



## A CLINICAL THERAPEUTIC CORRELATION IN POISONING CASES - A RETROSPECTIVE ANALYSIS IN A TERTIARY CARE HOSPITAL

<b>Dr. J. Vineeta Debbie Nesam</b>	Postgraduate, Department of Pharmacology, Govt. Stanley Medical College, Chennai, Tamilnadu.
<b>Dr. N. Asvini</b>	Assistant Professor, Department of Pharmacology, Govt. Stanley Medical College, Chennai, Tamilnadu.
<b>Dr. B. Pushpa</b>	Assistant Professor, Department of Pharmacology, Govt. Stanley Medical College, Chennai, Tamilnadu.
<b>Prof Dr. M. Kulandaiammal*</b>	Head of the Department, Department of Pharmacology, Govt. Stanley Medical College, Chennai, Tamilnadu. *Corresponding Author

**ABSTRACT** **Background:** Acute poisoning is a major public health problem. This retrospective study was done to analyse the characteristics of acute poisoning cases admitted in a tertiary care hospital in Chennai so as to ensure effective poisoning prevention and targeted interventions to reduce the mortality and morbidity due to poisoning, as the incidence of poisoning is rising worldwide.

**Methodology:** This retrospective analysis was done by analysing the poisoning case sheets in the medical records department in a tertiary care hospital for a duration of 3 months. Data pertaining to patient's demographic details, pattern, manner of poisoning, the mode of ingestion, clinical profile, severity of poisoning using Poisoning Severity Score, treatment profile and outcome were collected using a pre-structured proforma.

**Results:** In this study 488 poisoning case sheets were analysed. Most of poisoning cases (40%) occurred in the age group of 21-30 years. 59% were males. Chemical poisoning 79% was most common among males and tablet poisoning 63% among females. Manner was suicidal in 82% cases, accidental in 13% and 0.2% was homicidal. The incidence of Rat killer poisoning (33%) was highest followed by tablet poisoning (20%), Insecticide poisoning (13.5%), Animal poison (13%), Corrosive poisoning (5.7%), Chemical poisoning (4.9%), and Plant poison (2.7%). 5.7% patients had associated Psychiatric illness and 16% were alcoholic. 74% patients were admitted within 3 hours of poison intake. Gastric lavage, Activated charcoal, N-Acetylcysteine, Inj. Vitamin K, Ursodeoxycholic acid, Rifaximin, Atropine, Anti-snake Venom, and Pralidoxime were the treatments given. Of the total 488 patients 94% were discharged, 4% death and 2% left against medical advice. The mean duration of hospital stay was 4 days.

**Conclusion:** This study shows that Rodenticide poisoning was most common followed by tablet poisoning which mainly includes benzodiazepines, thyroid supplements, antiepileptics and antihypertensive agents. The next common was organophosphate poisoning of which chlorpyrifos and cypermethrin were common. Overall mortality rate was 4% of which Rat killer paste was the most common cause of mortality (35%) associated with coagulopathy, acute encephalopathy and toxic hepatitis. With proper Counselling, stress management, restricted access to OTC drugs and insecticides, by ensuring protective measures to avoid exposure and by prompt diagnosis and timely initiation of treatment at the primary level we can reduce the mortality.

**KEYWORDS :** poisoning, rat killer, tablet poisoning and organophosphorus.

### INTRODUCTION:

Poison is a substance (solid, liquid or gaseous), which if introduced in the living body, or brought into contact with any part thereof, will produce ill-health or death, by its constitutional or local effects or both. Acute poisoning forms one of the commonest causes of emergency hospital admissions causing significant mortality and morbidity.<sup>[1]</sup>

According to WHO, three million acute poisoning cases with 2,20,000 deaths occur annually. Of these 90% of fatal poisoning occur in developing countries particularly among agricultural workers. The exact incidence of poisoning in India is uncertain due to lack of data at central level. It has been estimated that about 10-15 million cases of poisoning are reported every year of which more than 50,000 die.<sup>[2]</sup>

The commonest cause of poisoning in India and other developing countries is pesticides, the reason behind this is poverty, illiteracy, unsafe practices, ignorance and easy availability of pesticides. Organophosphates form the largest bulk of pesticide poisoning. In India as many as 2,30,314 people died from suicide during 2016 of whom 70,000 (30%) died from pesticide poisoning.<sup>[3]</sup> Worldwide 1,50,000 deaths occur each year due to pesticides.

