

A CLINICAL STUDY OF ORGANOPHOSPHORUS COMPOUNDS POISONING WITH SPECIAL REFERENCE TO ECG CHANGES AND TROPONIN I

General Medicine

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ABSTRACT

Background: The modern world thrives well on revolution in the agricultural practices that has resulted in a massive thrust in agricultural productivity. One of the most important step in green revolution is pesticides. In the developing world, poisoning is a common method of suicide. Organophosphorus compounds inhibit acetyl cholinesterase and butyryl cholinesterase enzymes resulting in excess acetyl choline in the neuromuscular junction causing overstimulation at the cholinergic synapses. The cardiac manifestations occur in a majority of affected patients and may range from innocuous ECG manifestations, such as sinus tachycardia, to life-threatening complications including cardiogenic pulmonary edema. Repolarization abnormalities, including ST-segment elevation and T-wave inversion as well as prolongation of the QTc interval, are among the most frequent cardiac manifestations of acute OP poisoning. **Methods:** study was carried out in the Department of Medicine, Assam Medical College & Hospital, admitting in various ward of medicine, satisfying the inclusion and exclusion criteria. Patients were classified into three grades using 'Peradeniya organophosphorus poisoning scale'. 76 Changes in ECG was monitored and Troponin I levels were measured at admission and repeated if required. **Results :** In our study, mean age of the cases was 44.32 years with 57.9% cases were below 40 years i.e. young adults. In the study among the 190 patients 123 were males and 67 females. Among our study participants most of the cases were of suicidal OP poisoning (79.5%) while only 20.5% cases were accidental. Most common presenting symptoms in the study were blurring of vision (94.7%), lacrimation (92.1%), breathlessness (64.7%) and salivation (63.7%). In the present study out of 190 cases ECG changes were noted in 75 patients i.e 39.5% cases. Among them most common ECG finding was QTc prolongation (74.7%) followed by ST depression (24%) and T wave inversion (21.3%). A significant association was observed between severity of poisoning and incidence of ECG changes ($p < 0.01$). Saadeh AM et al.39 in a similar study observed arrhythmias in 11 (24%); prolonged Q-Tc interval in 31 (67%), ST-T changes in 19 (41%) and conduction defects, 4 (9%) cases. Karki P et al.40 observed electrocardiographical abnormalities including prolonged Q-Tc interval in 14 cases (37.8 percent), ST-T changes in 11 cases (29.7 percent), and conduction defects in two cases (5.4 percent). In our study out of 190 cases raised troponin I levels were seen in 30 (15.8%) cases. A significant association was observed between severity of poisoning and increase in troponin I levels ($p < 0.01$). Wan WG et al.45 discussed the diagnostic value of cardiac enzyme and troponin in acute organophosphorus pesticide poisoning (AOPP). **Conclusions:** We thus conclude that organophosphorus compounds poisoning is a major cause of morbidity and mortality and is suicidal in most of the cases. ECG abnormalities and myocardial injury is associated with OP poisoning and are more in POP severe grade of poisoning. Morbidity and mortality increases in patients with ECG changes (especially prolonged QTc) and raised Troponin I levels. Therefore, early hospitalization, treatment and follow up with ECG monitoring can be lifesaving in organophosphorus poisoning.

KEYWORDS

organophosphate poisoning, ECG, Troponin I.

BACKGROUND

According to World Health Organization report, about three million cases of pesticide poisoning occur every year worldwide and most of them are in Asia, among which 50% of them are organophosphate poisoning. Organophosphorus compounds inhibit acetyl cholinesterase and butyryl cholinesterase enzymes resulting in excess acetyl choline in the neuromuscular junction causing overstimulation at the cholinergic synapses. The symptoms are classified into muscarinic, nicotinic and central depending on the site of the compound over the respective receptors. Urination, lacrimation, emesis, miosis, excessive salivation, bradycardia, diarrhoea, and wheezing are the muscarinic features. Nicotinic features are paresis, fasciculation, tachycardia, and hypertension. Central features includes confusion, anxiety, seizures, ataxia and psychosis.⁷ The principal pharmacological action of all OPs is the inhibition of acetylcholinesterase; most patients die from cardiorespiratory failure. The cardiac manifestations occur in a majority of affected patients and may range from innocuous ECG manifestations, such as sinus tachycardia, to life-threatening complications including cardiogenic pulmonary edema. Repolarization abnormalities, including ST-segment elevation and T-wave inversion as well as prolongation of the QTc interval, are among the most frequent cardiac manifestations of acute OP poisoning. The current study was thus carried out to understand the cardiac manifestations of OP poisoning with special reference to cardiac enzymes and ECG changes.

