STUDY OF PATTERN AND OUTCOME OF ACUTE POISONING CASES AT TERTIARY CARE HOSPITAL IN NORTH INDIA

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ABSTRACT

BACKGROUND

Poisoning is a global public health problem causing significant morbidity and mortality. It is important to know the pattern and outcome of acute poisoning cases for proper planning, prevention and management of these cases.

The aim of the study is to determine the mode (suicidal, accidental, homicidal) and type of poisoning in North Indian population; relation to age, sex, occupation, marital status; outcome of different type of poisons and requirement of ventilatory support in different type of poisonings.

MATERIALS AND METHODS

This observational study was conducted in Department of Medicine of a tertiary care hospital in North India. A total of 379 patients were enrolled in the study after obtaining informed consent.

RESULTS

Poisoning was more common among males (59.89%). Maximum number of patients were in the age group 21-30 years (40.63%) and consumption was found to be more prevalent in rural population (75.99%). Most of the patients were farmers and students. Most common types of poisoning were organophosphate (n=95, 25.07%), snake bite (n=77, 20.32%) followed by aluminium phosphide (n=71, 18.73%). Out of 379 patients, 318 (83.91%) improved while 61 (16.09%) expired. Mortality was highest in aluminium phosphide poisoning. Requirement of ventilatory support was most commonly associated with aluminium phosphide poisoning (37.89%) followed by organophosphate poisoning (28.42%).

CONCLUSION

Poisoning was more common in young males. Pesticides and snake bite were major causes of poisoning. Of the total, 318 improved while rest of the 61 expired. Mortality was higher with use of aluminium phosphide poisoning (57.38%), snake bite (21.31%) and organophosphate consumption (9.84%). Requirement of ventilator was most commonly associated with aluminium phosphide poisoning. We suggest strict statutory measures covering import, manufacture, sale, transport, distribution and use of pesticides. Training of peripheral health center personnel to manage cases of poisoning, to provide ventilatory support and escalation in public awareness about the importance of problem should be done.

KEYWORDS

Aluminium Phosphide, Organophosphate, Poisoning, Snake Bite, Ventilatory Support.

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BACKGROUND

Poisoning is a significant global public health problem. According to WHO data in 2012, an estimated 1,93,460 people died worldwide from unintentional poisoning. Of these deaths, 84% occurred in low- and middle-income countries. Almost, a million people die annually as a result of suicide with chemicals accounting for a majority of these deaths. It is assessed that deliberate ingestion of pesticides causes 3,70,000 deaths each year.[1]

Poisoning forms a major problem in developing countries also, though the type of poison and the associated morbidity and mortality varies from one place to another and it may change over a period of time. The exact incidence of poisoning in India remains uncertain, but 1 to 1.5 million cases occur every year, of which almost one third are fatal.

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It has been estimated that in India five to six persons per lakh of population die due to acute poisoning every year. Poisoning is the fourth most common cause of mortality in rural India.[2]

In north India, Aluminium Phosphide (ALP) and Organophosphate Poisonings (OP) are widely used to control pests and insects and have become major contributors of deaths due to poisoning.[3,4,5] In addition to that snake bite is a common medical emergency faced by rural population. Early diagnosis, treatment and prevention are crucial in reducing the burden of poisoning-related injury in any country. Very few studies have been done in north India regarding the epidemiology of poisoning as compared to South India.

This study has been aimed to determine the mode (Suicidal, accidental, homicidal) and type of poisoning in north Indian population; relation to age, sex, occupation, marital status; outcome of different type of poisons and requirement of ventilatory support in different type of poisonings.

MATERIALS AND METHODS

This observational study was conducted in Department of Medicine of a tertiary care hospital in North India over a period of one year. A total of 379 patients from 12 to 80 years admitted with diagnosis of poisoning/snake bite in medical wards of hospital were enrolled in the study after obtaining informed consent. The study was approved by the Institutional Ethics Committee. In all patients, a detailed history was taken, clinical examination was done. Data was obtained in prestructured proforma regarding age, gender, marital status, education status, occupation, residence, time elapsed after intake, circumstances, type of poison, requirement of ventilatory support, ICU stay, total hospital stay, complications and outcome.

The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 15.0 statistical Analysis Software. Chi-square test and Analysis of Variance (ANOVA) test were applied. Level of significance (p) <0.05 was considered as statistically significant.