Acute poisoning in children is almost entirely accidental, while in adults it is mainly suicidal. Females predominate in all age groups, with an evident preponderance in the second and third decades of life.

This study is done to characterize poisoning with respect to demographic profile, common toxic agents used and fatality rate due to poisoning so as to ensure effective poisoning prevention and targeted interventions to reduce the mortality and morbidity due to poisoning.

### METHODOLOGY AND METHODS:

This retrospective analysis was carried out by analysing all case sheets

of poisoning in the medical records department at Govt. Stanley Hospital, Chennai, Tamilnadu for a duration of three months following approval from the Institutional Ethics Committee.

The following data were recorded from the medical records using pre-structured proforma:

1. Patients age, sex, co morbid illness, associated psychiatric illness and cause of poisoning.
2. Types of poisoning.
3. Time lapse between the consumption of poison and admission.
4. Application method.
5. Clinical profile of different types of poisoning
6. Severity of poisoning and its outcome.
7. Treatment given.

### POISONING SEVERITY SCORES:

NONE (0): No symptoms or signs related to poisoning.  
 MINOR (1): Mild, transient and spontaneously resolving symptoms.  
 MODERATE (2): Pronounced or prolonged symptoms.  
 SEVERE (3): Severe or life-threatening symptoms.  
 FATAL (4): Death.

### RESULTS:

#### Age Wise Distribution Of Poisoning Cases:

In this retrospective analysis 488 poisoning case sheets were analysed in the medical records department. Highest incidence of poisoning occurred in the age group of 21-30 years (40%) followed by 31-40 years (22.3%) and 11-20 years (17.8%) in Table 1. In this study the youngest patient was 1 year old and the eldest was 89 years old. The mean age of all patients was 29.508+/- 12.650 with P value < 0.0001. Corrosive poisoning (14%) was most common among 1-10 years of age. Among 21-30 years insecticide/pesticide (47%) followed by Rat killer (43%) and plant poison (31%) was commonly encountered. 5.7% patients had associated Psychiatric illness and 16% were alcoholic.

**Table 1: Age Wise Distribution Of Poisoning Cases**

AGE	ANIMAL POISON	SUBACUAL	CORROSIVE	HERBICIDE	INSECTICIDE	PLANT	RAT KILLER	TABLET	UNKNOWN	TOTAL
1-10	3 (13.6%)	3 (13.6%)	4 (18%)	0%	2(9%)	1 (4.5%)	1 (4.5%)	8 (36%)	0%	22
11-20	10(11.4%)	2(2.29)	6(6.9%)	1(1%)	10(11.4%)	2 (2.2%)	41 (47%)	14(16%)	1 (1%)	87
21-30	20 (10.2%)	7(3.57%)	13 (6.6%)	6(3%)	32(16.3%)	4 (2%)	70(35.7%)	38 (19.3%)	6 (3%)	196
31-40	16(14.9%)	6(5.5%)	2(1.83%)	8(7.3%)	13(11.9%)	3 (2.7%)	32(29.3%)	25 (22.9%)	4 (3.66%)	109
41-50	8(18.6%)	4(9.3%)	2(4.6%)	1(2.3%)	6(13.9%)	2 (4.6%)	12(27%)	7 (16.2%)	1 (2.32%)	43
51-60	8 (36.3%)	1(4.54%)	0%	1(4.5%)	4(18%)	1 (4.54%)	4 (18%)	3 (13.6%)	0%	22
ABOVE 60	1(11.1%)	1(11%)	1(11%)	0%	1(11%)	0%	2 (22%)	3 (33.3%)	0%	9

