ORIGINAL RESEARCH PAPER

Medicine

"A CLINICAL STUDY OF ACUTE ORGANOPHOSPHOROUS POISONING IN A TERTIARY CARE HOSPITAL IN NORTH-EAST INDIA WITH CORRELATION OF SEVERITY TO PROGNOSIS."

KEY WORDS:
Organophosphorous, POP Scale, Prognosis, Poisoning

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ABSTRACT

Organophosphorus compounds are common cause of pesticide poisoning worldwide leading to high morbidity and mortality especially in developing countries. We conducted a hospital-based observational descriptive study comprising of 406 patients with alleged history of organophosphorous ingestion in Fakhruddin Ali Ahmed Medical College Hospital, Assam over one year period to observe the clinical features and correlate severity with prognosis. In our study, the majority of patients were female(61.58%) and were in the third decade of life(39.16%). There was wide variety of clinical presentations. Accordingly, 51(12.56%) of total cases presented with mild severity, 348(85.71%) with moderate and 7(1.72%) with severe grade as per Peradeniya Organophosphorous Poisoning(POP) scale. 15 out of 348 patients(4.310 %) of moderate severity expired, while 6 patients(85.71%) died in severe category group. A total of 14 male(8.97%) cases died out of 156 and 7(2.8%) female cases died out of 250 cases.

INTRODUCTION

The World Health Organization estimates that three million pesticide poisoning occurs globally annually, of which minimum of 300,000 dies.[1] However, it represents only tip of iceberg as most cases are unreported from developing nations. Organophosphorus compounds are common cause of pesticide poisoning worldwide leading to high morbidity and mortality especially in developing countries, due to their low cost and easy availability.[2,3] Self poisoning by such compounds is estimated to kill around 200,000 people annually, mainly in Asia-Pacific region and mortality rate varies from 10-20%.[4] The incidence of organophosphorus poisoning in India was about 1.26 lakhs in 2007, as reported by Ravi et al.[5] The term organophosphorus(OP) is used for a wide variety of chemicals that are derived from phosphoric, phosphonic and phosphinic acids.[6] The most well-known are malathion, parathion, fenthion, diazinon, dimethoate, chlorpyrifos, paraoxon and soman.[7] They can be efficiently absorbed by inhalation, ingestion and skin penetration.[8] OP compounds are prevalent worldwide in household gardens and agriculture.

MATERIALS AND METHODS

We conducted a hospital-based observational descriptive study comprising of 406 patients presenting with alleged history of organophosphorous ingestion from 1/8/2017 to 31/7/2018 in Fakhruddin Ali Ahmed Medical College Hospital, Assam, a tertiary care hospital in North-East India after obtaining Ethical Clearance and satisfying the Inclusion and Exclusion criteria for the study. The patients with alleged history of organophosphorous ingestion within 6 hours of ingestion and who were at least 12 years age were included, however polysubstance abuse was excluded. Patients were thoroughly examined and necessary resuscitatory steps were taken promptly in the form of securing ABC, gastric lavage, decontamination, atropinisation, pralidoxime therapy and monitoring of vitals optimally. A comprehensive clinical and laboratorical workup was performed. On recovery phase, proper psychiatric evaluation was done before discharge and also advised for follow-up. Data was recorded in a preformed proforma. Informed consent was taken from eligible patients or legally authorized attendants. Medicolegal formalities were done. Clinical severity of poisoning was categorized according to Peradeniya Organophosphorous Poisoning(POP) Scale as proposed by Senanayke et al[9] in 1993. For laboratory investigations, routine tests were done. Statistical analysis of significance was performed wherever applicable using GraphPadInStat version 3.00 for Windows 7, GraphPad Software,San Diego California USA(www.graphpad.com).

