



Pattern and Outcome of Acute Poisoning Cases at a Tertiary Care Hospital - A Retrospective Study

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Abstract

Background & Objectives

Acute Poisoning with various substances is a major public health problem worldwide and one of the leading causes of morbidity and mortality in India. A thorough evaluation of the risk factors and prompt treatment helps to reduce the incidence and mortality. Hence the present study was conducted to find out the pattern and outcome of poisoning cases admitted at a tertiary care hospital

Methods

A Retrospective Hospital Record-Based Study was conducted in a tertiary care hospital after seeking permission from Institutional Ethics Committee. Data from June to December 2021 was collected from case

sheets. Demographic details, type of poison, time of ingestion & duration of hospitalization were collected.

Results

A total of 162 cases with 97 males and 65 females were reported. 73% are between 15-35 years of age. Most poisoning cases reported were due to intake of Rodenticides (45%) followed by organophosphorus substances (36%), drug over doses (9%), others (10%). Majority (40%) of the cases had arrived to the hospital within one to four hours of exposure and duration of hospitalization was less than four days. 146 (90%) were recovered with prompt treatment and 6% mortality reported with organophosphorus and 4% with rodenticide compounds.

Conclusion

Rodenticide poisoning was most commonly reported acute poisoning at tertiary care hospital but highest mortality was observed with organophosphorous poisoning. Provision of timely and adequate treatment following preventive measures like free sale restriction of the poisons, public awareness programs and proper psychological counselling may reduce the incidence and mortality rate in poisoning cases.

Keywords

Acute Poisoning; drug overdose; Organophosphorus; Outcome; Pattern; Rodenticide

Introduction

Poison is a substance that causes damage or injury to the body and endangers one's life due to its exposure by means of ingestion, inhalation or contact¹. The percentage of mortality due to acute poisonings in the developed nations is 2%, while in a developing nation like India, it is as high as 30% with approximately fifty thousand Indians dying annually²⁻⁴. Poisoning can be caused by either intentional (suicidal) or inadvertent factors (accidental). Intentional poisonings include intentionally swallowing dangerous substances and overdosing of pharmaceuticals, whereas unintentional poisonings include accidental over-doses of medications or chemicals and snake bites.

In general, accidental poisoning is more common in children; whereas suicidal poisoning is more common in young adults.⁵ Worldwide intentional poisoning is one of the important causes for mortality and morbidity.⁶ According to the World Health Organization (WHO) nearly 200,000 people die worldwide from accidental poisoning and around

84% of them occur in low- and middle-income countries.⁷

In economically developed countries, toxicity is associated with common household chemical agents such as detergents, cleaning and cosmetic products, as well as over-the-counter drugs such as paracetamol whereas in developing countries such as India, the most common poisoning agents were found to be insecticides and pesticides due to the country's dependence on agriculture and farming.^{8,9} With improvements in the agricultural and industrial industries, a wide range of agricultural insecticides and pesticides have become available and have become a common household product, some of which can cause major toxicity when exposed and are often used for self-poisoning.

Acute pesticide poisoning is one of the most common causes of intentional deaths worldwide.¹⁰ Majority of pesticide exposure is seen more in middle- and low-income countries due to increased use of agrochemicals in agricultural sector.¹¹

Suicide rates varied from 8.1 to 58.3/100,000 population in different parts of India¹². In 2010, there were reports of incidence of 38.8% of suicide by pesticide ingestion in India¹³. Poisoning accounted for 6.3% of the 413,457 accidental deaths in 2015, as per data obtained from National Crime Bureau of India¹⁴. The knowledge on pattern of acute poisoning helps in identifying risk population, early diagnosis and timely intervention reducing morbidity and mortality. Hence this study was carried out to know the pattern and outcomes of acute poisoning.

Materials and Methods

This is a retrospective hospital record-based study conducted at a tertiary care teaching hospital after obtaining approval from hospital authorities and

Institutional Ethics Committee. The case records were collected from medical record section from June to December 2021. Patients of both sexes admitted with history of acute poisoning due to organophosphorous/Rodenticides/ drugs over dosage/, different types of floor cleaners/Nerium/ supervasmol, drug poisoning were included in the study. Patients below the age of 18 years, food poisoning, venoms, dog or other animal bites, incomplete data record are excluded from the study. Demographic details, data on type of poison, time of ingestion & hospitalization, duration of hospitalization were recorded.