**Table 2: Age Wise Distribution Of Manner Of Poisoning Cases**

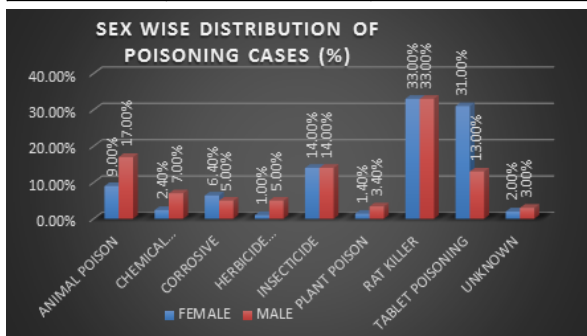
AGE INTERVAL	MANNER			Total	P VALUE
	ACCIDENTAL	HOMICIDE	SUICIDE		
1-10	17.0%	100.0%	1.5%	4.5%	P<0.0001
11-20	11.4%	0.0%	19.3%	17.8%	
21-30	33.0%	0.0%	41.9%	40.2%	
31-40	19.3%	0.0%	23.1%	22.3%	
41-50	10.2%	0.0%	8.5%	8.8%	
51-60	8.0%	0.0%	3.8%	4.5%	
Above 60	1.1%	0.0%	2.0%	1.8%	
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	

**Sex Wise Distribution Of Poisoning Cases:**

59% of poisoning cases occurred in males and females account for 41%. Sex difference was significant with a P value< 0.0001. Tablet poisoning (63%) was more common among females of which the most common was Paracetamol (4.7%) followed by Benzodiazepines (2%) and Metformin (1.4%). Among males Herbicide poisoning (88%) was common of which the most common was Paraquat poisoning (70%).

**Table 3 : Sex Wise Distribution**

SEX	FREQUENCY	PERCENTAGE
FEMALE	201	41.2
MALE	287	58.8



**Fig 1: Sex wise distribution of poisoning cases**

**Intent Of Poisoning:**

Intent was suicidal in 82%, 13% was accidental and 0.2% homicidal. Accidental poisoning (33%) and Suicidal poisoning (42%) was more common among 21-30 years age group. One case of homicide was seen in 1-10 years age group. In this study accidental poisoning was mainly caused by snake bites (73%) and 40% patients consumed rat killer to attempt suicide. Most of the poisoning exposures occurred in day time (61.4%).

**Table 4 : Time of Exposure**

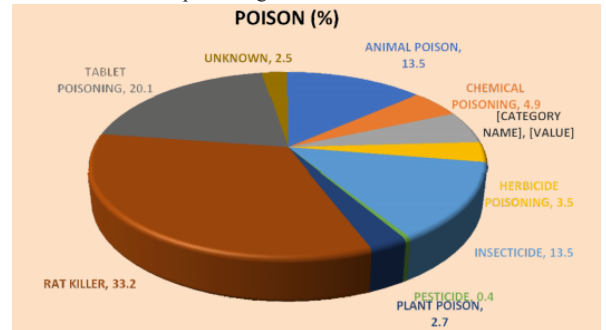
DAY	FREQUENCY	PERCENTAGE	P VALUE
MORNING	300	61.4%	P<0.0001
NIGHT	188	38.6%	
TOTAL	488	100%	

**Types Of Poisoning:**

**Rodenticide Poisoning:**

Out of the 488 cases observed, Rat killer poisoning was the most common type with 162 cases (32%). 96 cases were males and 66 were

females. Rat killer poisoning was most common among 21-30 years of age (43%). 160 cases of Rat killer were due to suicidal attempt and 2 cases were due to accidental ingestion. Based on Poison severity score it was found that 62% of rat killer cases were of moderate severity, 27% cases were severe and 11.7% were mild. 15% of patients were alcoholic and Hypertension (8%) was the most common comorbidity associated with Rat killer poisoning. 149 patients recovered and 5 deaths occurred in Rat killer poisoning of which all were females and was of severe type and all of them were on ventilator support. Coagulopathy (18%) and Toxic hepatitis (19%) was the common cause of death in Rat killer poisoning.