RESULTS

Age and sex distribution of study population is given in Table 1. Out of 379 patients ranging from 12 to 80 years, 227 (59.89%) were males and rest 152 (40.11%) were females. Male:female ratio was 1:0.67. Median age was 25 years and mean age was 28.93±12.56 years. Maximum number of patients were in the age group 21-30 years (40.63%).

Approximately, one third of the patients (n=128; 33.77%) were illiterate. Educational status of 139 (36.68%) patients was up to high school, 52 (13.72%) intermediate and rest 60 (15.83%) were graduates/postgraduates. In the present study, poison consumption was found to be more prevalent in rural population (75.99%) as compared to urban population (24.01%). Majority of the patients in our study belonged to Hindu (91.29%) religion, followed by Muslims (7.39%) and rest 1.32% were Sikhs.

Out of 379 patients recruited in the study, 235 (62.01%) were married and rest 144 (37.99%) were unmarried. Most patients were from agrarian background (32.19%) followed by students (25.65%) and housewives (25.59%). Other professions included businessmen (5.28%), labourers (5.01%), driver (1.85%) and other unclassified professions (3.43%).

Motive of consumption of poison in majority of patients was suicidal (68.34%) and in rest of the patients, poison was consumed accidentally (31.66%). Non-marital family problems (46.33%) and marital discord (33.20%) were the most common reasons for consumption of poison (Table 2).

Organophosphate poisoning (n=95, 25.07%) was the most common type of poisoning followed by snake bite (n=77, 20.32%) and aluminium phosphide (n=71, 18.73%) as shown in Table 3. Among males, most common type of poisoning was aluminium phosphide poisoning (n=54, 23.79%) followed by snake bite (n=50, 22.03%) while among females most common type of poisoning was organophosphate (n=47, 30.92%) followed by snake bite (n=27, 17.76%).

In our study, 53.30% (majority) of patients came within 2 hours after consumption of poison while 32.19% patients reported between 2 to 4 hours (Table 4). Among patients who reach hospital between 2 to 4 hours, 77.05% improved and 22.95% expired. A statistically significant association of outcome and time lapse in reaching hospital was found.

Duration of hospital stay in the present study ranged from 1-20 days and mean duration of stay was 5.64±1.31 days (Table 5). Minimum hospital stay was found for aluminium phosphide (4.08±2.42 days), followed by alcohol (4.47±1.51 days), kerosene/diesel/petrol (4.50±1.73 days) while maximum stay was found for hair dye/oil (8.00±4.00 days) followed by snake bite (6.36±2.96 days) as shown in Table 5. Difference in duration of stay for different poisons consumed was found to be statistically significant (p<0.001).

Out of 379 patients enrolled in the study, 318 (83.91%) improved while 61 (16.09%) expired. Mortality was higher with use of aluminium phosphide poisoning (57.38%), snake bite (21.31%) and organophosphate consumption (9.84%). Requirement of ventilator was most commonly associated with aluminium phosphide poisoning (37.89%) followed by organophosphate poisoning (28.42%). Difference in requirement of ventilator for different poisonous substances was found to be statistically significant. Maximum ICU stay/ventilator stay was 60.00±16.97 hours for consumption of hair dye followed by that for organophosphate (50.74±31.78 hours), insecticides excluding organophosphates (36.00±16.97 hours), snake bite (35.65±22.28 hours), drug overdose (48.00±0.00 hours) as compared to other poisonous substances (Table 6).

Age (Years)	Male (n=227)		Female (n=152)	
	No.	%	No.	%
12-20	58	25.55	47	30.92
21-30	93	40.97	61	40.13
31-40	43	18.94	22	14.47
41-50	16	7.05	10	6.58
51-60	11	4.85	9	5.92
61 and above	6	2.64	3	1.97
Total	**227**	**100.00**	**152**	**100.00**
Range (Median)	**13-70 (25.00)**		**12-80 (25.00)**	
Mean±SD	**29.15±11.99**		**28.60±13.41**	