Statistical Analysis

The data was entered in the Microsoft excel sheet. Descriptive statistics were used to analyze the data and the results were expressed as percentage.

Results

A total of 162 cases (97 males and 65 females) were reported. Table 1 shows sex wise and age wise distribution of cases and their mortality statistics. Maximum number of cases reported in 15-35 years (73%) followed by 21% of cases in 36-55 years age group. Mortality was more with males(11%)

and in 56-75yrs age group(20%)[Table 1].Most poisoning cases were due to intake of Rodenticides (45%) followed by organophosphorus substances(36%), drug overdoses (9%), different types of house cleaning agents (6%), Nerium (2.5%)and super vasmol (2%) poisoning [FIGURE-1]. Drug Poisoning cases were reported in 14 patients, out of whichparacetamol poisoning singly or in combination with other drugs was 7 patients followed by antidepressants in 4 patients and others being phenytoin, thyroxine and metronidazole one each [FIGURE-2]. Organophosphorus poisoning showed higher mortality of 16%[Table 1].

Table 2 shows the effect of time lapse in hospital arrival and mortality which was only 3% in those admitted within 1-4 hrs and 23% in patients admitted to hospital after 8 hrs of poison consumption. Data pertaining to duration of hospital stay in relation to type of poisoning was shown in Table-3. About 51% of them were discharged in 4days and 16% after 7 days. About 20-30% of cases from each poisoning were discharged after 7 days except rodenticide which was only 12%..

Sex Wise Distribution	Total cases (%)	Recovered Cases (%)	Expired Cases (%)
Males	97 (60%)	86 (89%)	11(11%)
Females	65 (40%)	60 (92%)	5 (8%)
Age wise distribution			
15-35 yrs	118 (73%)	110 (93%)	8 (7%)
36-55yrs	34 (21%)	28 (82%)	6 (18%)
56-75yrs	10 (6%)	8 (80%)	2 (20%)
Type of poisoning			
Rodenticide	73 (45%)	66 (90%)	7 (10%)
Organophosphorus	58 (36%)	49 (84%)	9 (16%)
Others	31(19%)	31 (100%)	0 (0%)

