

**RESEARCH ARTICLE****“A Study of Cardiac Profile in Organophosphate Poisoning”**

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Abstract

AIMS AND OBJECTIVES: To study the cardiac profile of organophosphate compound poisoning.

METHOD: About 100 cases of organophosphate poisoning admitted over a period of 1 year in SS Institute of Medical Sciences were studied. ECG was carried out daily on all patients during their stay. Chest x ray and estimation of serum electrolytes were done routinely on admission. Cardiac enzyme estimation was done if ECG showed significant changes along with echocardiography. As there was no method available for estimation of organophosphate compound ,blood pseudocholinesterase levels were estimated.

RESULTS: Males were predominant (86%) with 26-35 year age group being more common. Majority of them did not have ECG (57%) changes, with 4% had pulmonary oedema and 5% hypotension, 4% hypertension and out of 7 patients who underwent 2D Echo , 2 of them had Acute Myocardial Infarction Cardiac changes on ECG were seen more commonly among patients having very low pseudocholine esterase levels (60.9%). This association was found to be statistically significant (p<0.05).

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1 | INTRODUCTION

India is predominantly an agricultural country hence pesticides, insecticides are used abundantly during cultivation⁸. Thus it being natural to have access to these chemical substances by human beings, the contact or usage of these compound may either be accidental, or suicidal and rarely

homicidal. Organophosphate poisoning is an ever increasing and troublesome situation in the developing countries and is a major health care challenge in the 21st century.^{1,2} The widespread use of organophosphate and carbamates as agricultural insecticides has increased the likelihood of poisoning with these compounds. Cardiac complications often accompany poisoning with these compounds, which

may be serious and often fatal. Most of these can be prevented if recognized early and treated adequately. Hence the present study which is a hospital based observational crosssectional study of about 100 patients over a year has been undertaken with special interest to cardiac manifestations in the treatment of organophosphorus poisoning.

2 | MATERIAL AND METHODS

Patients admitted with history of organophosphate poisoning in SS Institute of medical sciences and research centre , Davangere. Methods of collection of data (including sampling procedures, if any) About 100 cases of organophosphate poisoning admitted over a period of 1 year in SS Institute of Medical Sciences were studied. ECG was carried out daily on all patients during their stay. Chest x ray and estimation of serum electrolytes were done routinely on admission. Cardiac enzyme estimation was done if ECG showed significant changes along with echocardiography. As there was no method available for estimation of organophosphate compound ,blood pseudocholinesterase levels were sent. BP, PR and ECG recordings taken on the arrival were selected for analysis. ECG analysis included rate, rhythm, ST/T abnormalities, conduction defects and measurement of P-R and Q-T intervals. Data was expressed as mean[SD]. The chi square test was used to determine significance. Results with P<0.05 were taken as statistically significant. Treatment was not stopped for the purpose of study.

Inclusion criteria:-

All adults with history of consumption &/or exposure to OPC of either sex, admitted in hospital within 24 hrs of ingestion.

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Characteristic manifestations including miosis, fasciculations and excessive salivation.

Exclusion criteria:-

All patients with poisoning due to compounds other than OPC.

Patients having H/o cardiac diseases, hypertension and diabetes.

3 | RESULTS

Table 1: Distribution of the study subjects based on gender

Gender	Frequency (Percentage)
Male	86 (86)
Female	14 (14)
Total	100 (100)

Majority of the study subjects were male (86%) and 14% were females.

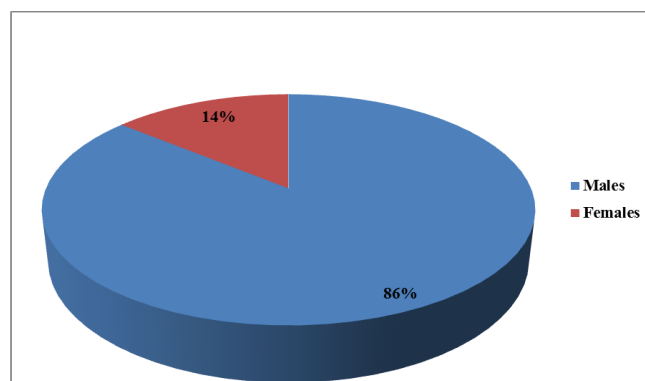


FIGURE 1: Distribution of the study subjects based on gender

TABLE 2: Distribution of the study subjects based on age

Age in years	Frequency (Percentage)
16-25	30 (30)
26-35	40 (40)
36-45	14 (14)
46-55	7 (07)
56-65	7 (07)
66-75	2 (02)
Total	100 (100)

Majority of the study subjects were in the age group of 26-35 years (40%) followed by 16-25 years (30%). The mean age of the study subjects was 33.7 ± 13 years.

