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Current Trends of Poisoning: An Experience at a Tertiary Care Hospital Hadoti Region, Rajasthan, India

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Abstract

Aims: The aim of this prospective study was to analyze the characteristics of acute poisoning cases admitted to M.B.S Hospital kota, Rajasthan, India. We report the socio-demographic and clinical features of cases and mortality rate.

Methods: The study was done in patients admitted with history of poisoning in the department of medicine at M.B.S Hospital, Kota; Rajasthan, India from the year July '2009 to December 2011 This study includes 799 consecutive poisoning Patient who were admitted to medicine department. Detailed history and clinical examination were done in all patients.

Results: During the study period 55,428 emergency cases were admitted, out of which 799 cases were of poisoning (1.41%). Out of 799 cases there were 674 cases of suicidal poisoning and 125 cases of accidental poisoning. The highest number of poisoning cases were in lower socio-economic status 592 cases (74.09%), followed by middle class 171 cases (21.4%) and then the upper class which constituted 47 cases (5.88%). Insecticides group which constituted 245 (30.65%) which was most common cause of poisoning, out of which organophosphorus poisoning was 139 (17.39%), Carbamate 47 (5.88%) and organocholorine was 59 (7.38%) cases. Next common poisoning cause was drugs like Diazepam, Alprazolam, Crocin, Iron, were most commonly used. Out of 799 cases drug consisted 121 cases (15.14%). Out of 799 patients 163 (20.40%) were expired in study period. Maximum number of people died because of Aluminium phosphate (31.4%) followed by OPC (20%) and Rodenticide (9.6%).

Conclusion: Pesticides were the major cause of poisoning; the reasons are agriculture based economy, poverty and easy availability of highly toxic pesticides in India. The poisoning related mortality could be decreased by improving ICU bed condition and appropriate supportive care at medical college and general hospital.

Introduction

A poison is any substance that is harmful to your body when ingested (eaten), inhaled (breathed), injected, or absorbed through the skin. Poisons have been used for many purposes across the span of human existence, most commonly as weapons, anti-venoms, and medicines [1].

The history of poison stretches from before 4500 BC to the day Poison was discovered in ancient times, and was used by ancient tribes and civilizations as a hunting tool to quicken and ensure the death of their prey or enemies [1].

Indian surgeon Sushruta defined the stages of slow poisoning and the remedies of slow poisoning. He also mentions antidotes and the use of traditional substances to counter the effects of poisoning [2].

Over the last few decades agricultural pesticides have become a common household item in rural areas of the developing world. Due to their easy availability, pesticides have also become commonly used for intentional self-poisoning [3,4]. According to World Health Organization (WHO) estimates published in 1990 (World Health Organization 1990), around 3 million poisoning cases with 220, 000 deaths occur annually. About 99% of these deaths occur in developing countries [5].

Pesticide poisoning is a significant problem in India. Organophosphorus (OP) compounds cause most self-poisoning deaths in southern and central India [6,7]. In parts of northern India, aluminium phosphide causes most deaths in an epidemic that started two decades ago [7,8].

The Hadoti region of Rajasthan is an area of intensive agricultural production. The present study was carried out to determine the impact, management and outcomes of pesticide poisoning in M.B.S. and associated group of hospitals, Govt. medical college, Kota.

Materials and Methods

Present statistical study is conducted by Department of General medicine (M.B.S. hospital, Govt. medical college), Kota (2009-2011) to know the current trends of poisoning in the region as per hospital records for various epidemiological clinical and biochemical parameters on the basis of history. Physical examination and investigation.

The victims were studied from the time of OPD admission to wards and followed up till recovery or death. Data were collected in a Performa, from the history given by the patient, hospital records, and police inquest reports relatives. The emphasis was on the age, sex, rural/urban, type of poison and manner of poisoning. All data was documented and statistically analyzed.

Observations and Results

During the study period 55,428 emergency cases were admitted,

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out of which 799 cases were of poisoning (1.41%). Remaining cases were cases of accidents, assaults, burns and other medical and surgical emergencies.

Age wise and type of poisoning (suicidal, homicidal, accidental) study

Table 1 shows the maximum numbers of cases of poisoning were in the age group 21 to 30 years. Out of 799 cases 343 cases (42.92%) were in this group. In the age group of 0 to 10 years all the cases were due to accidental ingestion of poison. From 11 years onwards the rate of suicidal poisoning increases. Out of 799 cases there were 674 cases of suicidal poisoning and 125 cases of accidental poisoning. Not even a single case of homicidal poisoning has been observed in this study.

