (41.45%)were in 15–30 age range, with a ratio between male and female is 5:11,while overall ratio of male and female among all groups is 1:2 . Other investigations done in south and north India also hadhighlightedthe young groups. [16], [17] In contrast to certain other research, men are higher than women (5:3) and (6.2:2) with overall fatality rates >8.3%.[18], [19],[20],[21]A study conducted by R Ravichandran et al. 2020 on paraquat poisoning revealed a very high mortality rate 72.7%.[22]This might be the cause of industrialization and urbanization, with a higher degree of modernized lifestyle, where a large amount of industrial products are exploited for domestic purpose. Changes in the local way of lifestyle and cultural norms may be the actual cause of the high rate of poisoning among men. In a research carried out in eastern India, 39.18% of acute poisoning in the age between 11 to 80 experienced by mode of suicidal attempt[23][24]while in south and north Indian region, majority of patients (68.7%) consumed the poisonous materials with the intention to self harm, while 31.3% accidentally victimized.[25][26] In this study yielded an overall mortality rate of 2.1%. It might be due to early transport for intervention, and other prompt preventive measures. Based on the record of psychiatric assessment it reveals that depression, high levels of stress, family conflicts, disharmony relationships,failure in academic exams, and inability to meet goals in professionas well as limited career optionswere linked to most suicidal intentions.

On account of outcome of poisoning, the cases those were attended earlier improved faster. Around 20% of patients brought to the emergency care within 2 hours revealed less hospital stay (< 7days) while 1.86% of patients had arrived at the hospital beyond 8 hours required more (> 14 days) as because of deterioration developed. Most of the cases of poisoning brought to the emergency centre in 4-8 hours of hospitalized for 10-14 days.This study enumerated that therapy does not always proceed within the optimal window of time (first Golden one hour of care) as timely treatment is crucialfor outcome of poisoning. This can be compared to other research in 2022 in South India region,in which5.13% expired among the patients who attended < 3 hours and 10.8% among who attended >12 hours.[27] However, there was no discernible difference in death rates between poisoning cases that received prompt emergency care and those that did not. The emergency first aid found considerable variations in the management and in the dosage schedule of multiple drugs i.e. atropine, antidote like PAM (Pyridine Aldoxime Methyl Chloride) and chelating agents charcoal etc. available at the referral hospital. It is challenging to make definitive conclusions on the importance of first care in cases of acute poisoning because this study is retrospective in nature. We believe that the definitive solution to the question of first aid's involvement at the primary healthcare level will come from prospective multi-centric investigations in the line of standard promptness criteria.

4.1:Limitations

As the study executed in a single centre tertiary medical care, lack of proper chemical and brand names of miscellaneous household chemicals and missing few blood parameters were the limitations of the research. All things considered, the current study has been able to provide a significant amount of new information about the occurrence, social circumstances and outcome of poisoning in treating hospital.

4.2:Generalizability

To generalize the result,rural nature and literacy rate of Assam in north east region is almost near similar toliteracy rate of the country, India; it perhaps gives a clue to further insights regarding the incidence, pattern and outcome in relevance to socio-economic, academic standard and psycho social context of the community.

5.CONCLUSIONS

Poisoningis alife-threatening emergency and invite medical jurisprudence. Among all cases organophosphate poisoning deteriorates the victim faster towards fatality. Survival was negatively impacted by the female and greater event-to-treatment delay at primary levels. The findings underscore the need for continued efforts in the prevention, public awareness, counselling specially in adolescents. There should be strict rule for accessibility of toxic materials for actual needs. It is obviously challenging to arrange a multi-centric field survey on a poison incident, evaluating far deeper iceberg factors and variables in this context, the reasons why treatment is delayed, and the degree of ignorance of proper application of herbicides, pesticides and other potentially toxic substances, but if it could be done in these hospital-based findings,or by utilization of artificial intelligence, they would shed light on preventive measures and a few issues that have not been introduced yet.

