CLINICAL PROFILE OF ORGANOPHOSPHOROUS POISONING: A HOSPITAL BASED STUDY

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ABSTRACT: BACKGROUND: Pesticides poisoning constitutes one of the most frequent poisoning in clinical practice all over the country and especially in this area where agriculture is the chief economic occupation. Acute organophosphorous poisoning ranks foremost in the list of agents which causes acute pesticide poisoning in the developing countries. Acute poisoning, accidental or due to deliberate ingestion or inhalation of these organophosphate chemicals is an important and one of the most common medical emergencies. Hence the present study is undertaken to evaluate demography and the clinical profile of organophosphorous poisoning cases admitted in Government General Hospital, Kakinada, Andhra Pradesh. **AIMS & OBJECTIVES:** Assessment of demography and the clinical profile of 50 patients with Organophosphorous poisoning. **MATERIALS AND METHODS:** In this descriptive study fifty patients with organophosphorous insecticide poisoning were evaluated by clinical examination. They were investigated and the results were analyzed. **RESULTS:** 1. The OP poisoning was most common in young adult males between the age group 16-30 years i.e 62% mostly belonging to rural area i.e 72%. 2. Oral route of exposure is the most common mode of poisoning i.e in 84% of cases often with suicidal intent. While accidental inhalational exposure and/or skin contact is evident in 16% of cases only. 3. Chlorpyrifos and monocrotophos (together 66%) were the most commonly used pesticides of the organophosphorous group in the present study. 4. CNS manifestations (82% of cases) in the form of altered sensorium, muscular twitchings/fasciculations were the most common presentation, apart from vomiting probably related to oral ingestion. Miosis is observed in 66% of cases only. 5. 36% of patients presented with respiratory manifestations in the form of frothing, cough and pulmonary secretions while frank pulmonary edema was noticed in 22% of case.

KEYWORDS: Organophosphorus poisoning, Mechanical Ventilation, Cholinesterase.

INTRODUCTION: Organophosphorus poisoning constitutes one of the most frequent poisoning in clinical practice all over the country and especially in this area where agriculture is the chief economic occupation. This is because of their wide and easy availability and occupational exposure with inadequate or inappropriate protective measures. Acute organophosphorous poisoning ranks foremost in the list of agents which causes acute pesticide poisoning in the developing countries. In India, Organocompounds (OPCs)-organophosphates and organocarbamates, are the commonest pesticides used and due to their easy availability, there is wide spread abuse of these compounds with suicidal intent. According to the WHO, one million serious accidental and two millions suicidal poisoning due to pesticides occur worldwide every year, of which 200000 patients' die, with most deaths occurring in developing countries.⁽¹⁾ In India no nationwide epidemiological studies have been undertaken, so It is not possible to know about the exact of problem and change in pattern over the year.

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Acute poisoning, accidental or due to deliberate ingestion or inhalation of these organophosphate chemicals is an important and one of the most common medical emergencies. Especially deliberate self-poisoning has become an increasingly common response to ever increasing emotional distress especially in adolescents and young adults. A good number of beds in medical intensive care units all over the country and also most developing countries are often occupied by pesticide poisoning cases. Hence the present study is undertaken to evaluate the clinical profile of organophosphorous poisoning cases admitted in Government General Hospital, Kakinada, Andhra Pradesh.

MATERIAL AND METHODS: Fifty patients with all egedorganophosphorous insecticide poisoning attended the department of medicine Rangaraya medical college, Kakinada, A. P. were taken up for this study after informed and written consent.

Detailed history was taken in each case from patient and attendants. A meticulous physical examination was done on each of them at the time of admission and diagnosis of poisoning was suspected from the following particulars:

- History of exposure, which was conceded to by most patients when they were brought to the hospital.
- Characteristic garlic or Kerosene like odour which was present on most of the patients who had consumed this insecticide.
- Corroborative evidence was also collected in the form of containers collected from the site by family members.
- Characteristic symptoms and signs of the poisoning like frothing from mouth, diarrhea, miosis, fasciculations, pulmonary edema or respiratory paralysis.