Table 2 shows total numbers of males were 493 (61.7%) which were more than females 306 (38.27%). Suicidal poisoning cases were 79.82% while accidental poisoning were 20.27%. In males the suicidal poisoning was 44.30% and in females 35.54%. The accidental poisoning in males was 82.71% and in females it was 17.17%. Maximum numbers of males were observed between 21 to 30 years age group-219cases (27.09%) and female also in the same age group-121 (15.14%).

Marital status and age wise study

Table 3 shows that majority of poisoning cases were found in age group 21-40 years, out of these 483 cases 267 were married and 216 were single. In above 40 years category majority of people were married.

Age	Total	Suicidal	Homicidal	Accidental
0-10 Years	06 (.75)	0	0	6
11-20 Years	199 (24.90)	156	0	43
21-30 Years	343 (42.92)	291	0	52
31-40 Years	140 (17.52)	120	0	20
41-50 Years	73 (9.12)	70	0	3
51-60 Years	25 (3.12)	24	0	1
Above 60 years	13 (1.62)	13	0	0
Total cases	799	674	0	125

Table 1: Showing age distribution and type of poisoning (suicidal, homicidal, accidental) studied (799 cases) during the year July 2009 to December 2011.

Age	Sex		Suicidal		Homicidal		Accidental	
	Male	Female	Male	Female	Male	Female	Male	Female
0-10 Years	5 (0.625)	1 (0.125)	0	0	0	0	5	1
11-20 Years	104 (13.06)	92 (11.51)	75	83	0	0	29	9
21-30 Years	219 (27.09)	121 (15.14)	175	119	0	0	44	2
31-40 Yrs	81 (10.13)	65 (8.13)	57	60	0	0	24	5
41-50 Years	57 (7.13)	16 (2)	36	16	0	0	21	0
51-60 Years	16 (2)	9 (1.12)	6	5	0	0	5	10
Above 60 years	11 (1.137	2 (0.25)	5	1	0	0	6	1
Total %	61.17	38.29	44.3	35.54	0	0	16.77	3.5

Table 2: Sex distribution and according type of poisoning (suicidal, accidental, homicidal) study.

Age	Married	Unmarried
21-40Years	267	216
41-50 Years	69	2
51-60 Years	24	1
Above 60years	13	0

Table 3: Showing marital status and age wise study of poisoning cases emergency services during the year July 2009 to December 2011.

Socio-economic status study

Table 4 shows the highest number of poisoning cases were in lower socio-economic status 592 cases (74.09%), followed by middle class 171 cases (21.4%) and then the upper class which constituted 47 cases (5.88%). The incidences of both suicidal and accidental poisoning were more in lower class than in middle class and higher class.

Month wise distribution

Table 5 shows the highest number of poisoning cases were in august-201cases (25.2), followed by July-117 cases (14.6%) and then may June which constituted 203 cases (25.5%). The incidence of both suicidal and accidental poisoning were more injury than in may June (Figures 1 and 2).

Nature of poison ingested

Table 6 shows the total number of poisoning was 799, insecticides group which constituted 245 (30.65%) which was most common cause of poisoning, out of which organophosphorus poisoning was 139 (17.39%), Carbamate 47 (5.88%) and organocholorine was 59 (7.38%) cases. Next common poisoning cause was drugs like Diazepam, Alprazolam, Crocin, Iron, were most commonly used. Out of 799 cases drug consisted 121 cases (15.14%). Then in order of frequency Aluminium phosphide figured as 3rd most common poisoning constituting 105 cases (13.14%). 4th most common cause of poisoning was rat killer constituting 83 cases (10.38%). However, in 106 cases (13.26%), the nature of poisoning was not known. Rest of the poisons was consumed quite less frequently (Table 6).

The present study shows that 24.53% of patients were agricultural workers, house wife were 21.77%, 19.89% of patients were student,

Status	Accidental (%)	Suicidal (%)	Homicidal (%)	Total (%)
Upper class	8 (1)	39 (4.88)	0 (00)	47 (5.88)
Middle class	34 (4.25)	137 (17.14)	0 (00)	171 (21.4)
Lower class	119 (14.89)	462 (57.88)	0 (00)	592 (74.09)

Table 4: Showing socio-economic status wise study of poisoning cases during the year July '2009 to dec'2011.