PERADENIYA ORGANOPHOSPHOROUS POISONING(POP) SCALE[9]

PARAMETER	CRITERIA	SCORE
Pupil Size	>/= 2 mm	0
	< 2 mm	1
	Pinpoint	2
Respiratory Rate	< 20 / min	0
	>/= 20 / min	1
	>/= 20 / min with central cyanosis	2
Heart Rate	>60 / min	0
	41-60 / min	1
	<40 / min	2
Fasciculations	None	0
	Present, generalized / continuous	1
	Both generalized and continuous	2
Level of Consciousness	Conscious and rationale	0
	Impaired response to verbal command	1
	No response to verbal command	2
Seizures	Absent	0
	Present	1
0-3: MILD POISONING, 4-7: MODERATE POISONING, 8-11: SEVERE		

RESULTS AND OBSERVATION

In the study, the majority of patients were female(61.58%) with a Male: Female Ratio of 1:1.603. Majority of cases 159(39.16%) were in the third decade of life with a mean age of 22.2 ± 8.4 years. Majority of cases 209(51.48%) presented to hospital within 2 hours of ingestion with a mean interval of 1.20 ± 0.35 hours. There was a wide variety of clinical presentations like tachycardia in 166(40.9%), confusional state in 176(43.3%), fasciculations in 188(46.3%), tachypnea in 260(64.04%), bronchorrhoea in 84(20.67%), nausea in 320(78.81%), vomiting in 298(73.40%), miosis in 309(76.11%) and pin-point pupils in 240 patients(59.11%). The mean atropinisation dose is 36 +/- 6 amp (1 amp is 0.6mg) and the mean duration of total atropine therapy is 4.2 days. Accordingly, 51(12.56%) of total cases presented with mild severity, 348(85.71%) with moderate severity and 7(1.72%) were presented with most clinical severity as per POP scale. Aspiration pneumonitis was observed in 30 cases(7.40%) which occurred mostly within 3rd day of hospitalisation , recurrence(cholinergic crisis) was seen in 7 cases(1.72%) cases at around 3rd-5th day of hospitalization. The average duration of stay in the hospital was 5 +/- 2 days. Out of 406 cases, 385(94.83%)patients survived while 21(5.17%) cases expired. 15 out of 348 patients(43.10%) of moderate severity expired, while 6 patients(85.71) died in severe category group. A total of 14 male(8.97%) cases died out of 156 and a total of 7 female(2.8%) cases died out of 250 cases.

The following tables are encorporated for illustrated description of the data of this study.

TABLE NO 1: SEX DISTRIBUTION AND MORTALITY

Gender	Total no of patients	Percentage(%)	Number of patients died	Percentage (%)
Male	156	38.42	14	8.97
Female	250	61.58	7	2.80
Total	406	100	21	5.17

TABLE NO 2: AGE DISTRIBUTION

Age (years)	Number of patients	Percentage(%)
12 – 20	144	35.47
21 - 30	159	39.16
31 – 40	47	11.58
41 – 50	30	7.39
51 – 60	19	4.68
61 – 70	3	0.74
>70	4	0.98

TABLE NO 3: CLINICAL MANIFESTATIONS

Manifestations	Number of patients	Percentage(%)
INTERVAL OF EXPOSURE TO HOSPITAL CONTACT		
A. <2 hours	209	51.48
B. 2 To 4 hours	157	38.67
C. >4 hours	40	9.85
CARDIOVASCULAR		
1. Tachycardia	166	40.89
2. Bradycardia	84	20.69
3. Hypertension	20	4.93
4. Hypotension	70	17.24
NEUROLOGICAL		
1. Confusional state	176	43.35
2. Unconscious	40	9.85
3. Convulsion	4	0.99
4. Fasciculations	188	46.31
5. Diplopia	152	37.44
6. Miosis (</= 2 mm)	309	76.11
A. <1 mm	240	59.11
B. 1 to 2 mm	69	17.00
C. >2 mm	97	23.89
RESPIRATORY		
1. Tachypnea	260	64.04
2. Cyanosis	6	0.15
3. Bronchorrhoea	84	20.67
GASTROINTESTINAL		
1. Nausea	320	78.81
2. Vomiting	298	73.40
3. Excessive Salivation	260	64.39
4. Diarrhea	4	0.99
5. Abdominal cramps	80	19.70
COMPLICATIONS		
1. Aspiration Pneumonitis	30	7.40
2. Recurrence / Cholinergic Crisis	7	1.72
3. ARDS	3	0.74