As soon as OP poisoning was suspected stomach wash and a good whole body wash with soap and water were done and stomach contents were sent to Forensic laboratory for chemical analysis.

RESULTS: In the present study:

- The OP poisoning was most common in young adult males between the age Group 16-30 years i.e 62% mostly belonging to rural area i.e 72%.
- Oral route of exposure is the most common mode of poisoning i.e in 84% of cases often with suicidal intent. While accidental inhalational exposure and/ or skin contact is evident in 16% of cases only.
- Chlorpyriphos and monocrotophos (together 66%) were the most commonly used pesticides of the organophosphorous group in the present study.
- CNS manifestations (82% of cases) in the form of altered sensorium, muscular twitchings/ fasciculations were the most common presentation, apart from vomiting probably related to oral ingestion. Miosis is observed in 66% of cases only.
- GI Gastrointestinal symptoms in the form of diarrhea, vomiting, abdominal pain and salivation were fairely common presenting feature as understandably most of the cases (84%) had consumed the poison orally. Vomiting in 25 cases (50%) and profuse diarrhoea in 6(12%) cases. In our study hypersalivation was observed in 18(36%) of cases and hyperactive bowel sounds in 8(16%) of cases.
- 36% of patients presented with respiratory manifestations in the form of frothing, cough and pulmonary secretions while frank pulmonary edema was noticed in 22% of cases.

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DISCUSSION: The organophosphorous compounds belong to the phosphorothionate class of chemicals. They are insecticidal and hence their toxic properties results from their ability to phosphorylate and inactivate certain esteratic enzymes in insects.

In man, most cholinesterase in the nervous tissue and erythrocytes is acetylcholinesterase, whereas cholinesterase in the liver, plasma or serum is pseudocholinesterase. Inhibition of these enzymes by organophosphates is a result of firm binding of phosphate radicals of the organophosphates to the active sites of the enzymes, forming phosphorylated enzymes. The clinical features are due primarily, if not entirely, to inhibition of acetylcholinesterase of the nervous system, resulting in accumulation of acetylcholine at the synapses. This excess of acetylcholine initially stimulates, then paralyzes transmission in cholinergic synapses, sparing adrenergic synapses. The cholinergic synapses are in CNS, somatic nerves, ganglionic synapses of the autonomic nerves, parasympathetic nerve endings and sympathetic nerve endings to sweat glands.⁽²⁾

Majority of agents show some signs and symptoms of toxicity within 6 to 12 hours after exposure with the exception of the highly fat-soluble compounds (Fenthion, difenthion, chlorfenthion). Some agents that may have delayed onset of symptoms include those compounds that require hepatic activation to convert the substance to its active toxic state (e.g., parathion to paraoxon).

With the exception of the fat-soluble agents, it was initially believed that most organophosphorous residues were eliminated within the first 48 hours after exposure. Newer data suggest these residues may remain for days to weeks, even after successful treatment of initial symptoms. AChE, if not regenerated by nucleophilic oximes such as the antidote pralidoxime, must be generated at the nerve terminal, a process that may take several months.

There are two main methods of detoxifying organophosphates, viz- a) Sulphur of parent compound replaced by oxygen to form oxygen analogues. b) Aromatic side chain substituted again by oxygen.

In the present study of 50 cases of Organophosphorous poisoning the peak incidence of this poisoning was in the age group of 16 to 30 years i.e., 62% and also there is gross male preponderance in the ratio of 4:1 (M:F) and 72% of our cases were from rural area while 28% cases were from urban area. Thus markedly higher incidence of O.P. poisoning was observed in young adult males mostly belonging to rural area and correlates well with and similar observations made in various studies, like Agarwal in 1993,⁽³⁾ Yamashita et al 1997,⁽⁴⁾ and Emerson et al in 1999.⁽⁵⁾

Alleged Motive of Poisoning: In our study consumption of organophosphorous poisoning with suicidal intent is a common motive in 39 cases (78%). In 11 cases (22%) mostly accidental in nature in the form of accidental inhalation and skin contact while spraying the insecticide without adequate personal precautions.