AIM AND OBJECTIVES

Aims: To study the clinical profile of organophosphorus compounds

poisoning.

OBJECTIVES

To evaluate the ECG changes and assess myocardial injury using Troponin I as biomarker in organophosphorus poisoning and its relationship with in hospital mortality.

METHODS

This is a hospital-based prospective study conducted in the department of medicine at assam medical college and hospital, dibrugarh, india. we enrolled patients admitted in department of Medicine, Assam Medical College and Hospital during study period and fulfilled the inclusion and exclusion criteria were taken up for the study.

Inclusion Criteria:

- All the organophosphorus poisoning cases, above 12 years of age, confirmed by history, documented, circumstantial evidence of ingestion, admitted in our hospital within 12 hours of ingestion with characteristic clinical findings and basic laboratory investigations and the subjects giving informed consent.

Exclusion Criteria:

- Patients who have ingested other substance in addition to organophosphorus compounds.
- Patients who are known to have pre-existing heart disease like rheumatic heart disease, ischemic heart disease etc.
- Patients who are hypertensives.
- Patients who are chronic alcoholics.
- Patients with chronic kidney disease.
- Patients who are below the age of 12 years.

- Patients not giving informed consent.

STATISTICAL ANALYSIS

The quantitative data was represented as their mean $\pm$ SD. Categorical and nominal data was expressed in percentage. The t-test was used for analyzing quantitative data, or else non parametric data was analyzed by Mann Whitney test and categorical data was analyzed by using chi-square test. Pearson correlation co-efficient was used for computing correlation between quantitative variables. The significance threshold of p-value was set at <0.05 . All analysis was carried out by using SPSS software version 21.

RESULTS:

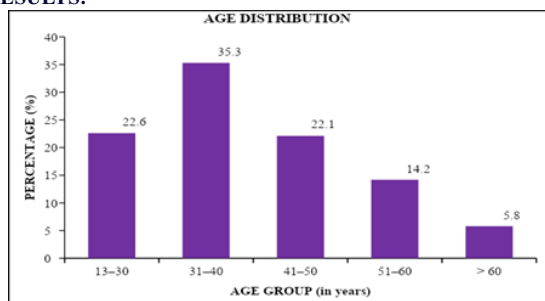


Fig 1.1: AGE WISE DISTRIBUTION- In the study mean age of the cases was 44.32 years with 57.9% cases were below 40 years i.e. young adults.

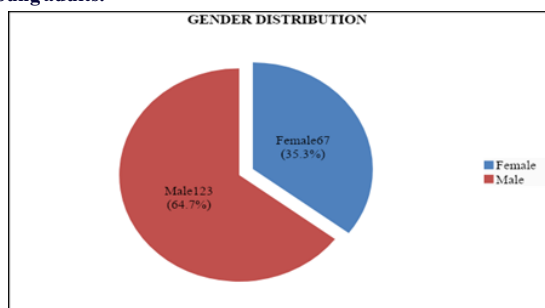


Fig 1.2: GENDERWISE DISTRIBUTION- In the study among the 190 patients 123 were males and 67 females. Male predominance was seen in the cases of OP poisoning with male : female (M:F) ratio of 1.84:1.

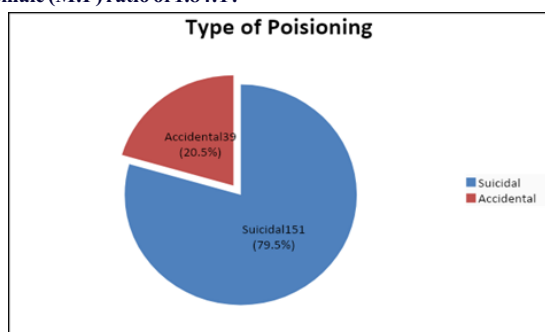


Fig 1.3: In the study most of the cases were of suicidal OP poisoning (79.5%) while only 20.5% cases were accidental.

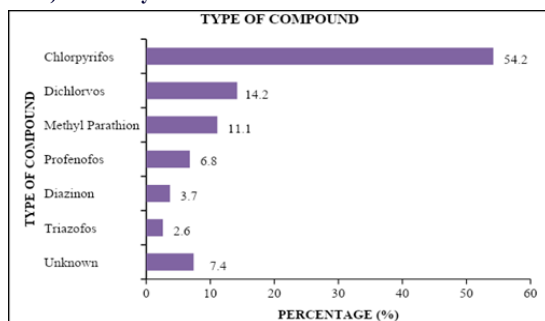


Fig 1.4: In our study most common compound identified was chlorpyrifos (54.2%) followed by dichlorvos (14.2%). No

compound was identified in 7.4% cases, where the compound was not brought and the patient was diagnosed on the basis of clinical features.