REFERENCES

1. Chaitanya Mittal, Surjit Singh, Praveen Kumar-M, Shoban Babu Varthya.Toxicoepidemiology of poisoning exhibited in Indian population from 2010 to 2020: a systematic review and meta-analysis.BMJ Open,2021, vol11, e 045182:1-9. doi:10.1136/bmjopen-2020-045182

2. 'An Etymological Dictionary of the English Language' by Rev. Walter W. Skeat:OxfordOxford at the Clarendon Press1778 , Amen corner; (p) 453
3. "A Sanskrit -English Dictionary" by Sir Monier-Williams,Oxford at the Clarendon Press, 1960: (p)348 and 1293
4. Toxicological chemistry and Biochemistry:Stanely E. Manahan; LEWIS PUBLISHERS A CRC Press Company Boca Raton London New York Washington, D.C.2003, (p)206-376,Chapter 10-18
5. WHO (2019) Preventing disease through healthy environments exposure to highly hazardous pesticides: A major public health concern.Department of Public Health, Environmental and Social Determinants of Health World Health Organization 20 Avenue Appia, 1211 Geneva 27, Switzerland
6. Spencer L James, Chris D Castle, Zachary V Dingels, Jack T Fox, Erin B Hamilton,Zichen Liu et al..:Estimating global injuries morbidity and mortality: methods and data used in the Global Burden of Disease 2017 study:Inj Prev. 2020 Oct;26(Supp 1):i125-i153. doi: 10.1136/injuryprev-2019-043531. Epub 2020 Aug 24.BMJ
7. WHO (2018). The public health impact of chemicals: Knowns and unknowns. Data addendum to 2016 data. Geneva, World Health Organization
8. WHO (2023) Preventive disease through healthy exposure to lead: a major public health concern:third edition:Department of Public Health, Environmental and Social Determinants of Health World Health Organization 20 Avenue Appia, 1211 Geneva 27, Switzerland
9. Nadeem Ullah Khan, Uzma Khan, Umerdad Khudadad , Asrar Ali, Ahmed Raheem, Shahan Waheed, Junaid Abdul Razzak:Trends in mortality related to unintentional poisoning in the South Asian region from 1990 to 2019: analysis of data from the Global Burden of Disease Study:BMJ Open 2023;13:e062744.http://dox. doi:10.1136/ bmjopen-2022-062744
10. R Rajasuriar R Awang, S B H Hashima, H R B H Rahmat:Profile of poisoning admissions in Malaysia. Hum Exp Toxicol, 2007,26(2): 73–81: DOI: 10.1177/0960327107071857
11. Michael Eddleston, Nick A Buckey, Peter Eyer, Andrew H Dawson. Management of acute organophosphorus pesticide poisoning. Lancet 2008: 371: 597-607, 2007. DOI: 10.1016/50140-6736(07) 61202-1
12. Rajesh Kumar, Nishat Ahmed Sheikh, Mohammad Abu Bashar, Abhimanyu Vasudeva, Adarsh Kumar, Abhishek Yadav, et al. Epidemio-toxicological profile of fatal poisoning cases autopsied at a tertiary care centre of North India. Journal of Family Medicine and Primary Care. 2023.Vol12(4):701-707 DOI: 10.4103/jfmpc.jfmpc_1974_22
13. ibid.
14. Gajalakshmi S Mani, Suma S Mathews, Punitha Victor, John V Peter, Bijesh Yadav, Rita RA Albert. 2022.Laryngeal Dysfunction in Acute Organophosphorus and Carbamate Poisoning.Indian Journal of Critical Care Medicine, Volume 26 Issue 2:166-173: DOI:10.5005/jp-journals-10071-24096
15. 15.Siddharth Sarkar, Gayatri Bhatia, Anju Dhawan Clinical Practice Guidelines for Assessment and Management of Patients with Substance Intoxication Presenting to the Emergency Department: Indian Journal of Psychiatry: Jan,2023, Vol65(2): p-196-211, DOI: 10.4103/indianjpsychiatry.indian.indianjpsychiatry_490_22
16. Anjali Sharma, Sukhpal Kaur.Sociodemographic Profile and Outcome of the Acute Poisoning Adult Patients Admitted to a Tertiary Care Hospital of Northern India.Journal of Postgraduate Medicine, Education andResearch,2024,01, v (58): doi.org/10.5005/jp-journals-10028-1598
17. 17.Eswaran Maheswari , Lydia Abraham , Chinju Susan Chacko, Ganesan Rajalekshmi Saraswathy , Aruna Chala Ramesh.Assessment of Pattern, Severity and Outcome of Poisoning in Emergency Care Unit. Journal of Applied Pharmaceutical Science,2016, Vol. 6 (12): 178-183, DOI: 10.7324/JAPS.2016.601225.
18. 18.Arulmurugan C., Sarfaraz Ahmed, Mohammad Gani.A retrospective study of paradigm and outcome of acute poisoning cases in a tertiary care teaching hospital in Southern India.International Journal of Research in Medical Sciences,2015,3(10):2654-2657:DOI:http://dx.doi.org/10.18203/2320-6012.ijrms20150808
19. 19.Amita Srivastava, Sharda Shah Peshin, Thomas Kaleekal and Suresh Kumar Gupta. An epidemiological study of poisoning cases reported to the National Poisons Information Centre, All India Institute of Medical Sciences, New Delhi.Human Experimental Toxicology. 2005,24:279– 85, doi:10.1 191/0960327105ht527oa
20. 20.K. N. Ramesha, Krishnamurthy B. H. Rao, Ganesh S. Kumar.Pattern and outcome of acute poisoning cases in a tertiary care hospital in Karnataka,India.Indian Journal of Critical Care Medicine**,**2009, vol13 issue 3:152-155, DOI**:** 10.4103/0972-5229.58541
21. Subash Vijaya Kumar,B Venkateswarlu,M Sasikala, G. Vijay Kumar.A study on poisoning cases in a tertiary care hospital, Journal of Natural Science,Biology and Medicine,2010, v1(1):35-39.DOI:10.4103/0976-9668.71671