Table 1: Demographic details and type of poisoning

Figure 1: Type of Poisons Consumed By Patient

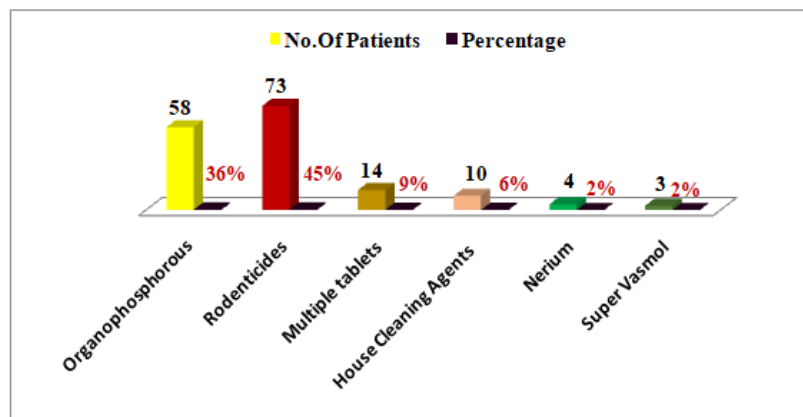


Figure 2: Various drugs used in poisoning

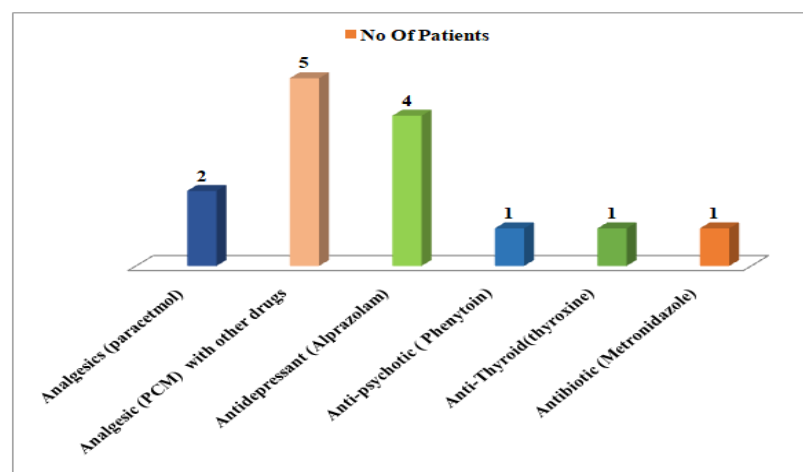


Figure 3: Type of Poisoning in relation to sex

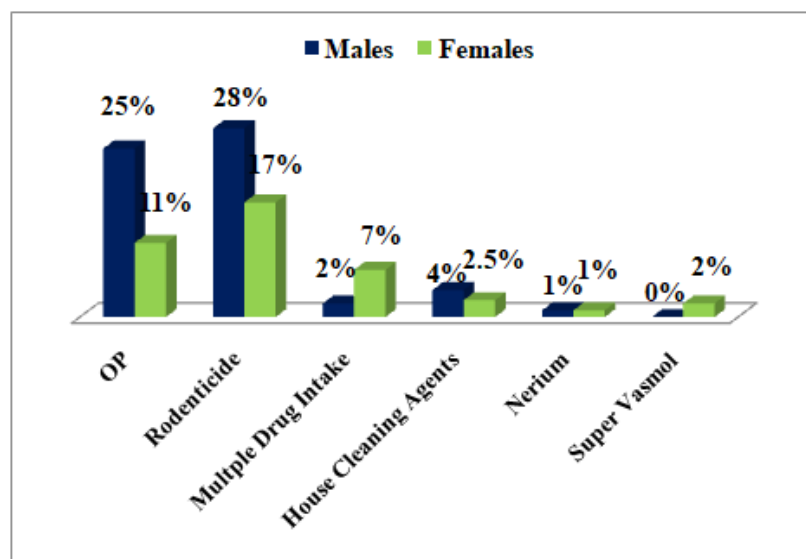


Table 2: Relationship between time lapse to hospital arrival and mortality with each type of poisoning in different sex

Time lapse in hospital Arrival	Expired Cases				Recovered cases				Total
	OP*	RP*	Others	Total	OP*	RP*	others	Total	
1-4 Hours	1(6.3%)	1(6.3%)	0	2(3%)	12(8%)	34(23%)	16(11%)	62(97%)	64(40%)
4-8 Hours	3(18.8%)	1(6.3%)	0	4(7%)	23(16%)	18(12%)	9(6%)	50(93%)	54(33%)
> 8hours	5(31.3%)	5(31.3%)	0	10(23%)	14(10%)	14(10%)	6(4%)	34(77%)	44(27%)
Total	9(56.3%)	7(43.7%)	0	16(10%)	49(34%)	66(45%)	31(21%)	146(90%)	162

*OP: Organophosphorus poisoning*RP: Rodenticide poisoning

Table 3: Duration of hospital stay in relation to type of poisoning.

Duration of Hospital Stay	OP	Rodenticide	Multiple Drug Intake	House Cleaning Agents	Nerium	Super Vasmol	Total
1-4 days	26(53%)	32(48%)	7(50%)	5(50%)	2(50%)	2(67%)	74(51%)
5-7 days	13(27%)	26(39%)	3(21%)	5(50%)	1(25%)	0	48(33%)
>7days	10(20%)	8(12%)	4(28%)	0	1(25%)	1(33%)	24(16%)
Total	49	66	14	10	4	3	146

Discussion

Poisoning is a major public health problem worldwide and one of the leading causes of morbidity and mortality. The WHO reports that pesticides are now the most common method of suicide worldwide.¹⁵

In this study, incidence of poisoning was more among younger age group of 15-35 years and there was a decrease in incidence with increasing age. In relation to age groups, the present study correlates with the study of Gupta, et al¹⁶ who reported maximum number of cases, 42.7% from 20-29yrs age group & Ramesh et al¹⁷ also reported highest incidence (61.4%) in 12-29yrs age group. The findings

of this study in relation to age group are also consistent with the studies of other workers^{18,19,20}. Suicide attempts among adults, particularly those between the age group of 21–30 years, could be due to lack of employment and family support, impulsive behaviors, stress due to job and family resulting in self-harm and fatal outcome. In contrast, another review²¹ revealed a high prevalence of death in 40–49 years of age, which can be attributed to their living conditions.