Portal of Entry: Organophosphates enter into man through 1.Oral ingestion- Suicidal, Accidental, Homicidal. 2. Respiratory-Occupational, Accidental, Wars 3. Skin-Occupational, Accidental 4. Conjunctiva-Occupational, Accidental 5. Parenteral-mostly in animal experimentation & rarely in man.

Absorption of organophosphates in most instances of occupational poisoning has been through the skin and respiratory tract. The most common incidence has been in agricultural workers, during or shortly after spraying of crops, or less commonly in industrial workers during manufacture,

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formulation or transportation. With increasing use of these insecticides, there have been more instances of accidental exposure especially in children, by dermal exposure, inhalation or ingestion. Dermal absorption notably increases with increasing skin temperature, cuts and some solvents applied especially amines.

There have been some instances of poisoning after ingestion of food sprayed with one of the more persistent insecticides when there had been insufficient time for hydrolysis of the insecticide. Poisoning by ingestion for the purpose of suicide, or rarely homicide, has been a most common cause of organophosphorous poisoning death.

In most cases of serious organophosphate poisoning, parathion or methyl parathion has been responsible. Self-poisoning with suicidal intent is a major problem in developing agricultural countries such as India and Sri Lanka, and is responsible for over 90% of exposures.

In this study the majority of cases 42(84%) had ingested the poison orally. 5(10%) had inhalational exposure and 3(6%) had skin contact as well as inhalational exposure while spraying crops with these insecticides. This is in sharp contrast to Namba et al in 1971⁽²⁾ mentioning occupational organophosphorous poisoning by accidental inhalation is the major route of poisoning. Probably in the earlier days adequate personal precautions were either not advocated or not followed strictly. Hence, majority cases were due to accidental inhalation in olden days. However, in the present days, enlistment of the all the precautions over the containers by manufacturers and wide publicity in the audio visual media made this route of poisoning less frequent and oral ingestion was the major route of poisoning at present all over the country and so in the present study.

Nature of Organophosphorous Compound used: Pesticides comprise a wide range of compounds including insecticides, herbicides, fungicides, Rodenticides and Fumigants. Insecticides are classified as Organophosphates, carbamates, Organochlorines, pyrethrum and synthetic pyrethroids. In India organophosphorous poisoning is the commonest poisoning.

The commonly used organophosphorous compounds are 1. Chlorthion 2. Dioxanthion Dimethoate 3. EPN (Ethoxy-4 nitrophenoxy phenyl phosphinesulphide) 4. Fenthion OMS-2 5. Parathion (Ethyl) 6. Trichlorfon 7. Abate (OMS-786) 8. Gardona 9. Fenitrothion (OMS-43 10. Phorate (Thimet) 11. Diazinon 12. (Cygon) 13. Malathion OMS-1 14. Acephate (Orthene) 15. Methyl parathion. 16. Ronnel. 17. Dichlorvos. 18. Naled (Dibram) 19. Chlorpyrifos (Dursban, Lorsban) 20. Dicapthion (OMS-214) 21. Monocrotophos (Azodrin).

Organophosphorous compounds were classified clinically on the basis of toxicity as most dangerous: TEPP, Disulfoton. Thiodemeton, Ditionsystox, Paraxon, BSI, Demeton (E 600), Mevin Phos, ISD: EPN, Schradan, Metacide, Methyl Parathion, Monocrotophos, Dicrotophos. Dangerous: Phosphamidon, Carbophenothion, coumaphos, Chlorpyrifos. Less dangerous: Methyl Dimeton, Dimethoate, Phostex, Dicapthion, Orthophosphate, Trichlofor. Least dangerous: Chlorthion, Ruelene, Malathion, and Runnel.

In our study the commonest poison patients were exposed to the chlorpyrifos, 24 (48%), followed by monocrotophos 9(18%), as chlorpyrifos compound also used against termites during construction of new houses and also widely used for paddy crops. Monocrotophos is also used by most agriculturists because it is an effective pesticide for rice and chilli pests.