Sr. No.	Month	Total Cases (%)	Death (%) 163 (20.40%)	
			Male	Female
			118 (72.39%)	45 (27.60%)
1	January	16 (2)	2 (1.69)	1 (2.22)
2	February	13 (1.6)	5 (4.23)	0 (0.00)
3	March	41 (5.1)	7 (5.93)	0 (0.00)
4	April	36 (4.5)	3 (2.54)	6 (13.3)
5	May	110 (13.8)	15 (12.71)	9 (20)
6	June	93 (11.6)	11 (9.32)	5 (11.11)
7	July	117 (14.6)	15 (12.71)	6 (13.3)
8	August	201 (25.2)	36 (30.50)	7 (15.55)
9	September	87 (10.9)	9 (7.62)	3 (6.66)
10	October	28 (3.5)	3 (2.54)	0 (0.00)
11	November	34 (4.25)	5 (4.23)	5 (11.1)
12	December	23 (2.87)	4 (3.38)	3 (6.66)
	Total	799 (100)	72.39	27.6

Table 5: Showing month wise study of poisoning cases during the year July '2009 to dec'2011.

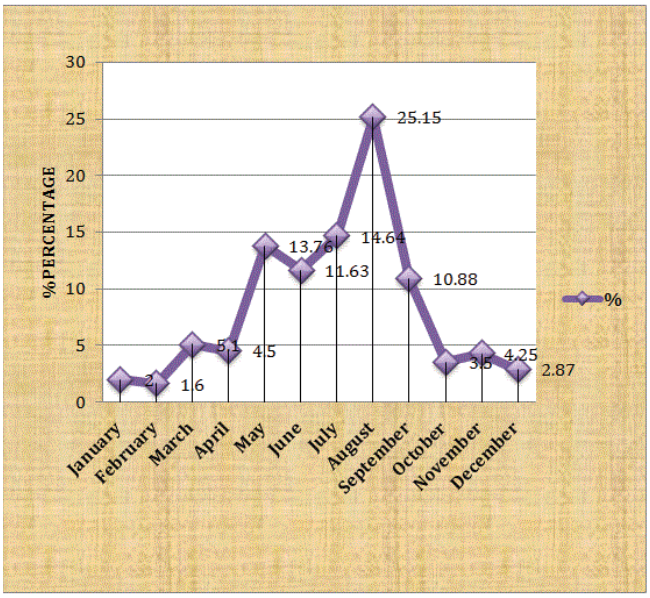

Figure 1: Maximum number of poisoning cases appeared in months of August (25.15%) followed by July (14.64%), May (13.76), June (11.63%) and September (10.88%). Thus in these months total 608 cases of poisoning were reported.

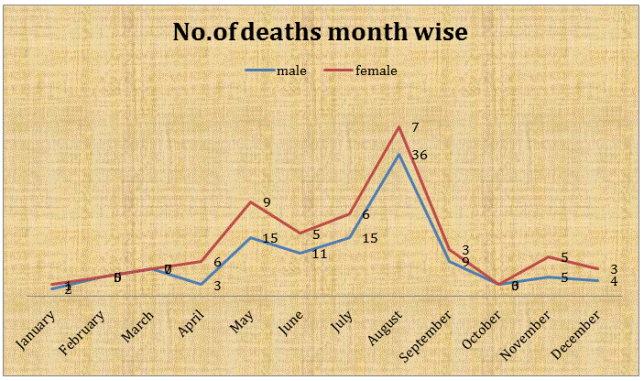

Figure 2: Out of 799 cases of poisoning 163 patients died which means 20.04% was mortality rate which was very high. Out of 163 deaths 118 were male and45 were female. Maximum deaths occurred in month of August (42) followed by May (24), July (21) and June (16). Total deaths in these months were 104. Out of these death cases 77 were male and 27 were female.

13.39% patients were unemployed and 12.76% were laborers. This could be due to easy availability and accessibility of poisons, particularly of insecticides by the agricultural workers. Accidental poisoning appears to be due to lack of knowledge, unsafe attitude and dangerous practices (Figures 3 and 4).