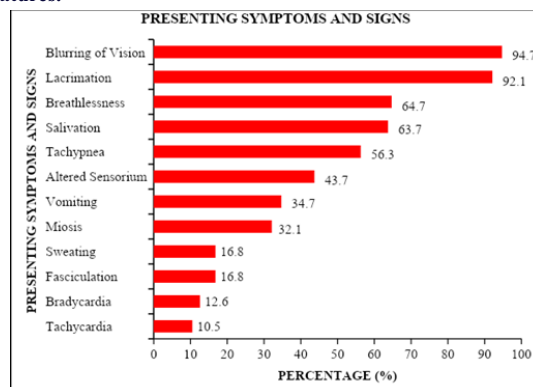


Fig 1.5: Most common presenting symptoms in the study were blurring of vision (94.7%), lacrimation (92.1%), breathlessness (64.7%) and salivation (63.7%). Most common sign observed in cases were tachypnea (56.3%) and miosis (32.1%).

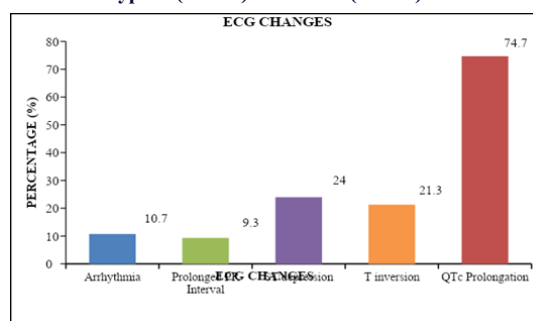


Fig 1.6: In the present study out of 190 cases ECG changes were noted in 75 patients i.e 39.5% cases. Among them most common ECG finding was QTc prolongation (74.7%) followed by ST depression (24%) and T wave inversion (21.3%).

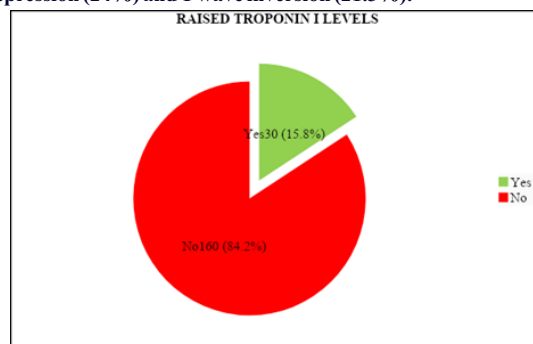


Fig 1.7: In our study out of 190 cases raised troponin I levels were seen in 30 (15.8%) cases.

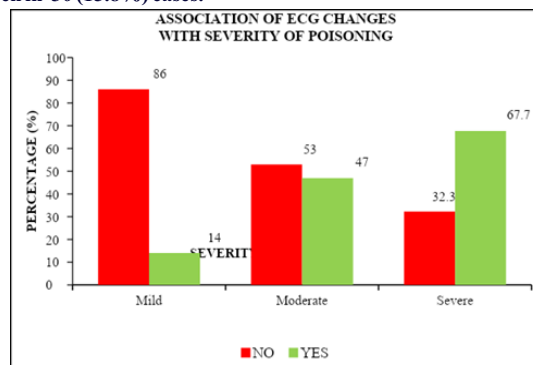


Fig 1.8: In the study ECG changes were seen in 14% mild cases as compared to 47% and 67.7% in moderate and severe cases of OP poisoning respectively. A significant association was observed between severity of poisoning and incidence of ECG changes ($p < 0.01$).

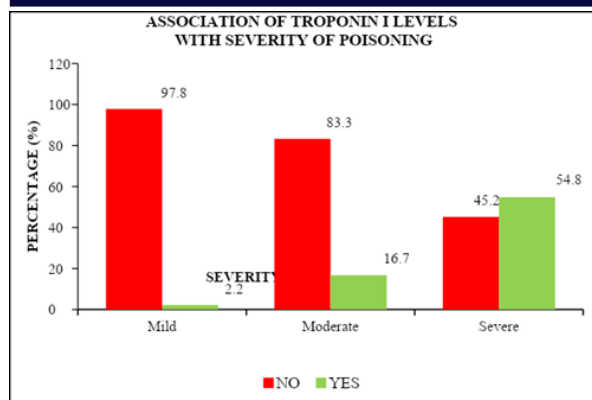


Fig 1.9: In this study raised troponin I levels were seen in 2.2% mild cases as compared to 16.7% and 54.8% in moderate and severe cases of OP poisoning respectively. A significant association was observed between severity of poisoning and increase in troponin I levels ($p<0.01$).