**Fig 2 : Distribution of types of Poisoning:**

**Tablet Poisoning:**

Out of the 488 patients observed, 98 cases were tablet poisoning which was the second most common type of poisoning seen of which 63% were males and 37% females. Tablet poisoning was more among 21-30 years of age (39%). 91 cases were suicidal and 7 was accidental in nature. Based on poison severity score 53% was of moderate severity and 43% was mild and 4% was of severe type. 97 cases recovered and 1 left against medical advice. No deaths occurred due to tablet poisoning. The most common was Paracetamol 5%, benzodiazepines (Alprazolam) 2%, Oral hypoglycaemic agents 1.4%, thyroid supplements, Antiepileptics and Antihypertensive agents.

**Insecticide/pesticide Poisoning:**

This was the third most common type of poisoning observed which accounted for 14% (68 cases). Of which 59% were males and 41% females. Insecticide poisoning was most commonly observed among 31-40 years of age (20%). Organophosphates was the most common type seen (23 cases). Out of 68 cases, 65 was suicidal, 2 accidental and 1 was homicidal in nature. 49% cases were of moderate severity and 16% was of severe type. Out of 68 cases, 63 recovered and there were 4 cases of death all were due to consumption of organophosphates. 3 out of 4 patients were on ventilator support and Respiratory failure was the cause of death. A total of 7 cases of Intermediate syndrome were observed.

**Animal Poison:**

Animal poison was the next most commonly observed type accounts for 14% (66 cases) of cases. Animal poison was most commonly observed among females (73%). Out of 66 cases 64 were accidental. 49% were moderate in severity and 29% were mild. Snake poisoning was the common cause. 18 cases of envenomation were observed. 64 cases recovered and 2 deaths were observed. Bleeding at the site of bite 42%, tingling sensation 35% and giddiness 35% were the most common symptoms seen. 25 patients received Anti-snake venom. 12% cases were hematotoxic.

**Table 5: Snake Envenomation**

Snake envenomation	Frequency	Percent	P VALUE
Envenomation	18	27	<0.0001
No Envenomation	48	72.7	
<b>Total</b>	<b>66</b>	<b>100</b>	

**Corrosive Poisoning:**

Out of 489 cases -28 cases of corrosive poisoning was observed. 73% were females. 46% of cases occurred among 21-30 years. Out of 28 cases 22 were suicidal and 6 were accidental. 61% cases were of moderate severity. Phenol poisoning (13 cases) was most commonly seen.

**Chemical Poisoning:**

Out of 489 cases 24 cases of chemical poisoning was observed. 19 cases of which were male. 29% of cases were seen in 21-30 years of age. 19 cases were suicidal in nature. Cell oil Poisoning was most commonly seen. 62% of chemical poisoning was of moderate severity.

**Herbicide Poisoning:**

Out of 489 cases, 17 cases of herbicide poisoning were seen which was most common in 31-40 years of age group (47%). Females account for 88% of the cases. All the cases were suicidal in nature. 59% cases were of severe type and was fatal. Paraquat poisoning accounted for most of the cases (12 patients) of which there were 6 deaths recorded. 17% of cases developed Acute kidney injury and 17% developed toxic hepatitis.

**Plant Poison:**

Plant poison account for 13 cases of which 10 patients were male. Oleander poisoning was most commonly seen. 1 death was seen remaining 12 patients recovered. Intent was suicidal in all patients. 54% cases were of moderate severity.

**Table 6 : Poison Severity Score**

POISON SEVERITY SCORE	ANIMAL POISON	CHEMICAL POISONING	CORROSIVE	HERBICIDE	INSECTICIDE	PLANT POISON	RAT KILLER	TABLET POISONING	UNKNOWN	TOTAL	P VALUE
MILD	29%	29%	32%	17.6%	35.29%	23.1%	11.7%	42.9%	58.3%	27.3%	0.0001
MODERATE	48.5%	62.5%	60.7%	23.5%	48.5%	53.8%	61%	53%	41.7%	54%	0.0001
SEVERE	22.7%	8.3%	7%	58.8%	16.2%	23%	27.2%	4%	0%	18.6%	0.0001
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

