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A STUDY OF CLINICAL PROFILE OF ORGANOPHOSPHATE POISONING AT A TERTIARY-CARE CENTER.

Toxicology

Dr Shreyank Itagi* Senior Resident, Department of General Medicine, Gadag Institute of Medical Sciences. *Corresponding Author

Dr Kiran Meti Associate Professor, Department of General Medicine, Gadag Institute of Medical Sciences

Dr Ananda Junior Resident, Department of General Medicine,Gadag Institute of Medical Sciences.

ABSTRACT

Organophosphate compounds(OP) are mainly used in agricultural field as an insecticide. Toxicity with these compounds is due to inhibition of acetylcholinesterase enzyme. Patients present with muscarinic and nicotinic features. Red blood cell and plasma acetylcholinesterase enzyme (AChE) levels are helpful in diagnosis of the patients. Also, it may result in life-threatening acute and chronic complications. Most of poisoned patients require intensive care and treatment is with injection atropine and PAM. This study was done at Gadag institute of medical sciences,Karnataka comprising 50 cases of OP poisoning. After taking written consent, personal history of the patients was taken. Also, a detailed history regarding poison and clinical symptoms were taken. Then, general and systemic examinations of patients were carried out, and blood samples were sent for investigations. We followed up the patients till discharge or expired. In our study, maximum incidence of OP poisoning was in between 20 and 40 years age group (60%), and male to female ratio was 2:1. Clinical signs such as bradycardia and tachycardia were present in 20% cases. Miosis was present in 70% cases. Low serum AchE level was found in 68% cases, with mortality in 44.62% among them. Type-I paralysis (52%) and acute respiratory failure (32%) were found as life-threatening complications. In our study, 64% patients survived. Detailed history and thorough clinical examination of patients are helpful in diagnosing the patients of OP poisoning. Life-threatening complications occurred in these patients. Early detection and immediate treatment in intensive care units with injections atropine and PAM can increase the chances of survival rate of patients.

KEYWORDS

Clinical profile, OP poisoning, Atropine, acute respiratory failure

INTRODUCTION

Organophosphorous compounds are one of the most commonly used insecticides. [1]Most of the acetylcholinesterase enzymes (AchEs)-inhibiting carbamates and organophosphate (OP) pesticides are used throughout the world for agricultural application as insecticides. The toxicity is due to inhibition of AchE that inactivates the neurotransmitter acetylcholine (Ach).[1]AChE activity can be measured in the serum and red blood cells. In India, OP compounds are easily accessible; therefore, it is the most common mode of poisoning fatalities as a source of both intentional and unintentional poisoning.
[2]Patients exhibit muscarinic and nicotinic symptoms depending upon severity of compounds. Muscarinic symptoms include nausea, vomiting, diarrhea, sweating, salivation, urination, stool incontinence, lacrimation, miosis, and bradycardia . Nicotinic features include muscular weakness, fasciculation, paralysis, convulsion, and coma.[3]OP compounds lead to acute and chronic complications. Acute complications include acute respiratory failure, acute respiratory distress syndrome (ARDS), types I and II paralysis, intermediate syndrome (IMS), sudden cardiac death and aspiration pneumonitis. Chronic complications include anxiety, depression, polyneuropathy, paralysis, and coma.[4]Poisoning with these compounds is fatal and requires treatment in ICU as they present with life-threatening complications and may result in mortality. Mortality rates depend on amount and type of compound, condition of patient on arrival at hospital, delay in diagnosis and treatment, and respiratory management.[5]

Treatment includes early resuscitation with oxygen, airway protection, intravenous fluids, muscarinic antagonist such as atropine, and acetyl cholinesterase reactivator such as PAM.[4]Gastric lavage could have a role but should only be undertaken once the patient is stable. Patients must be carefully observed after stabilisation for changes in atropine needs, worsening respiratory function because of IMS, and recurrent cholinergic features occurring with fat-soluble organophosphorus compounds.[6]Hence under these circumstances,it is worth to study in detail the various clinical and biochemical aspects of OP poisoning.

MATERIALS AND METHODS

The study comprised 50 cases of OP compound poisoning, which were admitted in Gadag institute of medical sciences, Karnataka, India. We included all patients of OP poisoning, those who came with history and clinical features of OP poisoning, irrespective of their vitals during our study period. After explaining the procedure to patients in their vernacular language and obtaining consent from them, this study comprised detailed history, clinical examination, and laboratory investigation of each of the cases including serum cholinesterase on admission and at the time of discharge. The diagnosis was based on definite history of OP poisoning, examination of container, typical clinical features, clinical examination findings, characteristic color of stomach wash or vomits, atropine tolerance, and decrease in cholinesterase activity in plasma or blood.

Details regarding age, sex, name, address, marital status, occupation, socioeconomic class, psychological problems, family history, major illness, etc. were taken into consideration. Detailed history regarding poison such as name of poison, quantity, route, intention, mean time delay, type, and site was noted in each case. General and systemic examinations with detailed examination of respiratory system, cardiovascular system, alimentary system, and central nervous system were done in all cases. Laboratory investigations including complete blood count, renal function test, serum cholinesterase levels on admission and on discharge, electrolytes, electrocardiogram, chest X-Ray (PA) were carried out in each case.

Statistical Analysis

Frequency and descriptive analysis are done using IBM SPSS version 22 statistical software.

