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Original Articles

Predictors of Morbidity & Mortality in Organophosphorus Poisoning: A Case Study in Rural Hospital of Karnataka

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Abstract

Organophosphorous pesticides poisoning can result from occupational, accidental or intentional exposure. Clinical manifestations include cholinergic syndromes, central nervous system and cardiovascular disorders Death is usually due to cardiovascular& respiratory failure.

Material & methods: *This case series was conducted in department Medicine AIMS, Bangalore from July 2013 to June 2014. Detailed history & clinical examination was done. Diagnosis of OP poisoning was based on clinical features, history of exposure to a known OP compound and low serum Achcholiesterase & pseudocholiesterase activity.*

Results: *Out of one thirty three, one hundred and thirty (82.66%) patients ingested the compound, 23 (7.6%) & only three patients had dermal / inhaled exposure while spraying pesticides in rice fields. In our study female to male ratio in was 1: 3.2, age ranged from 13 to 50 years with mean age was 31.5 years. Acute complications were frequently noted and were related to morbidity & mortality. Most consistent clinical symptoms were miosis 93.6%, increased salivation 86.4%, anxiety and restlessness 82.7%, bronchospam 78.1% and incontinence in 58%.*

Conclusion: *In OP acute complications are seen more frequently and are related to mortality & morbidity. The importance of rapid diagnosis, early and effective treatment should not be overlooked because patients who receive early& effective treatment generally will do better and have less complication and severity of poisoning.*

Key words: *Organophosphorus compounds; Achcholiesterase; Pseudocholiesterase; Respiratory failure; Atropine.*

Introduction:

Organophosphate (OP) compounds are widely used as pesticides in agricultural parts of the world.[1] Organophosphorous pesticides poisoning can result from occupational, accidental or intentional exposure. Deliberate self-harm by suicidal poisoning is common all over the world.[2] Toxicity of OPs is the result of excessive cholinergic stimulation through inhibition of acetyl cholinesterase (AChE). The rapid accumulation of ACh in the synaptic junctions of central nervous system and peripheral tissues results in a cholinergic crisis, characterized by range of muscarinic, nicotinic, and central effects. The activity of AChE and PChE is closely related to patient symptoms after exposure to OP compounds.The activity can drop to about 80% of normal before any symptoms occur and drop may upto to 40% of normal before the symptoms become severe.[3]

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The actions of ACh are removed by hydrolysis by AChE enzyme. Two main types of cholinesterases include: 1-Acetyl cholinesterase (AChE) or true cholinesterase and 2-Butyrylcholinesterase (BChE) or pseudecholinesterase.[4] Organophosphorous compounds are lipophilic substances and can easily cross the respiratory epithelial and dermal membranes.[5] Gastric mucosa is also very permeable to OP, and is a classical way of absorption in suicidal cases.[6] Wide spread distribution of Organophosphorous compounds, particularly in fatty tissues, and their fast degradation usually inhibits their accumulation. Mostly OP poison are degraded and eliminated in urine, feces and exhaled air, however some OPs are eliminated without considerable metabolism.

Clinical manifestations include cholinergic syndromes, central nervous system and cardiovascular disorders. These can broadly classified as muscarinic & nicotinic[7] which include; bradycardia, hypotension (Muscarnic), tachycardia(nicotinic), increased salivation/ lacrimation, excessive sweating, nausea & vomiting, diarrhoea, pain abdomen, & faecal & urinary incontinence. Hyperstimulation

of the neuromuscular junction by acetylcholine initially results in fasciculation's, which is later followed by neuromuscular paralysis involving the ocular, bulbar, neck, proximal limb, and respiratory muscles in that order of severity. Muscle Paralysis may last for 2-18 days.[8] CNS manifestation include Anxiety, restlessness, convulsion, miosis, insomnia, coma, chyene stokes breathing respiratory & cardiovascular failure.[9] Intermediate syndrome or type II paralysis usually occurs after 24-96 hours after acute cholinergic crisis. In most patients respiratory insufficiency draws attention. Cranial nerve palsies & proximal muscle weakness, with relative sparing of distal muscles. Incidence of Intermediate syndrome varies between 8% to 50%.[10] Chronic OP poisoning may occur in mainly agricultural workers may induce organophosphate-induced delayed neuropathy (OPIDN). It is a symmetrical sensorimotor axonopathy, which is most severe in long axons, and occurs seven to 14 days following exposure.[11] Death is usually due to respiratory and cardiovascular failure.[12,13] The initial management of acute OP poisoning includes cardio respiratory stabilization, decontamination (removal of clothes for possible source of continued exposure in occupational intoxication), irrigation of skin and eyes, and gastric lavage to minimize absorption of the OP compound.[14,15] The mainstay of treatment involves atropine, a central and peripheral muscarinic receptor antagonist, and pralidoxime chloride, which reactivates inhibited AChE.[16] In recent years new adjunct therapy and cheap medications such as sodium bicarbonate, magnesium sulfate as well as antioxidants have been considered for the management of OP poisoning.[17]