Rural area reported highest incidence of poisoning 590 (73.84%), rural area reported 192 cases (24.03%) whereas 17 cases (2.10%) were of undetermined origin (Tables 7 and 8).

Nature of insecticide poison ingested

Table 9 shows the total number of insecticide group which constituted 245 (30.65%) which was most common cause of poisoning, out of which organophosphorus poisoning was 139 (17.39%), Carbamate 47 (5.88%) and organocholorine was 59 (7.38%) cases. Among organophosphorus group, Diazinon (Tik-20) along was responsible for 46 cases. In carbamates group Apocarps (Baygon) was widely used, constituting 41 cases.

With reference to Table 10 majority of people i.e. 337 had taken poison orally, followed by inhalation (63), dermal (33) and parental (0).

Incidence of signs and symptoms in poisoning

On the basis of Table 11 shows that nausea and vomiting were found to be the most common complaint. In organophosphorus the most common sign was pupillary constriction followed by excessive salivation and sweating. In OPC 39% cases were admitted with cough with expectoration and 39% were of diarrhoea. Maximum 8% convulsion came in case of organophosphorus. Maximum hypotension resulted in case of aluminium phosphate (24%). Similarly breathlessness and cough with expectoration were also resulted highest in case of aluminium phosphate. In Rodenticide poisoning palpitation (65%) was the biggest complaints followed by nausea (56%) and abdominal pain (56.4%).

Table 12 shows that maximum number of people died because of aluminium phosphate (31.4%) followed by OPC (20%) and rodenticide (9.6%).

Discussion

The present study was carried out from July 2009 to Dec 2012 in

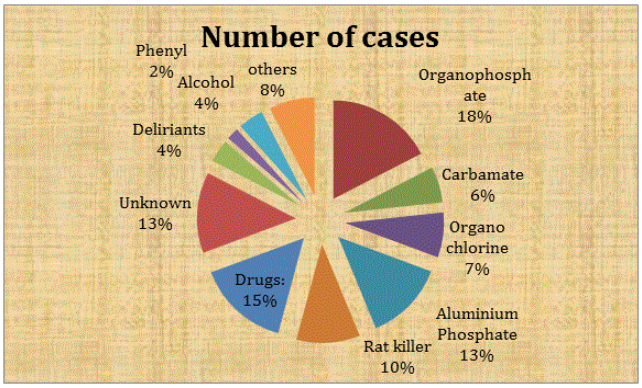

Figure 3: Maximum i.e. 33 deaths happened due to Aluminium phosphate followed by Organophosphate (32), Rat killer (19), Organocholorine (19), Carbamate (12), Unknown (11) and others (11).

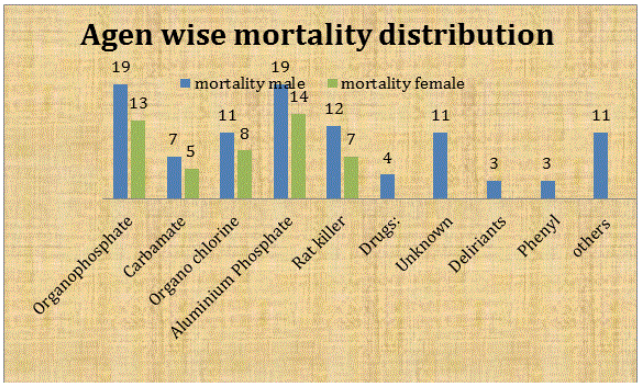

Figure 4: Maximum i.e. 33 deaths happened due to Aluminium phosphate followed by Organophosphate (32), Rat killer (19), Organocholorine (19), Carbamate (12), Unknown (11) and others (11).

Name of the poison	Number of cases (%)		Death (%) 163 (20.40%)	
			male	female
Organophosphate		139 (17.39)	19	13
Carbamate		47 (5.88)	7	5
Organo chlorine		59 (7.38)	11	8
Aluminium Phosphate		105 (13.14)	19	14
Rat killer		83 (10.38)	12	7
Kerosene Oil		8 (1)	3	0
Drugs:		121 (15.14)	4	0
Crocin	10	1.2 (%)	0	0
Iron	12	1.5	0	0
Diazepam	18	2.25	0	0
Alprazolam	21	2.62	0	0
Phenothiazine	14	1.75	0	0
Barbiturate	7	0.87	0	0
Others	39	4.88	0	3
Unknown		106 (13.26)	11	13
Deliriants		30 (3.75)	3	1
All-out		5	0	0
Phenyl		16	3	0
Alcohol		33	1	0
Camphor/pared		7	0	0
Spirit		4	1	0
Acid		7	0	1
Croton Speed		2	0	0
Cannabis (Bhang)		8	0	0
Zinc Phosphide		6	1	1
Copper Sulphate		3	1	0
Alkali		3	1	0
Herbicide		7	0	0
Total		799	97	66

Table 6: Showing the nature of poison ingested during the year July '2009 to dec'2011 (Total number of cases 799).