22. J. Jesslin, R. Adepu and S. Churi: Assessment of Prevalence and Mortality Incidences Due to Poisoning in a South Indian Tertiary Care Teaching Hospital. Indian J Pharma Sci,2010, v 72(5):587-591. doi: 10.4103/0250-474X.78525
23. ibid.
24. Suparna Chattterjee, Verma Vivek Kumar, Hazra Abhijit, Pal Jyotirmoy:An observational study on acute poisoning in a tertiary care hospital in West Bengal, India,Perspective in Clinical Research,2020,v 11(2):75-80, doi:10.4103/picr.PICR_181_18
25. 25.R Ravichandran, Deepak Amalnath , Kusa K Shaha , BH Srinivas. Paraquat Poisoning: A Retrospective Study of 55 Patients from a Tertiary Care Center in Southern India. 2020.Indian Journal of Critical Care Medicine: Vol24(3)156-159DOI: 10.5005/jp-journals-10071-23369
26. 26.Ashok Kumar Pannu, Ashish Bhalla, Vitla Vamshi, Manish Kumar Upadhyay, Navneet Sharma, Susheel Kumar. Changing spectrum of acute poisoning in North India: A hospital-based descriptive study, Turk Journal of Emergency Medicine, 2022, v 22. (4):192-199: doi:10.4103/2452-2473.357627
27. 27.Narayanasamy Krishnasamy, Narmadhalakshmi R, Parameshwari Prahalad, Jayalakshmi R, Lokesh R, Jayanthi Ramesh etal.Determinants of Poison-related Mortality in Tertiary Care Hospital, South India: Indian Journal of Critical Care Medicine (2024) v.28(4): DOI:10.5005/jp-journals-10071-24668