**Mode Of Ingestion And Outcome:**

Ingestion by oral route (86%) was the most common mode of ingestion of poison followed by bites/stings (14%) and inhalation (0.2%) with P<0.0001. 74% of patients were admitted within 3 hours of exposure of which 29% recovered and 4% death. Admission within 3-6 hours (22%) was associated with 32% recovery and 11% mortality and admission greater than 6 hours (3%) of poison ingestion led to decreased recovery of 13% and increased death 50%. A total of 94% patients recovered of which 93% were males and 95% females. 2% of patients left against medical advice with equal distribution in both sex and death occurred in 4% of patients with highest death occurring among males 5%. The highest incidence of death was seen in 83% females in Rat killer poisoning followed by 43% of males in Herbicide poisoning. Recovery rate was high in Rat killer poisoning 48% in females and 40% in males followed by Tablet poisoning 22% in females and 14% in males. 19 patients (4%) were on ventilator of which 18 patients (95%) died.

**Table 7: Ventilator Support**

Ventilator Support	Frequency	Percent	P VALUE
Ventilator	19	3.9	P<0.0001
No Ventilator	469	96.1	
Total	488	100.0	

**Table 8 : Time Since Exposure**

TIME SINCE EXPOSURE	DISCHARGE	AMA	DEATH	TOTAL	P VALUE
<3 HR	351 (97%)	8 (2.2 %)	4 (1.0%)	363	0.0001
4-6 HR	99 (90.7 %)	2 (1.8%)	8 (7 %)	109	0.0001
>6 HR	8 (50.5 %)	0	8 (50 %)	16	0.0186
TOTAL	458	10	20	488	

**Table 9: Sex Wise Distribution Of Outcome**

SEX	DISCHARGED	%	AMA	%	DEATH	%	TOTAL
MALE	267	93%	6	2%	14	5%	287
FEMALE	191	95%	4	2%	6	3%	201
TOTAL	458	94%	10	2%	20	4%	488

**Table 10 : Time Since Exposure Versus Outcome**

TIME SINCE EXPOSURE	DISCHARGE	AMA	DEATH	TOTAL	P VALUE
<3 HR	351 (97%)	8 (2.2 %)	4 (1.0%)	363	0.0001
4-6 HR	99 (90.7 %)	2 (1.8%)	8 (7 %)	109	0.0001
>6 HR	8 (50.5 %)	0	8 (50 %)	16	0.0186
TOTAL	458	10	20	488	

**Duration Of Hospital Stay And Prognosis:**

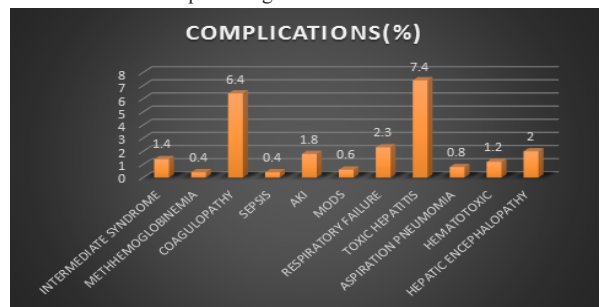
The mean duration of hospital stay was 3.986+/-3.3 with minimum stay in hospital being 1 day and maximum being 31 days. 90% of patients were admitted for a period of 1-7 days, 8% within 8-14 days, 1.6% between 15-28 days and 0.2% were admitted for greater than 28 days. Greater than 7 days of hospital stay was more common among rat killer poisoning with high mortality rates.

**Table 11: Duration Of Hospital Stay**

Hospital stay duration	Frequency	Percent	P VALUE
1 - 7 days	438	89.8	<0.0001
8 - 14 days	41	8.4	
15 - 28 days	8	1.6	
> 28 days	1	.2	
Total	488	100.0	

**COMPLICATIONS:**

Most common cause of death in Animal bites was hematotoxicity in 11% and multiorgan dysfunction 3%. In Chemical poisoning most common cause of death was Acute kidney injury (3.2%). In Herbicide poisoning AKI and Toxic hepatitis 17% was the most common cause of death. Coagulopathy (18%) and Toxic hepatitis (19%) was common cause of death in Rat killer poisoning. Intermediate syndrome (10.29%) and Methemoglobinemia (2.9%) were most common in Insecticide/Pesticide poisoning with P value<0.0001.