Material & methods:

This case series was conducted in department Medicine AIMS, Bangalore from July 2013 to June 2014. All patients of OP poisoning were included in this study. However, we excluded those patients in whom Organophosphorus poisoning was doubtful. Detailed history was taken from all the patients' relatives about the circumstances of poisoning. Detailed clinical examination of the patients was done. Diagnosis of OP poisoning was based on clinical features that included bronchorrhoea, bronchospam, miosis, salivation, defecation, urination and hypotension, history of exposure to a known OP compound and low serum Achcholiesterase & pseudocholiesterase activity (level < 4500 IU). Patients were treated according to the standard protocol of organophosphates poisoning with respiratory support, atropine and pralidoxime. All patients were dealt upto recovery or death from poisoning. Baseline investigations included blood complete picture, urea, creatinine, arterial blood gas values, and serum cholinesterase levels. Data was retrieved from the files on a structured Performa. Studied variables included gender, mode of exposure, time lag in starting treatment, duration of hospital stay, acute complications & outcome of patients.

Results:

One hundred thirty three cases of OP poisoning were admitted during the study period. one hundred and thirty (82.66%) patients ingested the compound, 23 (7.6%) & only three patients had dermal / inhaled exposure while spraying pesticides in rice fields. One hundred two (76.6%) were males and 31 (23.33%) female with ratio of 3.2 :1.There was wide variation of age ranging from a minimum of 13-68 years with mean age of 31.5 Years. Forty eight patients out of 133 were stable after gastric lavage. They were kept under observation for the next 3 days and finally discharged. Though the clinical presentation of acute poisoning was variable as shown in (table 1 & 2) however, most consistent feature was miosis (93.6%), restlessness/anxiety (83.7%), bradycardia (24.8%), urinary/faecal incontinence (58.6%) and hypokalemia was seen in 20 (15%) cases. Transient elevation in liver enzymes was noticed in 18/133. Eighteen (13.5%) patients developed episodic convulsions. The most common complications were respiratory distress and mental confusion, in almost all cases. Hypotension was seen in 15 (11.2%) patients, single organ failure (mostly respiratory) failure was seen in 45/133 (33.8%) and MOF was seen in 39/133 (29.3%). Fifty three patients required ventilator support out of which only 15 patients survived. Also mortality was seen in those patients who required ventilator support for prolonged period of time. Patients developed derangement in renal function test.In most of cases derangement of the renal function was reversible & renal function test improved within a week. Only three cases had acute renal failure with anuria. Out of which one cases serum creatinine was 10.2 on day of admission with severe metabolic acidosis & he died within 24hours of admission. Rest of two cases with ARF died within a week's time. The overall mortality rate was 42/133 (31.7) seven cases (5%) were discharged against medical advice. Delayed complications like mild sensory loss of lower limbs or weakness of limbs were uncommon in our patients, who came for follow up.

Data Analysis

Descriptive statistics (frequency and percentage) were computed for categorical variable like sex, age, group, clinical presentation and outcome.

Table-I

Clinical presentation of acute poisoning.

Variable	No.of patients N=133	Percentage (%)
Sex		
Male	102 males	76.6%
Female	31 females	23.4%
131sucicidal	98.4%	
Intention	2 cases dermal	2.6%
exposure		
Presenting symptoms		
1. anexity/restlessness	110	82.7%
2. loss of consciousness/ altered sensorium	45	33.8%
3. severe bradycardia at time of admission	33	24.81%
4. Lacrimation /salivation.	115	86.4%
5. urniary/faecal incontinence	78	58.6%
6. Miosis	124	93.6%
7. bronchospam	104	78.1%
8. hypotension	15	11.2%
9. fits	18	13.5%
Deranged renal function test, Serum creatinine		
>1.4mg/dl	21	15.03%
Deranged liver function test	18	13.5
Hypokalemia	20	15%
Complications		
1. SOF/respiratory failure	45/133	33.8%
2. MOF	39/133	29.3%
Required Ventilator support.	53/133	39.8%
Outcome		
1. Died	N=42	31.7%
	Males =29	21.8%
	Females=13	9.7%
2. Survived	Death Survived N=84	63.15%
	Males=69/133	51.8%
	Females=27	20.3%
3. DAMA	N=7	5.2%