The findings of the present study revealed a higher incidence of poisoning in males than in females. The current study’s male preponderance is

similar to Sharma et al study¹⁸ which reported a similar incidence of poisoning among male subjects. A similar study conducted in a tertiary hospital in Karnataka state²², India and other studies^{23,24} also reported higher incidence of poisoning among males compared to females. Contradict to our result, Nepal²⁵ has shown M: F =1:2, Albania²⁶ as M: F =0.09:1 and in Turkey and Ethiopia^{27,28} M: F is about 1:1.47. The male preponderance could be due to their being more exposed to occupational hazards and stress or strain as compared with females.

In this study maximum poisoning were due to Rodenticides 73(45%) followed by Organophosphorus compounds (OPC) 58(36%). We found that yellow phosphorus was the most common type of rodenticide being used in our patients. This is in contrast to the type of poison used in Northern India, where metal phosphides are most prevalent.²⁹ Aluminum phosphide was the most common poisoning in north India accounting up to 67.8% of cases in Siwach et al³⁰ study from Haryana. Aluminum phosphide is the most common pesticide used in wheat cultivation, which is the most common staple grain in north India, but OPC is the most common pesticide used in rice fields in south India, where people rely on rice more than wheat^{31,32}.

In the present study, organophosphorous poisoning is the second most common types of poisoning. Organophosphorous pesticides are the most common cause of poisoning in agricultural workers and other unskilled workers^{33,34}. A study conducted in Pondicherry revealed a rapidly increasing trend in the incidence of OPC poisoning over a 3-year period.³⁵ Other studies also showed that OPC are the most commonly used poisoning substances.³⁶ A study conducted at the All India Institute for Medical

Sciences, New Delhi, showed that drugs (18%) and insecticides (12.80%) are the most common agents out of a total of 726 poisoning cases³⁷. This difference in the type of poisoning seen within the country may be due to the difference in the pattern of use and availability of pesticides.

Apart from pesticide poisoning, the other common type of poison in this study is drug overdose. Studies from across India have also shown Drug overdose to be one of the causes of suicidal deaths.^{38, 39} In our study, Drug overdose was significantly higher in women as compared with men. This is similar to Leena Anthony et al study⁴⁰. From the literature, we found that women tend to consume drugs frequently as compared with other poisonous compounds.⁴¹ However, the western data show that Drug overdose is common in men.⁴² Most of the Drug overdoses were managed symptomatically with supportive therapy. The probable reason could be that these drugs are easily available as over-the-counter medications in India. Paracetamol was common drug found to be involved in overdose in our study followed by antidepressant (Alprazolam), antipsychotic (Phenytoin), Antithyroid (Thyroxine), Antibiotic (Metronidazole). Sedatives and analgesics have been reported as the most common substances abused in Western countries, with mortality rates varying between 0.4% and 2.0%.^{43,44,45}

Self-poisoning was the common method of suicide and supports with other studies⁴⁶⁻⁴⁸. According to WHO, pesticide poisoning accounts for the most of the global suicides, and the majority of them occur in lower- and middle-income countries⁴⁹. Most of the patients in this study had consumed the poison later in the evening hours, which could be because people frequently meet in their homes after work hours to

discuss their problems and become frustrated, which can lead to taking drastic measures. This pattern of consumption has been shown in other study⁵⁰. It has been hypothesized that persons who are certain that they want to die choose a deadly substance and take it in the evenings when the rest of the family is sleeping.

In our study, 64 (40%) of total poisoning cases had reached the hospital early, within 4hrs and 54(33%) within 4-8hrs followed by 44(27%) more than 8hrs from time of consumption of poisoning. Majority of them were managed properly and were discharged from the hospital. Among the total deaths reported, 23% was of patients reached the hospital after 8hrs of consumption of poison. Time lapse has a significant effect on outcome of poisoning because the patients, who received first aid at small peripheral hospitals, were referred by a doctor after development of complications, which could not be managed at the peripheral centers and a lot of time could have lapsed during the transport. The first aid given had considerable variation on gastrointestinal lavage, dosage schedule of various antidotes such as atropine, pralidoxime at the referral hospital.

In Our study, it is found that majority of poisoning cases 74(51%) were cured and discharged from the hospital within 4 days of admission, which are similar to Ramesh et al¹⁷ Study who found that duration of hospital stay was 4 days. This current study finding in relation to duration of hospital stay is also similar to other studies^{51,52} The duration of hospital stay depends upon the severity of poisoning and the treatment administered.