Table 1. Gender Wise Comparison of Study Population in Different Age Groups (n=379)

p=0.788

Reason	Male		Female		Total	
	No.	%	No.	%	No.	%
Marital discord	49	33.11	37	33.33	86	33.20
Love affair	11	7.43	0	0.00	11	4.25
Family problem (problem/altercation with family members other than spouse)	67	45.27	53	47.75	120	46.33
Financial difficulty	3	2.03	0	0.00	3	1.16
Addiction/Friend dispute/depression	9	6.08	6	5.41	15	5.79
Unknown	9	6.08	15	13.51	24	9.27

Table 2. Comparison of Reason for Consuming Poison in Males and Female Subjects in Suicidal Cases (n=259)

p=0.013

Type of Poison	Male (n=227)		Female (n=152)		Total (n=379)	
	No.	(%)	No.	(%)	No.	(%)
Organophosphate	48	21.15	47	30.92	95	25.07
Snake bite	50	22.03	27	17.76	77	20.32
Aluminium phosphide	54	23.79	17	11.18	71	18.73
Rat killer	12	5.29	14	9.21	26	6.86
Corrosive/acid/phenyl	9	3.96	17	11.18	26	6.86
Drug overdose	10	4.41	10	6.58	20	5.28
Insecticides (other than organophosphate)	11	4.85	5	3.29	16	4.22
Alcohol	15	6.61	0	0.00	15	3.96
Miscellaneous	9	3.96	6	3.95	15	3.96
Kerosene/Petrol/Diesel	3	1.32	1	0.66	4	1.06
Scorpion bite	0	0.00	3	1.97	3	0.79
Hair dye/oil	0	0.00	3	1.97	3	0.79
Unknown	6	2.64	2	1.32	8	2.11

Table 3. Comparison of Type of Poison Consumed by Male and Female Population (N=379)

p<0.001.

	Outcome					
	Expiry (n=61)		Improved (n=318)		Total (n=379)	
	No.	%	No.	%	No.	%
<2 hours	30	14.85	172	85.15	202	53.30
2-4 hours	28	22.95	94	77.05	122	32.19
5-8 hours	1	5.56	17	94.44	18	4.75
>8 hours	2	5.41	35	94.59	37	9.76

Table 4. Association of Time Lapse with Outcome

p=0.028 Row wise percentage.

Sl. No.		No.	Min.	Max.	Mean	SD
1.	Corrosive/acid/phenyl	26	3	8	6.15	1.22
2.	Organophosphate	95	1	15	6.26	1.84
3.	Rat killer	26	3	7	4.85	1.01
4.	Drug overdose	20	4	8	5.65	1.31
5.	Aluminium phosphide	71	1	9	4.08	2.42
6.	Alcohol	15	3	8	4.47	1.51
7.	Kerosene/Petrol/Diesel	4	3	6	4.50	1.73
8.	Hair dye/oil	3	4	12	8.00	4.00
9.	Snake bite	77	1	20	6.36	2.96
10.	Scorpion bite	3	1	8	5.00	3.61
11.	Miscellaneous	15	3	20	6.93	3.81
12.	Insecticides	16	1	8	5.44	2.00
13.	Unknown	8	5	8	6.00	1.07
	Total	**379**	**1**	**20**	**5.64**	**2.41**

Table 5. Duration of Hospital Stay in Different Poisons

p<0.001

Type of Poison	Male				Female				Requirement of Ventilator*		ICU Stay/Ventilator Stay (in hours)			Total	Expired	
	Improved		Expired		Improved		Expired								% Mortality	
	No.	%	No.	%	No.	%	No.	%	No.	%	n	Mn	SD		No.	%
Corrosive/acid/phenyl	9	4.84	0	0.00	17	12.88	0	0.00	0	0.00	0			26	0	0.00
Organophosphate	46	24.73	2	4.88	43	32.58	4	20.00	27	28.42	27	50.74	31.78	95	6	9.84
Rat killer	12	6.45	0	0.00	13	9.85	1	5.00	1	1.05	1	7.00	.	26	1	1.64
Drug overdose	10	5.38	0	0.00	10	7.58	0	0.00	1	1.05	1	48.00	.	20	0	0.00
Aluminium phosphide	26	13.98	28	68.29	10	7.58	7	35.00	36	37.89	36	9.67	9.87	71	35	57.38
Alcohol	14	7.53	1	2.44	0	0.00	0	0.00	2	2.11	2	36.00	16.97	15	1	1.64
Kerosine/Petrol/Diesel	2	1.08	1	2.44	1	0.76	0	0.00	1	1.05	1	24.00	.	4	1	1.64
Hair dye/oil	0	0.00	0	0.00	3	2.27	0	0.00	2	2.11	2	60.00	16.97	3	0	0.00
Snake bite	41	22.04	9	21.95	23	17.42	4	20.00	20	21.05	20	35.65	22.28	77	13	21.31
Scorpion bite	0	0.00	0	0.00	2	1.52	1	5.00	1	1.05	1	5.00	.	3	1	1.64
Miscellaneous	9	4.84	0	0.00	5	3.79	1	5.00	1	1.05	1	6.00	.	15	1	1.64
Insecticides	11	5.91	0	0.00	3	2.27	2	10.00	3	3.16	3	26.67	20.13	16	2	3.28
Unknown	6	3.23	0	0.00	2	1.52	0	0.00	0	0.00	0			8	0	0.00
Total	**186**	**81.94**	**41**	**18.06**	**132**	**93.42**	**20**	**6.58**	**95**	**100**	**95**	**29.40**	**27.60**	**379**	**61**	**16.09**
	p<0.001				**p=0.022**				**p<0.001**		**p<0.001**				**p<0.001**	