Occupation	No. of patients	Percentage (%)
Farmer	196	24.53
House wife	174	21.77
Labourer	102	12.76
Student	159	19.89
Driver	7	0.87
Govt job	40	5.2
Police	4	0.5
Dependent	6	0.75
Shop keeper	4	0.5
Others/Unemployed	107	13.39

Table 7: Occupation of Victims.

Areas	No of patients	Percentage	Death (%)
Rural	590	73.84	111 (68.09)
Urban	192	24.03	52 (31.90)
Undetermined	17	2.1	0
Total	799	100	163 (20.40)

Table 8: Rural/Urban distribution of victims. Distribution of nature of poisoning as shown.

MBS hospital, Kota. 799 cases of poisoning were taken as sample size. They were taken randomly. Observations of this study were compared with other available studies.

Table 13 shows that the incidence of poisoning (42.92%) was more common among the age group between 21 to 30 years. This correlates to the age distribution reported by other studies [21-24].

Name of the poison		Male	Female
Organophosphorus Group	Diazinon (Tik-20)	34 (73.91)	12 (26.080)
	Malathion (Kill bug)	31 (81.57)	7 (18.43)
	chlorpyriphos	30 (62.5)	18 (37.5)
	Other	2 (28.58)	5 (71.42)
Carbamate Group	Apocarps (Baygon)	24 (58.53)	17 (41.46)
	Carbamate(Sevin)	3 (50)	3 (50)
Organolorine Group	Endosulphan	39 (69.64)	16 (28.57)
	Lindale	2 (100)	0 (00)
	DDT	1	0 (00)

Table 9: Showing the nature of insecticide poison ingested brought to M.B.S Hospital, Kota emergency services during the year July '2009 to dec'2011 (Total number of cases 245).

Agent	OPC		Rodenticide		Alluminium Phosphate	
Route of administration	M	F	M	F	M	F
Ingestion	107	62	26	37	69	36
Inhalation	30	13	8	12	0	0
Parental	0	0	0	0	0	0
Dermal	30	3	0	0	0	0

Table 10: Study according Route of Exposure of Poisoning.

In this study, males were more affected (61.7%) than the females (38.27%). The maximum number of cases belonged to 21-30 years age group. Similar observations were made by Dalal et al. [14] males consisting 63% of cases of poisoning and still higher incidence was observed by Agarwal et al. [15] i.e. 72% cases of poisoning in males. Sharma et al. [16] also reported that poisoning cases were more in males than in females. In our study we had more number of accidental poisoning cases in males as compared to females (4:1). Majority of these cases was from rural areas, so probably inhalation of poison could have happened during their spray on crops.

The present study shows that 36.53% of patients were agricultural workers and labourers, house wife were 21.77%, this could be due to easy availability and accessibility of poisons, particularly of insecticides by the agricultural workers.

De alwis et al. [17] also found that 45% cases of poisoning were among agricultural farmers. Ingianna et al. [18] also observed increased incidence of occupational poisoning among agricultural workers. This study shows that highest number of poisoning cases were in lower socio-economic status 592 cases (74.09%), followed by middle class-171 cases (21.4%) and then the upper class which constituted 47 cases (5.88%) which was similar to other study [21,23].

The incidence of poisoning cases were found maximum in age group 21-40 years, out of these 483 cases 267 (55.27%) were married and 216 (44.72%) were single. In above 40 years category majority of people (97.24%) were married [25].

Similar observations were made by Mutalik et al. [19], Gupta et al. [12] and study by Vanishree et al. [26]. In present study majority of people i.e. 337 had taken poison orally. Mutalik et al. [19] and Gupta et al. [12] found that route of poisoning in majority of cases was oral. Maximum number of cases 349 (37.80%) consumed 51-100 ml of poison, out of total deaths, 43 (47.25%) belonged to this group.