TABLE NO 4: STRATIFICATION AS PER POP SCALE

Category	No. of patients (n=406)	Percentage (%)	No. of death (n=21)	% of death
Mild	51	12.57	0	0
Moderate	348	85.71	15	43.10
Severe	7	1.72	6	85.71

DISCUSSION

GENDER DISTRIBUTION

In our study, out of 406 subjects, 156(38.42%) were males and 250(61.58%) were females with a Male-Female ratio of 1:1.603(Table 1). Other studies I. Banerjee[10] and P. Karki et al[11] reported female predominance with Male-Female Ratio of 1:1.38 and 1:1.5 respectively. However, studies by S. Agarwal et al[12] and Sahin Colak et al[13] showed male preponderance with 65.3% and 52.2% respectively.

AGE DISTRIBUTION

Here, the youngest age was 13 years and the oldest age was 80 years with a mean age of 22.2 ± 8.4 years. Maximum number of cases were in the third decade of life 159(39.16%) of which female comprised majority 97(61.01%) followed by second decade 144(35.47%) of which 100(69.44%) were female and thirdly 47 cases(11.58%) in their fourth decade of which 30(63.83%)cases were female(Table 2).

N. Saraf et al[14] found 46% patients in 3rd decade of life. Ercan Gonduz et al[15] observed a mean age of 27.29 ± 11.4 years. Bhattarai N et al[16] found majority between 20-40 years. Rehimen et al[17] found majority in 15-25 years. I. Banerjee et al[10] reported mean age as 34.37 years. Sahin Colak et al[13] reported mean age of 39.4 ± 15.9 years.

INTERVAL BETWEEN EXPOSURE AND ADMISSION TO HOSPITAL

Majority of cases 209(51.48%) presented to hospital within 2 hours of ingestion of organophosphorus compounds with mean interval of 1.20 ±0.35 hours. A total of 157(38.67%) of cases came to hospital within 2-4 hours of ingestion and remaining 40(9.85%) presented after 4 hours of ingestion(Table 3).

P. Karki et al[11] showed maximum(90%) presentation within 2 hours. Bhattarai et al[16] showed maximum presentation within 2 hours(57.4%) and between 2-4 hours in (29.8%)cases. The mean interval between poison consumption and admission to hospital was 4.4 hours(Mean ± S.D.: 4.4± 2.29) in I. Banerjee et al[10].

CARDIOVASCULAR SYSTEM MANIFESTATIONS

This study showed 166(40.9%) patients having tachycardia while only 84(20.7%) of patients had bradycardia. Further 20(4.9%) of patients had hypertension while 70(17.2%) of patients had hypotension(Table 3). P Karki et al[11] showed similar findings with tachycardia(40.5%), hypertension(13.5%) and hypotension(10.8%). S Agarwal et al[12] showed tachycardia(24%), bradycardia (6.6%), hypertension (10.8%) and hypotension(2.4%).

NERVOUS SYSTEM INVOLVEMENT

Out of 406 cases, 176(43.3%) were in confused state, 40(9.9%) were unconscious, 4(0.9%) had seizures and 188(46.3%) had fasciculation, 152(37.44) had diplopia(Table 3).

G. Someswar et al[18] found disturbed consciousness in 72% and fasciculations in 44% cases. S. Agarwal et al, 2006[12] found confusion in 43%, coma in 1.6%, convulsions in 0.8%, fasciculations in 1.8%. N. Saraf et al[14] reported fasciculation in 56% of cases.

RESPIRATORY SYSTEM INVOLVEMENT

In this study, tachypnea was the most predominant respiratory feature:260(64.04%)cases. Cyanosis was observed in 6(1.5%) and bronchorrhea in 84(20.67%) cases(Table 3).

S. Agarwal et al, 2006[12] showed cyanosis in 2.4% and bronchorrhea in 21.6%. G. Someswar et al[18] reported tachypnea as the major manifestation(86%).