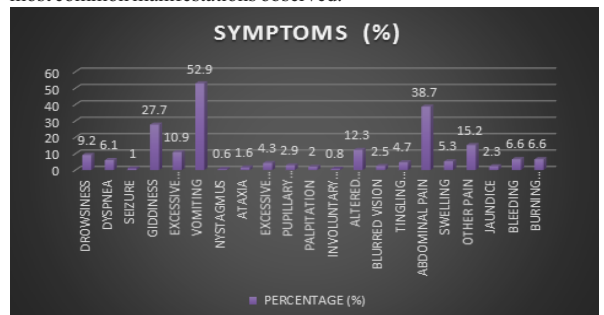


**Fig 3: Complications In Poisoning Cases**

**Poisoning Symptoms And Treatment:**

Treatment options included Gastric lavage 69%, Activated charcoal 18.6%, Atropine 10%, Pralidoxime 3%, Vitamin K 22.3%. Rifaximin 20%, UDCA 21%, INJ Anti-snake venom 5%. Adjuvant drugs included Rantidine, Pantoprazole, Emeset, Ondansetron, Lorazepam etc.

Vomiting 53%, abdominal pain 39%, giddiness 28%, altered sensorium 12%, excessive salivation/sweating 11%, drowsiness 9%, dyspnoea 6%, burning epigastrium 6.6% and jaundice 2% were the most common manifestations observed.



**Fig 4: Symptoms in Poisoning cases**



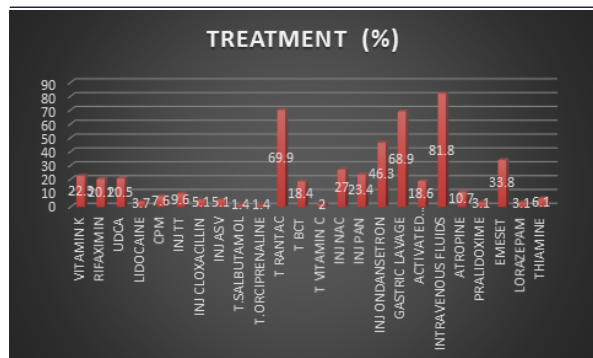


Fig 5: Treatment of Poisoning cases

## DISCUSSION:

In this study we found that there was a male preponderance (59%) of poisoning cases which was similar to studies done by Irteqa Ali et al and Surendra Kosya et al. This could be attributed to the high stress and occupation hazards to which most men are exposed to. We found that there was a high incidence of poisoning amongst young adults of age 21-30 years (40%), this was similar to a study done by Surendra Kosya et al<sup>[4]</sup> which showed 43% of poisoning cases occurring among 21-30 years of age. Another study done by Raut Aswari et al in Western India showed that high incidence (55%) of cases occurred in 20-35 years of age.<sup>[5]</sup> This could be attributed to domestic causes, unemployment, lack of education, marital related stress and impulsive behaviours.

In this study we also observed the most common cause for poisoning was suicidal 82% followed by accidental 13% which was similar to a study done by Erhan Zohre et al which showed 83% of suicidal poisoning and 16% accidental.<sup>[6]</sup> We also found that the main cause of Accidental poisoning was snake bites among 21-30 years age group attributed to environmental exposure which was similar to study done by Raut Aswari et al while other studies showed household agents as the common cause. This difference could be attributed to the geographical variations.

In this study Rat killer poisoning 33% was most commonly observed followed by tablet poisoning 20% and insecticide/pesticide poisoning 14% which was similar to the study done by Bamathy et al in which tablet poisoning 34% was most common followed by organophosphates 29%.<sup>[7]</sup> The preponderance to rat killer poisoning in North Chennai was attributed to easy availability of rodenticides, as the sale of pesticides/insecticides was restricted to farmers which was available only in selected shops, victims mainly preferred the rat killer poison which was easily available and cheap. Tablet overdose was attributed to mishandling of doses and accidental ingestion in old age and children respectively. Adults with suicidal intention was mainly associated with mental illness and easy availability of over the counter medications.