Table 6. Distribution of Patients by Type of Poisoning, Sex, Requirement of Ventilator and Outcome

DISCUSSION

Poisoning forms a major problem in developing countries. Although acute poisoning cases are second only to road traffic accidents in numbers, this is often a neglected health problem.[2]

In the present study, men (59.89%) outnumbered women (40.11%). A high proportion of poisoning among men in these productive years may be attributed to high degree of stress in academic, love affairs, financial and emotional fronts, inability to achieve targets and also due to easy accessibility to poisons. Many other studies have also shown that men outnumbered women.[3-19] However, some studies show that incidence of poisoning was more in women than men.[20,21,22]

Majority of cases (40.53%) were from age group 21-30 years (both in male and female). This can be explained by the fact that the persons of this age suffer from stress of the modern lifestyles, unemployment, marital problems, failure in love, failure in education, family problems, impulsive behaviour, etc. Past studies have also shown similar findings.[6-11,19,20,21,23,24] This might indicate the importance of specifically targeting this age group with early identification of stress factors and counselling.

In our study, we also found that approximately one third of the patients (n=128; 33.77%) were illiterate and nearly 76% were from agrarian background. This is due to fact that majority of patient in our study are from rural area where most of the persons are either illiterate or studied up to high school. Illiteracy also counts for the accidental cases of poisoning. This finding also shows that education is important in preventing poisoning.

This maybe because widespread use of pesticide in agriculture sector in rural area. Poverty, failure of crops, family problems and easy availability of the poison in their household made people of rural area more prone for poisoning. Other studies also show that poisoning are more common in rural areas.[3,8,16,25,26] However, some studies from state of Karnataka, the incidence was more in those who were from urban background.[9,12,24]

Majority of the patients in our study belonged to Hindu (91.29%) religion, followed by Muslims (7.39%) and rest 1.32% were Sikhs. Larger number of poisoning reported in the Hindu community is in all likelihood due to them forming a large part of population. Secondly, certain religions like Islam prohibit intentional poisoning.[10,23] Other studies also show that most of the patients were Hindus.[7,10,15,23,26,27]

Out of 379 patients recruited in the study, majority [235 (62.01%)] were married and rest 144 (37.99%) were unmarried. Consumption of poison was found in higher proportion of married females (65.79%) as compared to married males (59.47%) similar to other studies.[7,12,15,16,24,27] Poisoning are more common in married persons because they have more responsibility in comparison to unmarried persons, conflict with spouse, conflict with other family members.

Motive of consumption of poison in majority of patients in our study was suicidal (n=259, 68.34%) and in rest of the patients, poison was consumed accidentally (n=120, 31.66%). Among accidental majority (n=77, 64.17%) of cases were due to snake bite. Other studies also show the same trend.[6,8,14,20]

In overall population, family problems (46.33%) and marital discord (33.20%) were the most common reason of consumption of poison. In contrast to our study, Subhash Chandra Joshi et al studied that financial crisis was one of the most common reasons as the motive behind the poisoning (53.22%).[28]