As per mortality rate, this study showed mortality rate of 16(10%) among total reported poisoning cases. This correlated with Kumar et al,⁵³

study which reported a mortality rate of 8.3%. The findings of the present study are not consistent with the study of Banerjee et al⁵⁴ and Mittal et al⁵⁵ who observed a mortality rate of 16.2% & 18.6% respectively.

Among total expired poisoning cases, high mortality resulted due to organophosphorous compound ingestion 9(56%). The outcome of any poisoning case depends upon type and nature of poison, the amount of poison consumed, information regarding the poisonous agent and its antidote, the feasibility of immediate medical care, time lapse in arrival at medical facility and general health status of the individual.

The majority of the poisoning cases reported in this study were suicidal in nature, indicating the need for effective measures to prevent suicidal tendencies by providing adequate psychological counseling to those who are at a higher risk of suicide, particularly younger married males who are unemployed and have a low education level. Restricting the packaging and unchecked sale of insecticides by regulatory authorities is also required⁵⁶.

Limitation of the present study was that being a six months study and a single hospital retrospective record based study, missing some valued information like psychiatric history details, snake poisoning and incidence of seasonal variation. The findings are not reflective of a general profile of poisoning from the whole region. There was also possibility of misdiagnosis, since the poisonings reported were not confirmed with serum analysis and that the only source of information about the causative poisoning agent was provided by the patient or the patient's family member. Hence, a multicenter study for a

longer duration is recommended to achieve a comprehensive pattern of acute poisonings occurring in south India.

Conclusion

Incidences of suicidal poisoning are rising day by day due to social, emotional and professional stress. Most commonly used agents for suicidal poisoning are pesticides or medicines by the people. Psychiatric evaluation and counselling during the hospital stay will minimize self-harm. Early hospitalization and timely intervention reduce the morbidity and mortality.

References

1. Thomas WF, John HD, William RH. Stedman's Medical Dictionary. 28th ed. New York: Lippincott William and Wilkins; 2007. p. 2004.
2. Pillay VV. Textbook of Forensic Medicine and Toxicology. 17th ed. Paras Publication, Hyderabad: 470-496 (2016).
3. Devi S. Toxicology, general consideration. In: Reddy NKS. Essentials of Forensic Medicine and Toxicology. 33rd ed. Jay Pee Brothers, Hyderabad: 446-465 (2014).
4. National crime records bureau. Suicides in India, Chapter -2. Government of India, National crime records bureau; 2012. Available in: <http://ncrb.gov.in/StatPublications/ADSI/ADSI2012/suicides-11.pdf>
5. Das RK. Epidemiology of Insecticide poisoning at A.I.I.M.S Emergency Services and role of its detection by gas liquid chromatography in diagnosis. Medico update 2007;7: 49-60.
6. Eddleston M, Phillips MR. Self poisoning with pesticides. BMJ 2004;328: 42-44.
7. World Health Organization – International Programme on Chemical Safety: Poisoning Prevention and Management. [Last accessed on 2018 Jan 22]. Available from: <http://www.who.int/ipcs/poisons/en/>
8. Gargi J, Tejpal HR. A retrospective autopsy study of poisoning in the northern region of Punjab. *J Punjab Acad Forensic Med Toxicol* 2:17-20 (2008).
9. Abd-Elhaleem ZAE, Muqhem BAA. Pattern of acute poisoning in Al Majmaah region, Saudi Arabia. *Am J Clin Exp Med* 2(4): 79-85 (2014).
10. Konradsen F, Dawson AH, Eddleston M, Gunnell D. Pesticide selfpoisoning: thinking outside the box. *Lancet* 2007;369:169-70.
11. Dash SK, Raju AS, Mohanty MK. Sociodemographic Profile of Poisoning Cases. *J Indian Acad Foren Sci* 2005;27:133-8.
12. Saddichha S, Prasad MN, Saxena MK. Attempted suicides in India: a comprehensive look. *Arch Suicide Res: Off J Int Academy Suicide Res.* 2010;14(1):56e65. <https://doi.org/10.1080/13811110903479060>.
13. Patel V, Ramasundarahettige C, Vijayakumar L, et al. Suicide mortality in India: a nationally representative survey. *Lancet.* 2012;379(9834):2343-2351.
14. Accidents in India. Accidental Deaths and Suicides in India. New Delhi: National Crime Records Bureau, Ministry of Home Affairs, Government of India; 2015. Available from: <http://www.ncrb.gov.in/StatPublications/ADSI/ADSI2015/adsi-2015-full-report.pdf>
15. Bertolote JM, Fleischmann A, Butchart A, Besbelli N. Suicide attempts and Pesticides: a major hidden problem. *Bull World Health Organ* 2006, 84: 260.