This study shows 74% (majority) of patients were admitted within 1-3 hours of poison exposure and 22% patients admitted within 4-6 hours and among 3.2% patients admitted >6 hours of poison exposure - 13% survived and 50% died. This increase in the incidence of death and decrease in recovery observed in patients admitted >6 hours of exposure is mainly attributed to delay in admission and an increased toxicity of the poison ingested. A statistically significant association was found between outcome and time lapse in reaching hospital. This was similar to study done by Irteqa Ali et al.<sup>[8]</sup>

The mean duration of hospital stay in this study was 3.986±/3.3 days. Minimum stay in hospital was 1 day seen in Herbicide 17% and corrosive poisoning 17.7%. This was due to small amount of poison ingested. Maximum duration was 31 days seen in Rat killer poisoning owing to its high fatality. This was similar to the study done by Shreya M Shah et al where the duration of hospital stay ranged from 1 to 38 days with an average of 5.39 days per person.<sup>[9]</sup> Difference in duration of stay for different poisons consumed was found to be statistically significant (p<0.0001)

In this study out of 488 patients admitted 458 (94%) recovered, 20 deaths (4%) and 10 left against medical advice (2%). Among 20 deaths highest mortality occurred in Rat killer-7 cases (35%) followed by 6 (30%) cases of Herbicide poisoning which mainly included Paraquat poisoning followed by 4 cases of Organophosphates (20%). Mortality

was common among male 70%. Higher mortality rate of 16% was seen in other studies done by Shreya M. Shah et al and Irteqa Ali et al in North India, 7% mortality was observed in another study done by Bamathy et al in South India. House hold poisons 37% and pesticide poisoning 36% caused high fatality in study done by Tejas Prejapathi et al<sup>[10]</sup> in contrast to Rat killer poisoning and Paraquat poisoning which was observed in our study. Paraquat is a highly toxic weed killer. It inhibits the reduction of NADP to NADPH resulting in overproduction of reactive oxygen and nitrogen species that destroy lipid cell membranes. The most common cause of death is Respiratory failure due to pulmonary fibrosis which was observed in this study. In Rat killer poisoning the most cause of death observed was toxic hepatitis and Hepatic encephalopathy with elevated liver enzymes, PT and INR levels.

In this study 19 cases (3.8%) were on ventilator support of which 18 cases (95%) died. Highest incidence of ventilator support was required in rat killer and herbicide poisoning owing to its severity. In rat killer poisoning the symptoms mainly included vomiting 77%, abdominal pain 69%, dyspnoea 8%, jaundice 23% which was similar to study done by Radhika Venugopal et al at Rajiv Gandhi Hospital.<sup>[11]</sup> In organophosphate poisoning the chief manifestations included vomiting 45%, pupillary constriction 20% and abdominal pain 20% and intermediate syndrome 10% and dyspnoea in 12% this was similar to study done by John Victor Peter et al which showed Respiratory failure as the main cause of death in organophosphate poisoning as observed in our study.<sup>[12]</sup>

## LIMITATIONS:

In this study patient's education details, marital status, employment, socio economic status and cause for intentional poisoning, could not be analysed as these data were not recorded in the case sheets.

## CONCLUSION:

This study shows that the incidence of Rodenticide poisoning was most common followed by tablet poisoning which mainly included Analgesics (Paracetamol) 5%, Benzodiazepines (Alprazolam) 2% and Oral hypoglycaemic agents 1.4% followed by Insecticide poisoning which includes organophosphates of which chlorpyrifos and cypermethrin were common. Rat killer paste was the most common cause of mortality which was associated with coagulopathy, hepatic encephalopathy and toxic hepatitis. Intentional poisoning was more common among young adults hence counselling and awareness of depression and stress management should be ensured to decrease the suicidal tendencies. Access to insecticides should be restricted and farmers should take protective prophylactic measures to avoid exposure. 74% of patients were admitted within 3 hours of exposure, hence with timely initiation of treatment at the primary level we can reduce the mortality and morbidity.