Organophosphate and aluminium phosphide are common agents used for poisoning because of low cost and easy availability and since majority of patients in our study were from rural background and were farmers, they used these pesticides instead of other poisons. Snake bite is also common in our study because of predominance of people of rural area. Difference in choice of poisonous substances used by males and females was found to be statistically significant ($p<0.001$). Corrosive/acid/phenyl, organophosphate compounds, rat killer, drugs, hair dye/oil are easily available in home, so women select these poisons instead of others. Proportion of men was higher as compared to women for snake bite, petrol/diesel poisoning and alcohol intoxication. This be explained by the fact that alcohol addiction in India is more common in men. In rural India, men mainly work in the fields making them prone for snake bites. Petroleum products are easily accessible to men more in comparison to women. Among miscellaneous poisoning, we have noted poisoning with thinner, kanneer seed, 2,4-dinitrophenol sodium, nitrobenzene, glass powder, ethylene dibromide, Kanchmar, peppermint oil, benzene hexachloride, lizard bite, centipede bite and Bengal monitor bite.

Duration of hospital stay in the present study ranged from 1-20 days and mean duration of stay was 5.64±1.31 days. Minimum hospital stay was found for aluminium phosphide (4.08±2.42 days), followed by alcohol (4.47±1.51 days), kerosene/diesel/petrol (4.50±1.73 days) while maximum stay was found for hair dye/oil (8.00±4.00 days) followed by snake bite (6.36±2.96 days). Difference in duration of stay for different poisons consumed was found to be statistically significant ($p<0.001$). In aluminium phosphide poisoning cases, most of the patients expired within 1 to 3 days, this is the reason of less hospital stay, while in case of alcohol intoxication patients recover early therefore staying for less duration in hospital. Among 3 cases of hair dye poisoning, 2 were on ventilator for long time because of development of laryngeal oedema, therefore hospital stay was prolonged. Patients of vasculotoxic snake bite who had renal failure, had prolonged stay because those patients had to undergo regular dialysis.

Out of 379 patients included in our study, 318 (83.91%) improved while rest of the 61 (16.09%) expired. Majority of expiry was due to aluminium phosphide poisoning. Among patient who reach hospital within 2 hours, 85.15% patients improved and 14.85% expired. Among patients who reach hospital between 2 to 4 hours, 77.05% improved and 22.95% expired. This shows that getting medical treatment early is necessary to reduce expiry. However, percentage of expiry was less among patients who reach hospital between 5-8 hours and after 8 hours (5.56% and 5.41%, respectively), but this may be due to fact that among these groups majority of cases were snake bite that were either non-poisonous or it was dry bite.

Proportion of mortality was higher in use of aluminium phosphide (57.38%), snake bite (21.31%) and organophosphate (9.84%) as compared to other poisonous substances where mortality ranges from 0 to 3.28%. Other studies also show that aluminium phosphide was the poison, which was responsible for maximum number of deaths among poisoning cases.[3,10,25] In contrast to our study, some studies show that the poisons responsible for most of the mortality were organophosphate pesticides.[6,24]

Requirement of ventilator was most commonly associated with aluminium phosphide poisoning because in most of the patients of aluminium phosphide poisoning had either severe acidosis or cardiac arrest. In organophosphate poisoning, requirement of ventilator was due to respiratory depression, a complication seen in most of organophosphate poisoning cases.

Organophosphorus poisoning and snake bite patients improved on ventilatory support. Where ventilator/ICU support was not available, even there they improved with intubation and Artificial Manual Breathing Unit (AMBU) bag ventilation. Therefore, peripheral staff should be trained for timely intubation and respiratory support on AMBU bag.

CONCLUSION

In the present study, men outnumbered women. Majority of cases were from age group 21-30 years. Approximately, one third of the patients were illiterate. Poison consumption was found to be more prevalent in rural population. Majority were married. Most common profession of patients was agriculture followed by students and housewife. Most common type of poisoning cases reported overall was organophosphate followed by snake bite followed by aluminium phosphide. Proportion of mortality and requirement of ventilator was higher in case of aluminium phosphide poisoning. We suggest the government should regulate the import, manufacture, sale, transport, distribution and use of insecticides and pesticides. Upgrading the peripheral health centres to manage cases of poisoning in emergency including training of staff to give first aid treatment of poisoning (including timely intubation and respiratory support on AMBU bag) and availability of

antidote and anti-snake venoms and increase in public awareness about the seriousness of problem through health education.

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