RESULTS

50 cases of OP compound poisoning were studied during the period between January 1, 2022 and June 30, 2022 at Gadag institute of medical sciences,Karnataka.. Maximum incidence of OP poisoning was in between 20 and 40 years age group (60%).Male to female ratio was 2:1.We observed that muscarinic symptoms were more common than nicotinic symptoms. Among muscarinic symptoms, nausea and vomiting were present in all cases. Other symptoms in decreasing order were perspiration and incontinence of stool and urine (70%), salivation (60%), altered sensorium (40%), and respiratory difficulty (36%). We found history of OP poison in 84% cases, while rest of cases were diagnosed by clinical examination and laboratory results.We found that bradycardia and tachycardia each was present in 20% cases, while other 60% cases showed normal pulse rate. Mortality was higher in normal pulse rate (36.64%) when compared with bradycardia (30%) and tachycardia (10%). Miosis was present in 70% cases with mortality in 34.29% cases among them, while miosis was absent in 30% cases.We divided all patients according to AchE level into three categories. They were considered mild when > 800 IU/L or 20%–50% AchE was found in serum, which was found in 14% cases; among

them, mortality was 14.28%. They were considered moderate when AchE was either 400–800 IU/L or 10%–20% in serum, as seen in 18% cases; about 22.22% patients expired among moderate group. Severe category included, patients, followed by type-II paralysis (80%), sudden cardiac death (75%), and acute respiratory failure (62.5%).We found that 64% patients survived, 32% expired, and 4% were discharged against medical advice. Higher incidence of death was observed on the first day (62.5%). About 87.5% survived patients were staying for more than 5 days in hospital.Also,all Monocrotophos compound poisoning was associated with severe manifestations including invasive ventilator support,inotropes and higher atropine requirement.Also,this compound was associated with 100% mortality.

Table 1: Combined Age- And Sex-wise Distribution

AGE(YRS)	MALE	FEMALE	TOTAL
13-20	2	10	12
21-30	18	4	22
31-40	6	2	8
41-50	5	0	5
>51	3	0	3

Table 2: Clinical Signs Wise Distribution

Pulse(bpm)	No of cases (%)	Mortality(%)
Bradycardra(<60)	10(20)	3(30)
Tachycardia(>100)	10(20)	1(10)
Normal(60-100)	30(60)	11(37)
Miosis-Present	35(70)	12(24)
Miosis-Absent	15(30)	4(27)

Table 3: Grading Of Severity Of OP Poisoning In Relation To Mortality, According To Serum Cholinesterase Level.

Grading depends on AchE level on admission	No. of cases	Mortality
Mild (20%–50%) (>800 U/L)	7	1
Moderate (10%–20%) (400–800 U/L)	9	2
Severe (<10%)(<400U/L)	34	15

Table 4: Complication-wise Distribution In Relation To Mortality

Complication	No. of cases	Mortality
Type I paralysis(acute cholinergic crisis)	26	3
Acute respiratory failure	16	10
Aspiration pneumonitis	12	4
Sudden cardiac arrest	8	6
ARDS	6	6
Type II paralysis (IMS)	5	4
Resecretions	2	1
GBS	0	0

Table 5: Outcome And Hospital Stay-wise Distribution

Outcome	Total	Duration of hospital stay (in days)				
		First	Second	Third	Fourth	>Five
Discharged	32	-	-	2	2	28
Expired	16	10	3	2	1	-
Absconded or DAMA	2	-	-	2	-	-

DISCUSSION

A total of 50 cases of OP poisoning was studied from January 1, 2022 to June 30, 2022 at Gadag institute of medical sciences, Karnataka, India. Maximum incidence of OP poisoning was in between 20 and 40 years age group, which is comparable to the study by Emerson et al[7] which shows 95% cases in 30–50 years age group and the lowest incidence in elderly persons.Similar finding was noted in the study by Kora et al.[8]. In our study, male subjects were involved more than female subjects. Whereas the finding by Banerjee et al[9] showed that female subjects are more commonly involved. This study shows that muscarinic effects predominates and appears first and then nicotinic effects. Study by Emerson et al[7] shows that muscarinic symptoms were found in 92% cases, while this study showed in 100% cases. This study is also correlated with the findings by Mishra et al[10] that nausea and vomiting is present in 88% cases. Miosis is a good clinical sign to diagnose OP poisoning, which is also comparable with CHA study that showed 64%. We found that miosis was found in 70% cases in our study and in 91% cases in the study done by Banerjee et al[9] so, it is also comparable with our study. Nicotinic symptoms appear late, and that indicates progression of disease process. Fasciculation is a bad prognostic sign, and, in our study, it was found in 60% cases which was comparable to the study by Chugh et al[11] which showed in 40% cases. Mortality is three times higher among patients who had fasciculation at the time of admission.. This study is also comparable with the study by Faiz et al[15] which showed that morbidity and mortality are higher in patients with acute complications. This study shows that maximum complication and mortality were noted during the first 24 h (e.g., 20% mortality), which is also comparable with the study by Munidasa et al[16] They suggested that maximum mortality was observed in the first 72 h. Davies et al[17] also supported that poor survival was noted in those patients who came late to hospital, showing high GCS score on admission, and maximum cases of survival had hospital stay of more than 5 days. So, a week is sufficient to observe clinical course of OP poisoning. In our study, nearly, about two-thirds of patients survived, which is comparable with the study by Gohel et al[13] in which 70% patients recovered and 27% expired.

CONCLUSION

For diagnosis, we require detailed history and clinical examination, with the support of laboratory investigations such as AchE level.Patients are presented with muscarinic and nicotinic signs and symptoms. Among complications, ARDS is more dangerous. Chances of survival are high among patients who reached hospital earlier and received immediate treatment in intensive care unit. Injections Atropine and PAM are very helpful to treat the patients. Also banning of monocrotophos compound can be considered as it associated with high mortality and worse prognosis.

Compliance with ethical standards

Conflict of interest: The authors declare no conflict of interest, as this research was undertaken solely for scientific purposes.

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