GASTROINTESTINAL INVOLVEMENT

Majority of cases 320(78.81%) presented with nausea and 298(73.40%) vomiting while 260(64.39%) with salivation, 4(0.99%) cases had diarrhoea and 80(19.70%) had abdominal cramps(Table 3)

S. Agarwal et al[12] reported vomiting as the dominant symptom in 96.8% cases while 82.1% had nausea, 61.1% had salivation and 35.6% had abdominal cramps. I. Banerjee et al[10] showed majority(47.93%) cases having nausea and vomiting. Sahin Colak et al[13] showed vomiting in 79% cases.

EYE INVOLVEMENT

In our study, 309(76.11%) of patients had miosis at the time of

presentation. Out of 406 cases, 97(23.89%) cases had pupil size >/= 2mm, 240(59.11%) i.e. majority of cases had pupil size 1mm or less. Rest 69(17 %) patients had pupil size of <2mm but not pinpoint pupil(Table 3)

S. Agarwal et al[12] reported pinpoint pupil in majority(66.1%). I. Banerjee et al[10] also showed predominance of miosis as the eye manifestation(91.94%). Makwava Prakash et al[19] showed pupil size of >2mm in 40% cases, and 36% having pupil size < 2mm. G. Someswar et al[18] noted 52% cases with miosis.

DOSE OF ATROPINE

The mean Atropinisation dose was 36 ampoules (0.6 mg/ampoule) +/- 6 ampoules. However the smallest dose was 2 ampoule and the largest dose administered was 900 ampoules for proper atropinisation. The mean duration of total atropine therapy was for 4.2 days.

CLINICAL SEVERITY AND PROGNOSIS ON BASIS OF GRADING OF SEVERITY BY POP SCALE[18]

In the study, 51(12.56%) of total cases presented with mild severity, 348(85.71%) with moderate severity and 7(1.72%) were presented with severe clinical severity. 15 out of 348 patients(4.310%) of moderate severity expired, while 6 patients(85.71%) died in severe category group. No death occurred in mild group(Table 4). The statistical analysis showed p value <0.0001,which is extremely significant.

A study published In International Journal of Clinical Cases and Investigations showed 50% of cases studied in moderate severity, 5% in severe grade. The 85% of patients who expired belonged to moderate and severe grade. This study shows high compatibility with our study. Makwava Prakash et al[19] reported that 75% cases of severe disease expired. N. Saraf et al[14] reported that 31 cases(96.9%) with mild grade poisoning survived. Only 1 patient(3.1%) in mild grade and 41.2% in moderate grade expired. There was only 1 case in severe grade which expired.

COMPLICATIONS

Aspiration Pneumonitis was observed in 30 cases(7.40%) occurring mostly within 3rd day of hospitalisation , recurrence(Cholinergic Crisis) was seen in 7 cases(1.72%) at around 3rd-5th day of hospitalisation and ARDS in 3 cases(0.74%) at around 4th-7th day of hospitalization(Table 3). S K Tripathy et al[20] observed aspiration in 15% cases and ARDS in 18% cases.

DURATION OF STAY

The average duration of stay in hospital was 5 +/- 2 days, however the shortest stay before discharge was of 24 hours and longest stay was of 21 days.

MORTALITY

Out of 406 cases, 385(94.83%) cases survived while 21(5.17%) cases died. A total of 14 male(8.97%) cases died out of 156 and a total of 7 female(2.8%) cases died out of 250 cases(Table 4). Death was maximum(11 cases,52.38%) during the first 24 hours, followed by 5 cases(23.81%) by next day, and there have been 4 cases(19.05%) to die after 10 days since presentation. The earliest death was within five minutes of presentation and the longest time since death was 19 days of stay. In a study by S Agarwal et al[12], P. Karki et al[11], Makwava Prakash et al[19], S K Tripathy et al[20] and Rehimen et al[17], mortality of cases was reported to be 6.2%, 8.1%, 8%, 10% and 14% respectively.

CONCLUSION

Organophosphorous poisoning is a common cause of poisoning in rural areas where agriculture is given prime importance. Since our study area is nearby rural terrain, this type of poisoning is of high incidence. Proper pesticide training & first-aid management of organophosphorous poisoning is prudent in reducing the mortality & morbidity.

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