## REFERENCES:

1. Rakesh Sharma, Neelanjana, Nandita Rawat, Nalini Panwar: A retrospective study to assess pattern and outcome of acute poison cases in north-east India, *Journal of Family Medicine and Primary Care*, June 2019, 8(6):2068-2071.
2. Preet Aggarwal, Rohini Handa, Jyoti Prakash Wali- Aut Poisoning Management and Guidelines, *Journal of Indian Academy of Clinical Medicine*, Vol 5(2):142-147.
3. Ayanthi Kaeunarathe, David Gnnell, Flemming et al: How many premature deaths from pesticide suicide has occurred since agricultural green revolution? *Clinical Toxicology* 2020; vol 58(4):227-232.
4. Surendra Khosya and SR Meena: Current Trends of Poisoning: An Experience at a Tertiary Care Hospital Hadoti Region, Rajasthan, India, *Journal of Clinical Toxicology*, 2016;6(2),1-7.
5. Raut Aswari I, Pawar Atmaram, Kakane Bhagwan, Dave Priti, Shaj Kavya, Gulam Ali Jabeen: Toxicological Pattern of Poisoning in Urban Hospitals of Western India; *J Young Pharm*, 2017; 9(3):315-320
6. Erhan Zohre MD, Seyran Bozkurt MD: Retrospective Analysis of Poisoning Cases Admitted to the Emergency Medicine; *Archives of Iranian Medicine*, 2015, Volume 18(2):117-122.
7. B. Bamathy, K. Punnagai, C.A. Amritha And D. Darling Chellathai: Incidence & Patterns of Acute Poisoning Cases in an Emergency Department of a Tertiary Care Hospital in Chennai; *Biomedical & Pharmacology Journal* 2017, 10(3):1286-1291.
8. Irteqa Ali, Kamal Kumar Sawlani, D. Himanshu, Shyam Chand Chaudhary, Kausar Usman, Virendera Atam, Mohd, Parvez Khan: *J. Evid. Based Med. Healthc*, January 2017; 4(6):326-331.
9. Shreya M. Shah, Pratik D. Aswari, Anand J. Amin: Clinico-epidemiological profile of patients presenting with acute poisoning, *International Journal of Contemporary Research and Review*, July 2016; 8(13):35-41.
10. Tejas Prajapati, Kartik Prajapati, R.N. Tandon, Saamil Merchant: A study of Acute Poisoning Cases Excluding Animal Bites at Civil Hospital, Ahmedabad, *J Indian Acad Forensic Med*, April-June 2013, 35(2):120-122.
11. Radhika Venugopal, Krishnaswamy Narayanasamy- Rat killer poisoning vs Liver damage in South Indian Patients- *J Gastroenterology and Digestive System* 2018; 3-6.
12. John Victor Peter, Thomas Isiah- Clinical Features of Organophosphate poisoning- *Indian Journal of critical care medicine*, 2014- vol 18(11):735-737.
13. Abubakar S, Githa, Kiran N, Sreebala: A Study on Pattern of Poisoning Cases in a Tertiary Care Hospital, Bangalore, *Indian Journal of Pharmacy Practice*, Jan - Mar, 2014, 7(1):13-17.
14. D K Suneetha I, J Inbanathan, Sowmya Kannoth, P K Reshma, M S Shashank: Profile of

- Rat Killer Poisoning Cases in a Tertiary Care Hospital at Mysore, International Journal of Scientific Study, March 2016;3(2):264-267.
15. S. Chandrasekhar I, M. Abdur Rahim, S.M.S. Quraishi, C. Ravi Theja, K. Sai Kiran: An Observational Clinical Study of Assessing The Utility Of Pss (Poison Severity Score) And GCS (Glasgow Coma Scale) Scoring Systems In Predicting Severity And Clinical Outcomes In OPC Poisoning, J. Evid. Based Med. Healthcare, Vol. May 11, 2017,4(38):2325-2331.
  16. Michael Eddleston, Andrew Dawson, Lakshman Karalliedde, Wasantha Dissanayake, Ariyasena Hittarage: Early management after self-poisoning with an organophosphorus or carbamate pesticide – a treatment protocol for junior doctors, Critical Care, December 2004;8(6):391-396.
  17. Somasundaram K.V., Ashok Patil Shukla S.K: Epidemiological Profile Of Op Poisoning Cases Treated at Pravara Hospital, Loni, India, Indian J. Prev. Soc. Med, 40(3&4), 2009:184-188.