In this study, amount of poison consumed was correlated with mortality, similar to the findings of Gupta et al. [12]. In this study, most

Signs and symptoms	Nausea/vomiting	Excessive salivation/ sweating	Pupillary constriction	Breathlessness	Cough with expectoration	Slurred speech	Muscle weakness	Convulsion	Giddiness	Irritability	Altered sensorium	Abdominal pain	Diarrhoea	Palpitation	Shock/hypotension.
Agent															
OPC	80.2%	69.12%	72.80%	13.03%	39%	4%	6%	8%	25.60%	11.40%	15%	34%	39.40%	56.66%	5%
Rodenticide	56%	13%	0%	16%	16%	2%	4%	0%	15%	2%	0.89%	56.40%	0	65%	2%
Alluminim Phosphate	34%	11%	0%	29%	46%	8%	2%	4%	40%	35%	19%	36%	0	35%	24%
Drugs	23%	9%	5%	3%	8%	18%	8%	1%	23%	9%	6%	11%	4%	23%	0
Others	15%	3%	4%	6%	13%	6%	1%	0%	16%	4%	7%	15%	9%	17%	0

Table 11: Incidence of Signs &symptoms in poisoning.

Outcome	Recovery		LAMA/Abscond		Death		% death	Total cases
Agent	M	F	M	F	M	F		
OPC	57	36	64	39	30	19	20%	245
Rodenticide	28	13	11	28	5	3	9.60%	83
Alluminim Phosphate	31	23	10	8	19	14	31.40%	105
Drugs	21	18	54	21	4	3	5.70%	121
Others	51	74	69	34	11	6	7.90%	215

Table 12: Outcome according Poisoning agent.

Age group (years)	Present study	Vishwanathan et al [11]	Kamat et al [8]	DE & Chatterjee [7]	Sarjit Singh et al [10]	Gupta et al [9]	Maka et al [11]
11 –20	199(24.90%)	0.464	0.44	0.3	0.45	0.37	0.265
21 –30	343(42.92%)	0.428	0.44	0.49	0.45	0.53	0.43
31 –40	140(17.52%)	0.053	0.06	0.09	0.05	0.1	0.19
41 –50	73(9.12%)	0.053	0.06	0.12	0.05	—	0.1
>50	25(3.12%)	—	—	—	—	—	0.015
	13(1.62%)						

Table 13: Comparison with other studies.

of the cases were suicidal (79.82%) and only (20.27%) of cases were accidental. Gupta et al. [12] found similarly out of total 60 cases studied, 55 patients had taken poison with suicidal intention.

In present study most of the patients were admitted to the hospital within 4-5 hours (31.96%) and within 3-4 hours (19.5%). Mortality was high in the patients who were admitted after 4-5 hours of consumption of poison (51.65%). This is comparable to the findings of Gupta et al. [20], where, all the cases that came after 8-10 hours of consumption of the compound died. This means that patient if bought for treatment early has more chances of survival.

Clinical manifestation

The frequency of various symptoms noted in organophosphorus poisoning is compared with other study from India [7-16,20]. In this study is the commonest symptoms were nausea/vomiting which was similar to the observation of other workers [7-20].

In this study aluminium phosphate resulted hypotension and breathlessness in (24%) cases. Chugh et al. [27] reported shock and ARDS main finding which was similar our study.

In this study aluminium phosphate resulted the dominant clinical feature is severe hypotension (54%) dizziness (40%), nausea, vomiting (34%). Gupta S, Singh S and Chugh SN et al. findings were similar to our study [28-30].

In rodenticide (zinc phosphide) poisoning case presenting symptoms as abdominal pain (66.4%), palpitation (65%) and sweating (66%) were reported. Chugh et al. [31] in their study of twenty cases of zinc phosphide ingestion (self-poisoning) profuse vomiting (100%), pain in abdomen (100%), palpitation and sweating (80%), dyspnea and tachypnea (75%), metabolic acidosis (60%), shock (40%), and hypotension (40%) were the most common presenting features. Five patients (25%) died. This was partially similar to our study.

In present study mortality rate in Aluminium phosphate (31.4%) which is much higher than mortality rate (6.41%) observed by Dalal et al. [14]. Probably they studied Endosulphan and aluminium phosphate combindly.