16. Gupta BD, Hapani JH, Shah VN. Current trend of poisoning in jamnagar: an experience of tertiary care teaching hospital; *J IndAcad Fore Med*, 2006;28(3):90-92.
17. Ramesha KN, Rao KBH, Kumar GS. Pattern and outcome of acute poisoning cases in a tertiary care hospital in karnataka, India. *Indian J Crit Care Med*. 2009;13(3):152-5
18. Sharma R, Neelanjana RN, Rawat N, et al. Mortality and morbidity associated with acute poisoning cases in north-east India: a retrospective study. *J Family Med Prim Care*. 2019;8(6):2068–2072. doi:10.4103/ jfmpc.jfmpc _237_19.
19. Saxena V, Atal DK, Das S. Retrospective analysis of the pattern of poisoning in Uttarakhand. *J Indian Acad Forensic Med*. 2014;36:230–233.
20. Sulaj Z, Prifti E, Demiraj A, et al. Early clinical outcome of acute poisoning cases treated in intensive care unit. *Med Arch*. 2015;69(6):400–404. doi:10.5455/medarh.2015.69.400-404.
21. Chakrabarty P, Tudu NK, Saren AB, et al. Epidemiology of unnatural death from suspected poisoning: an autopsy based study. *IOSR J Dent Med Sci*. 2015;14(8):1–8
22. Ramesha KN, Rao KBH, Kumar GS. Pattern and outcome of acute poisoning cases in a tertiary care hospital in Karnataka, India. *Indian J Crit Care Med*. 2009;13(3):152-155.
23. Saxena V, Atal DK, Das S. Retrospective analysis of the pattern of poisoning in Uttarakhand. *J Indian Acad Forensic Med*. 2014;36:230–233.
24. Kumar MR, Kumar GPV, Kumar S, et al. A retrospective analysis of acute organophosphorus poisoning cases admitted to the tertiary care teaching hospital in South India. *Ann Afr Med*. 2014;13(2):71–75. doi:10.4103/ 1596 - 3519. 129876.
25. Rehiman S, Lohani SP, Bhattarai MC. Correlation of serum cholinesterase level, clinical score at presentation and severity of organophosphorous poisoning. *J Nepal Med Assoc*. 2018;47:47–52.
26. Sulaj Z, Prifti E, Demiraj A, et al. Early clinical outcome of acute poisoning cases treated in intensive care unit. *Med Arch*. 2015;69(6):400–404. doi:10.5455/medarh.2015.69.400-404
27. Yurumez Y, Durukan P, Yavuz Y, et al. Acute organophosphate poisoning in university hospital emergency room patients. *Intern Med*. 2007;46(13):965–969. doi:10.2169/ internal medicine. 46.6304
28. Adinew GM, Woredikal AT, DeVos EL, et al. Poisoning cases and their management in emergency centres of government hospitals in northwest Ethiopia. *African J Emerg Med*. 2017;7(2):74–78. doi:10.1016/ j.afjem. 2017.04.005
29. Kharkongor MA, Mishra AK, Ninan KF, Iyadurai R. Early use of intravenous N-acetylcysteine in treatment of acute yellow phosphorus poisoning. *Curr Med Issues*. 2017;15:136e138.
30. Siwach SB, Gupta A. The profile of acute poisonings in Harayana-Rohtak Study. *J Assoc Phys India*. 1995;43(11):756e759.
31. Proudfoot AT. Aluminium and zinc phosphide poisoning. *Clin Toxicol*. 2009;47(2):89e100.
32. Sardar D, Mathews N, Mammen J, et al. Rodenticidal hepatotoxicity: raised plasma Von Willebrand factor levels predict in-hospital survival and preliminary report of the outcome of Von Willebrand factor reducing management