Table-II

Characteristics of acute poisoning

	Minimum	Maximum	Median/mean	SD
Age	13 years	68 years	28/31.5	12.98
Time bet consumption and 1.02 hours hospitalisation	9.57	4.05/4.65	2.433	
Cholinesterase level	330	1890	700/905	450.23
Hospital stay	1day	28days	7.89/ 11.195	7.81
Amount of poison consumed	10ml	200ml	50/77.5	54.86

Discussion:

Organophosphorous compounds were synthesized by von Hoffman. Organophosphorous pesticide poisonings are common in developing worlds.[18] The highest incidence is seen in India.[9,19] Suicidal and non-suicidal organophosphate poisoning is a major problem in rural areas of India , with rapidly increasing incidence rate.[19, 20] In our study the female to male ratio in was 1: 3.2. However, the female to male ratio given by Ather, is 1:1 and Tall et al, is 1:1.8 which is quite different from present study. The age ranged from 13 to 50 years with mean age was 31.5 years.[21, 22] However, Hayden et al.[23] showed age range from 13 to 47 years with a mean age of 23 years. 13 Majority of the cases were young people's from the age group 16-40 years about 80%, this is comparable to other studies as done by Khan MN et al[24] in which maximum number of patients were between 15-35years of age. Clinical manifestations include cholinergic syndromes, central nervous system and cardiovascular disorders. These can broadly classified as muscarinic & nicotinic.[7] Hypokalemia, hyperglycemia, acute renal failure, heamaturia , transient elevation of liver enzymes, and serum amylase may occur. Hematological, creatin phosphokinase (CPK) and lactate dehydrogenase levels may be disturbed, and thus required to be performed for the management of patients.[25] Death is usually due to cardiovascular& respiratory failure, paralysis of respiratory muscles and obstruction caused by bronchospasm and bronchial secretions.[12,13] Most frequent signs noted in this study were miosis 93.6%, increased salivation 86.4%, anxiety and restlessness 82.7%, bronchospam 78.1% and incontinence in 58%. Other frequent clinical features noted in this study are mentioned in table 1 with percentages, also comparable with other studies likes Tahir MH et al 8 and Karki P et al.[26,27] In the present study there were 33.3% cases of presented with altered sensorium & or loss of consciousness which was subsequently followed by deep coma. Sequeira et al[28] showed the frequency of deep coma to be 21%.Acute

complications seen in this study were episodic convulsions developed in 18/133(13.5%) patients, severe bradycardia was seen in 33 (24%) patients, hypotension was seen in 15 (11.2%) patients. Acute renal failure & hypokalemia was seen in 15.03% & 15 % respectively. Acute complications as given by Malik et al[12] were bradycardia in 29 (93.5%), change in mental status in 10 (32.2%), low oxygen saturations (less than 90%) in 21 (67.8%) and subsequent convulsions in 3 (9.6%). We have failed to document a strict relationship between levels of serum cholinesterase and the severity of clinical manifestations and prognosis, similar observation as seen in serial studies.[29]

In our study it also became evident that most of patients who expired, there was time lag (max 9.5 hours) between consumption of OP substances and initiation of treatment which is also supported by study done by Suliman MI et al.[30] Mortality was higher was in those cases who had consumed large amounts of OP substances, empty stomach. Patient who had SOF/MOF organ failure and required prolonged ventilator support had increased morbidity & mortality. Patient who and those who had severe renal dysfunctions with anuria (serum creatinine > 5mg/dl). Mortality rate in our study was 37.1% which higher than shown in a study done by Numidasa UA et al[31] & Pandyal BP et al.[32] However, frequency of mortality due to OP given by Yamashita[33] varied between 4% and 30%, 16 5.5% in a study by Malik.[12] The reason for high mortality may be due to late arrival, not receiving any treatment at periphery before arrival to the hospital, poverty and illiteracy, unawareness regarding mortality rate of OP poison the & non availability of ICU facilities.[31]

Conclusion:

Organophosphorus poisonings is common in developing worlds and pose a major health threat. In OP acute complications are seen more frequently than chronic complication. Mortality & morbidity are higher in those cases, wherever there is a delay initiation of treatment condition, or who have consumed larger amounts of OP substances Mortality is also higher in patients who immediately develop acute complication like severe bradycardia and renal failure, who have SOF/MOF organ failure and those who require prolonged ventilator support. The importance of rapid diagnosis, early and effective treatment should not be overlooked because patients who receive early & effective treatment generally will do better and have less complications and decreased morbidity & mortality rates. Good supportive & ICU care cannot only reduce the frequency of acute or chronic complications but will also decrease mortally rate in these cases.

Conflict of Interest : None

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