In present study, we observed mortality rate in organophosphorous poisoning (20%). Thomas et al., Atul et al. and Batra et al. also observed that Organophosphorus (OP) compounds cause most self-poisoning (20%) in India, probably due their easy easily availability of organophosphate pesticide [6,7,22].

In present study, mortality was due to Rodenticide poisoning (9.6%). Chugh et al. [30] were observed in 20 patient studies, that five patients (25%) were died.

Summary and Conclusion

This study was done in order to analyse the trends of poisoning

in Kota district keeping in mind various demographic factors. In this process a sample size of 799 poisoning cases was taken.

In the present study, the following observations were noted:

- Maximum numbers of patients 42.92% were in the age group between 21-30 years.
- Males (61.17%) were more frequently affected than the females.
- People from lower socioeconomic status (74.09%) consumed poison more frequently than the upper socioeconomic status (5.88%).
- Most people from rural areas (74%) were involved than from urban areas (24.03%)
- Married people (46.68%) were more frequently involved.
- In most of the cases (42.17%) route of poisoning was oral.

Total hospitalization period was less than 5 days in majority of cases. Among the total deaths reported, the majority (60%) was of patients arriving at the hospital after 6 h. Those patients (80% of total poisoning cases) who reached the hospital early, i.e. within 6 h, managed properly and were discharged from the hospital.

Commonest symptoms present were nausea/ vomiting (80.20%), papillary Constriction (72.80%) and sweating and excessive salivation (69.12%). occur in cases of organophosphorous poisoning. Hypotension, breathlessness and cough with expectoration were resulted highest (24%) in case of aluminium phosphate. In Rodenticide poisoning palpitation (65%) was the biggest complaints followed by nausea (56%) and abdominal pain (56.4%). The male preponderance appears to be due to more exposure to occupational hazards and stress or strain as compared with females in this part of the world.

In our study suicidal poisoning was leading 79.82%, and leading poisoning was Organo phosphorous group of compounds 30.65%. Next common poisoning by aluminium phosphates (13.14%), 3rd most common poisoning constituting rat killer constituting 83 cases (10.38%). poisoning cause was drugs like Diazepam, Alprazolam, Crocin, Iron, were most commonly used. Out of 799 cases drug consisted 121 cases (15.14%). Maximum number of poisoning cases appeared in months of August, July, May June and September this probably happened because these are months when harwasting of crops takes place in rural area and results are declared. Highest mortlity is in aluminium phosphide (31.4%) group. The mortality/morbidity in any case of acute poisoning depends on a number of factors such as nature of poison, dose consumed, level of available medical facilities and the time of interval between intake of poison and arrival at hospital etc. Suicide attempts among adults, especially in the age group of 21-30 years, could be due to lack of employment, break up in the family support system, failure of love affairs, an individual's frustrations, inadequacy to cope with some immediate situation, impulsive behaviours, stress due to job and family, etc.

Fatality estimates such as we have presented here under-represent the burden of disease because suicide has a long term impact on family, friends and work colleagues of the deceased. Furthermore, as we have shown, poisoning occurs predominantly in rural areas of low income group, and the intense medical care required to treat poisoned patients may impact greatly on already stretched healthcare resources particularly in rural areas - is urgently required to provide the evidence base to underpin public health strategies for poisoning in these region. The limited resources in government hospitals in terms of trained doctors, nurses, support personnel, laboratory facilities and finance, may be partially responsible for the high number of deaths. There is a need for a prospective study to determine whether dedicated staff, training, and evidence-based protocols can lead to significant decreases in in-hospital mortality. At the same time, discussions should be opened with the state Agricultural Ministry concerned targeted bans of pesticides.

Improving the availability of antidotes is an important factor that could improve outcomes.

To prevent such high incidence, exposure and death due to poisoning:

1. Sale of insecticide to the public should be strictly controlled by law.
2. Farmers and other people involved in spraying insecticides should be educated regarding prophylactic measures. They must be counselled to wear protective garments, not to spray at a stretch for more than 2 hours, and to avoid food intake in the spraying area. They should also to be informed to discontinue spraying on appearance of any of the symptoms and to avoid spraying in presence of any wound.
3. Facilities for prompt and adequate treatment of poisoning should be available in all hospitals.

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