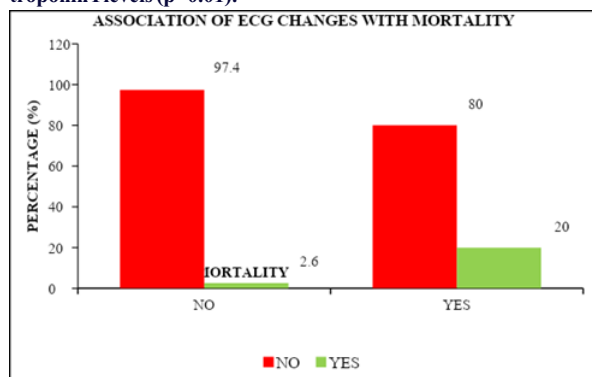


Fig 1.10: In our study a significant association was observed between mortality and incidence of ECG changes ($p<0.01$). Mortality rate was 20% in cases with ECG changes as compared to 2.6% in cases without ECG changes.

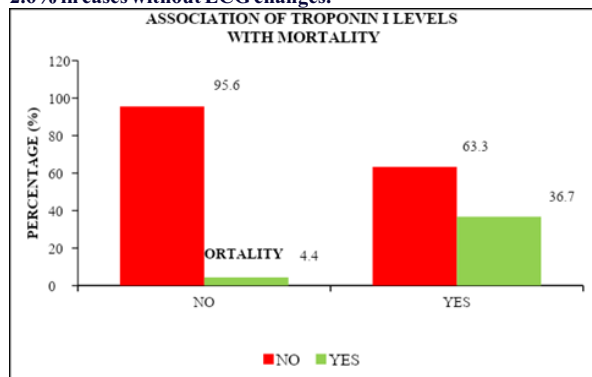


Fig 1.11: In our study a significant association was observed between mortality and raised troponin I levels ($p<0.01$). Mortality rate was 4.4% in cases with normal troponin I as compared to 36.7% in cases with raised troponin I levels.

VARIABLES	B	S.E.	Wald	df	P-value	Odds Ratio	95% CI for EXP(B)	
							Lower	Upper
ECG Changes	0.085	0.011	61.06	1	<0.01	1.089	1.066	1.112
Raised Troponin I	0.964	0.286	11.385	1	<0.01	2.622	1.498	4.591
Constant	-2.445	1.032	5.617	1	0.018	0.087		

Fig 1.12: binary Logistic Regression Analysis For Prediction Of Mortality In Op Poisoning Cases

On logistic regression analysis, both ECG changes and raised troponin I levels were observed as independent predictors of mortality in OP poisoning cases.

DISCUSSION:

Organophosphates are frequently used pesticides can result in serious morbidity and mortality. In our study the mean age of the cases was 44.32 years with 57.9% cases were below 40 years i.e. young adults, which is consistent with study done by Raddi D et al. Out of 320 cases studied, 58.75% (188 cases) were males, and 41.25% (132 cases) were females.

Mean age in the study by Chintale KN et al was 38.7 years with 74.26% males to 25.74% females. In our study, ECG changes were noted in 39.5% cases. Most common ECG finding was QTc prolongation (74.7%) followed by ST depression (24%) and T wave inversion (21.3%). Prolonged PR interval and arrhythmia was seen in 9.3% and 10.7% cases respectively. Saadeh AM et al. in a similar study observed arrhythmias in 11 (24%); prolonged Q-Tc interval in 31 (67%), ST-T changes in 19 (41%) and conduction defects, 4 (9%) cases. In the study raised troponin I levels were seen in 2.2% mild cases as compared to 16.7% and 54.8% in moderate to severe cases of OP poisoning ($p<0.01$). A significant association was observed between mortality and raised troponin I levels ($p<0.01$).

CONCLUSION:

We thus conclude that organophosphorus compounds poisoning is a major cause of morbidity and mortality and is suicidal in most of the cases. ECG abnormalities and myocardial injury is associated with OP poisoning and are more in POP severe grade of poisoning. Morbidity and mortality increases in patients with ECG changes (especially prolonged QTc) and raised Troponin I levels. Therefore, early hospitalization, treatment and follow up with ECG monitoring can be lifesaving in organophosphorus poisoning

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