- protocol. *Indian J Gastroenterol.* 2019;38(6):527e533.
33. Raddi D, Anikethana GV. Clinical profile of organophosphorus poisoning in a tertiary care hospital. *Indian Journal of Basic and Applied Medical Research.* 2014;4:14-22.
34. Parron T, Antonio FH, Enrique V. Increased risk of suicide with exposure to pesticides in an intensive agricultural area: A 12-years retrospective study. *Forensic Sci Int* 1996;79:53-63.
35. Basu A. Study of Organophosphorus poisoning over 3 years. *J Assoc Physicians India* 1988;36:21.
36. Unnikrishnan B, Singh B, Rajeev A. Trends of acute poisoning in South Karnataka. *Kathmandu Univ Med J (KUMJ)* 2005;3:149-54.
37. Strelitz J, Engel LS, Keifer MC. Blood acetylcholinesterase and butyrylcholinesterase as biomarkers of cholinesterase depression among pesticide handlers. *Occup Environ Med.* 2014;738. Baby S, Manju PH, Yesudas KF. Psychiatric diagnosis in attempted suicide. *Calicut Med J.* 2006;4 [Google Scholar]
38. Nagendra Gouda M, Rao SM. Factors Related to Attempted Suicide in Davanagere. *Indian J Community Med.* 2008;33:15–8.
39. Anthony L, Kulkarni C. Patterns of poisoning and drug overdosage and their outcome among in-patients admitted to the emergency medicine department of a tertiary care hospital. *Indian J Crit Care Med.* 2012;16(3):130e135. <https://doi.org/10.4103/0972-5229.102070>.1(12):842-847.
40. Akhlaghi M, Arbabi Z, Khadivi R. Pattern of Acute Poisoning in Shahrekord. *Asian J Epidemiol.* 2009;2:9–12
41. Shah R, Uren Z, Baker A, Majeed A. Trends in deaths from drug overdose and poisoning in England and Wales 1993-1998. *J Public health.* 2001;23:242–6.
42. Evans GJ. Deliberate self-poisoning in Oxford area. *Br J Prev Soc Med* 1967;21:97-107.
43. Smith AJ. Self- poisoning with drugs: A worsening situation. *Br Med J* 1972;4:57-9.
44. Rygnestad T. A comparative prospective study of self-poisoned patients in Trondheim, Norway between 1978 and 1987: Epidemiology and clinical data. *Hum Toxicol* 1989;8:75-82.
45. Banerjee I, Tripathi SK, Roy AS. Clinicoepidemiological profile of poisoned patients in emergency department: A two and half year's single hospital experience. *Int J CritCInj Sci.* 2014;4:14-7
46. Maskey A, Parajuli M, Kohli SC, Baral S, Basnet S, Poudel N. Scenario of poisoning cases in adults admitted in manipal teaching hospital, pokhara, nepal. *Nepal Journal of Medical Sciences.* 2012;1(1):23-6
47. Karki RK, Risal A. Study of poisoning cases in a tertiary care hospital. *Kathmandu Univ Med J* 2012;10(4):70-73.
48. WHO. Preventing suicide. in: A global imperative. In. Geneva: World Health Organization; 2014.
49. Anthony L, Kulkarni C. Patterns of poisoning and drug overdosage and their outcome among in-patients admitted to the emergency medicine department of a tertiary care hospital. *Indian J Crit Care Med.* 2012;16(3):130e135. <https://doi.org/10.4103/0972-5229.102070>.
50. Ramanath KV, Naveen Kumar HD. Study the assessment of poisoning cases in a rural tertiary

- care teaching hospital by a clinical pharmacist.
Asian J Pharm Clin Res. 2012;5(2):138-41.
51. Vaidya YP, Hulke SM. Study of trends of poisoning in the cases reported to government hospital, Yavatmal. Chron Young Sci 2012;3:63-7
52. Kumar SV, Venkateswarlu, Sasikala M, Kumar GV. A study on poisoning cases in a tertiary care hospital, J Nat Sci Biol Med. 2010;1(1):35-9.
53. Banerjee I, Tripathi SK, Roy AS. Clinicoepidemiological profile of poisoned patients in emergency department: A two and half year's single hospital experience. Int J Crit Inj Sci. 2014;4:14-7.
54. Mittal N, Shafiq N, Bhalla A, Pandhi P, Malhotra S : A prospective observational study on different poisoning cases and their outcomes in a tertiary care hospital; SAGE Open Medicine 2013 1: DOI:10.1177/2050312113504213. Published online 2013 Sep 17. PMID: PMC4687764 <https://www.ncbi.nlm.nih.gov/pubmed/26770682>. Accessed on 01/05/201.
55. Gunnell D, Knipe D, Chang SS, et al. Prevention of suicide with regulations aimed at restricting access to highly hazardous pesticides: a systematic review of the international evidence. *Lancet Glob Health* 5(10): 1026-1037 (2017).