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Symptoms and Signs: Signs and symptoms of organophosphorous poisoning are attributable mainly to the accumulation of acetylcholine at the cholinergic synapses and may be classified into muscarinic (Parasympathetic), nicotinic (Sympathetic and motor) and central nervous system manifestations according to the site of action.⁽⁵⁾ The time interval between the exposure and onset of symptoms varies with the route and degree of exposure.

Central Nervous System: Central Nervous System signs and symptoms were most commonly observed in this study. 41 patients (82%) presented with various neurological manifestations in the form of altered sensorium (62%), fasciculations (24%) or convulsions (2%), motor weakness 4%. 5(10%) cases presented with stupor and 3(6%) with unconsciousness. This observation is in agreement with Wadia and Sadagopans (1974),⁽⁶⁾ study where they found 10 per cent of cases with impairment of consciousness. Of the 5 cases who had accidentally inhaled the insecticide, 4 had predominantly CNS symptoms. This highlights the fact that the CNS is the most susceptible organ system in organophosphorous poisoning, whatever may be the route of administration.

Miosis is the commonest characteristic feature observed in 66% of patients. In our study, only 4% had intermediate syndrome in the form of neck, proximal muscle weakness and mild respiratory paralysis observed on day 3 and were kept on mechanical ventilatory support and recovered by 7th day. However Wadia et al (1974)⁽⁷⁾ study revealed miosis in almost all cases (95%) fasciculations in 27%, coma in only 10% and paralysis in 26%.

Gastrointestinal Tract: Gastrointestinal symptoms in the form of diarrhea, vomiting, abdominal pain and salivation were common presenting feature as understandably most of the cases (84%) had consumed the poison orally. Vomiting in 25 cases (50%) and profuse diarrhoea in 6(12%) cases. In our study hypersalivation was observed in 18 (36%) of cases and hyperactive bowel sounds in 8(16%) of cases.

Respiratory System: In our study 36% of cases had respiratory symptoms at the time of admission in the form of cough, breathlessness and frothing at the mouth. However 11 patients i.e. 22% had pulmonary edema at the time of admission or during hospital stay.

In our study out of 17 cases of severe poisoning 11 (64.70%) had signs of pulmonary edema and 6 had no signs of pulmonary edema. Among the 11 cases of pulmonary edema 5 patients were expired and 6 survived. In our study, only 5 cases had neurogenic respiratory depression. However, 2 of them due to intermediate syndrome could be revived while the other 3 with central respiratory depression and coma expired despite ventilatory support.

Cardiovascular System: In our study it was observed that tachycardia in 20%, hypertension in 8%, hypotension in 4% of cases and bradycardia was present in 2% of cases.

Rath and Sahu¹⁹⁸³⁽⁷⁾ observed bradycardia in 38.2% of patients, tachycardia in 26.5%, hypotension in 17.6% and hypertension in 14.7% and the findings in the present study were not correlating with their study.

Saadeh et al in 1997⁽⁸⁾ found that cardiac complications often follow OP poisoning and the disorders reported range from hypotension or hypertension to arrhythmias and cardiac arrest.

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Age group distribution	No. of Patients	Percentage
1. 11-15	2	4
2. 16-20	13	26
3. 21-25	15	30
4. 26-30	3	6
5. 31-35	7	14
6. 36-40	3	6
7. 41-45	2	4
8. 46-50	3	6
9. 51-55	19	2
10. 56-60		-
11. 61-65	1	2

Table 1: Age group distribution of 50 cases of organophosphorous poisoning

In our study 62% of patients were in the age group of 16-30 years i.e the poisoning is most common in adolescents and young adults than at extremes of age.

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Sex	No. of Patients	Percentage
Male	40	80
Female	10	20

Table 2: Sex Distribution

OP poisoning was consumed mostly by males i.e. 80% cases were males.

Area	No. of cases	Percentage
Rural	36	72
Urban	14	28

Table 3: Demography (Rural/Urban distribution)

Most of these cases were from rural area, as this district is rich agricultural area. And hence easy availability of these pesticides.

Purpose of poisoning	No. of Patients	Percentage
Suicidal	39	78
Accidental	11	22
Homicidal	-	-

Table 4: Alleged motive of OP poisoning in the present study

In our study consumption of OP poisoning with suicidal intent is a common motive. The other modes of poisoning are mostly of accidental in nature.

Portal of entry	No. of Patients	Percentage
1. Oral	42	84
2. Inhalation	5	10
3. Skin contact and inhalation	3	6

Table 5: Portal of entry of OP insecticide observed in the present study

Oral ingestion is the most common mode of OP poisoning observed in present study, most of them with suicidal intent. Inhalation while spraying is the next common mode.

An attempt is made to know the exact nature of OP compound by identification of container at the consumption site and other enquiries. The following is the list of compounds identified.

Nature of organophosphate used.

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Organophosphate used	No. of Patients	Percentage
1. Acephate	5	10
2. Monocrotophos	9	18
3. Triazophos	5	10
4. Chlorpyriphos	24	48
5. Malathion	1	2
6. Profenophos	1	2
7. Dimethoate	4	8
8. Phorate	1	2

Table 6

The above distribution shows Chlorpyriphos is the most widely used compound in this region, as this compound is also used as anti-Termite agent during construction of new houses

The following is the Incidence of various symptoms noticed at the time of admission in the present study.

Respiratory Symptoms	No. of Patients	Percentage
1. Cough	6	12
2. Breathlessness	1	2
3. Frothing	11	22
CNS Symptoms		
1. Restlessness	5	10
2. Drowsiness	21	42
3. Muscle twitching	5	10
4. Convulsions	1	2
5. Stupor	5	10
6. Coma	3	6
Gastrointestinal Symptoms		
1. Crampy pain abdomen	2	4
2. Vomiting	25	50
3. Diarrhoea	6	12

Table 7

In the present study, Drowsiness was noticed in 21 cases (42%) followed by Muscle twitching in 5 cases (10%), Restlessness in 5 cases (10%), Stupor in 5 cases (10%), Vomiting in 25 cases (50%), Frothing at the mouth in 11 cases (22%) constitute the most frequent prominent symptoms. Majority of cases were presented with neurological symptoms.

Respiratory Signs	No. of Patients	Percentage
1. Pulmonary oedema	11	22
2. Wheeze with rales	2	4

Table 8: Incidence of respiratory signs observed in this study were

Pulmonary oedema was noticed in 11 cases (22%) and Wheeze with rales in 2 cases (4%).

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Gastrointestinal signs	No. of Patients	Percentage
1. Hypersalivation	18	36
2. Hyperactive bowel sounds	8	16

Table 9: The following is the Incidence of gastrointestinal signs in the present study

Most of the cases i.e. 36% were presented with Hypersalivation.

In O.P. poisoning CNS involvement is early and most frequent. The following is the incidence of CNS signs in the present study.

CNS Signs	No. of Patients	Percentage
1. Altered sensorium	31	62
2. Coma	3	6
3. Miosis (< 2 mm dia)	33	66
4. Fasciculations	12	24
5. Motor weakness	2	4

Table 10

Miosis is the most common sign observed in the present study. i.e. in 33 cases (66%)

The following table shows the Incidence of cardiovascular signs in the present study.

Cardiovascular parameters	No. of Patients	Percentage
1. Heart rate		
a) <60	1	2
b) 61-100	39	78
c) 101-150	9	18
d) > 150	1	2
2. Blood pressure		
a) < 100 mm Hg Systolic	2	4
b) normal	44	88
c) > 140/90 mm Hg	4	8

Table 11

Bradycardia was noticed in one case (2%), tachycardia in 10 cases (20%), hypotension in 2 cases (4%) and hypertension in 4 cases (8%).

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Fig. 1: Histogram showing age-group distribution of organophosphate poisoning

Fig. 2: Pie diagram showing Portal of entry of OP insecticide

Fig. 3: Histogram Comparing occurrence of CNS signs in organophosphorous poisonings

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