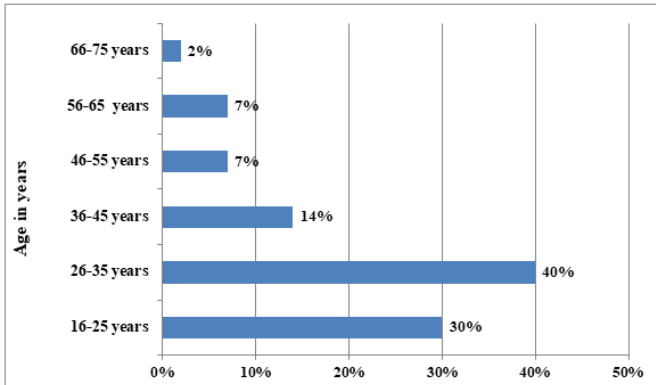


FIGURE 2: Distribution of the study subjects based on age

TABLE 3: Distribution of study subjects based on blood pressure

Blood Pressure	Frequency (Percentage)
Normal	91(91)
Hypotension	05 (05)
Hypertension	04 (04)
Total	100 (100)

Table 3 shows that 91% of the study subjects had normal blood pressure, 5% had hypotension and 4% had hypertension.

TABLE 4: Distribution of study subjects based on Pseudocholeline Esterase levels

Pseudocholeline esterase level	Frequency (Percentage)
Very low (≤ 500 IU/L)	46 (46)
Low ($>500 - < 4500$ IU/L)	43 (43)
Normal (>4500 IU/L)	11 (11)
Total	100 (100)

Table 4 shows that the pseudocholeline esterase levels was very low among 46% of the study subjects, while in 45 % of the study subjects it was more than 500 to < 4500 IU/L.

Majority of the patients (57%) had no changes on ECG. Sinus bradycardia was predominant ECG

TABLE 5: Signs of cardiotoxicity in ECG

Signs of cardiotoxicity	Frequency (Percentage %)
Sinus Tachycardia	1 (1)
Sinus Bradycardia	23 (23)
Poly VT	1(1)
Torsades De Pointes	1(1)
VT,VF	1(1)
Prolonged QT	4 (4)
SVT AVNRT	3 (3)
SVT Sinus Tachycardia	1 (1)
Atrial Fibrillation	4 (4)
PR Prolongation	2 (2)
AWMI	1 (1)
Second degree block	1 (1)
Normal	57 (57)
Total	100 (100)

change noticed in 23%. Prolonged QT interval and Atrial Fibrillation were seen in 4% each, AVNRT in 3%, PR prolongation in 2%, Sinus Tachycardia, Polymorphic VT, Torsades De Pointes, VT, VF, SVT, Anterior wall MI, Second degree heart block were seen in 1% of patients.

TABLE 6: Signs of cardiotoxicity on 2 D ECHO

Signs of cardiotoxicity on 2DECHO	Frequency (Percentage %)
Normal	5 (71.4)
EF 40, Myocardial Infarction (AWMI)	1 (14.3)
RMMA+ ,EF 40	1(14.3)
Total	7 (100)

(N=7)

2D ECHO was carried out in 7 patients based on ECG changes and strong index of suspicion. In 1% of patients anterior wall MI and regional wall motion abnormality was seen.

Majority had normal chest X ray but 4 % of them had reverse moustache sign suggestive of pulmonary oedema.

$\chi^2=1.328, df=1, p=0.2498$

TABLE 7: Signs on chest X ray

Signs of chest X-ray	Frequency (Percentage %)
Normal	96 (96)
Pulmonary edema	4 (4)
Total	100(100)

TABLE 8: Association between gender and cardiac changes

Gender	Cardiac changes		Total n(%)
	No n(%)	Yes n(%)	
Male	51 (59.3)	35 (40.7)	86 (100)
Female	6 (42.8)	8 (57.2)	14 (100)
Total	57 (57)	43 (43)	100(100)

Cardiac changes on ECG were seen more among female patients (57.2%) when compared to male patients (40.7%). However this association was not statistically significant (p>0.05).

TABLE 9: Association between age and cardiac changes

Age in years	Cardiac changes		Total n(%)
	No n(%)	Yes n(%)	
16-25	19 (63.3)	11 (36.7)	30(100)
26-35	21 (52.5)	19 (47.5)	40 (100)
36-45	9 (64.3)	5 (35.7)	14 (100)
> 46	8 (50)	8 (50)	16 (100)
Total	57 (57)	43 (43)	100 (100)

$\chi^2=1.445, df=3, p=0.695$

Cardiac changes were seen more commonly among patients aged 46 years and above (50%) when compared to other age group. This association was not found to be statistically significant (p>0.05).

TABLE 10: Association between Pseudocholine esterase levels and cardiac changes

Pseudocholine esterase levels	Cardiac changes		Total n(%)
	No n(%)	Yes n(%)	
Very low	18 (39.1)	28 (60.9)	46(100)
Low	29 (67.4)	14 (32.6)	43(100)
Normal	10 (90.9)	1(9.1)	11 (100)
Total	57 (57)	43 (43)	100 (100)

$\chi^2=13.07, df=2, p=0.001454$

Cardiac changes on ECG were seen more commonly among patients having very low pseudocholesterase levels (60.9%) when compared to the patients with low levels (32%) and normal levels of enzymes (9.1%). This association was found to be statistically significant (p<0.05).

4 | DISCUSSION

This cross sectional hospital based study was conducted in a tertiary care centre in Davangere for a period of 1 year on 100 patients of organophosphorous compound poisoning. The findings in our study and those of other studies mentioned in literature are compared here. Dalvi CP, Abraham PP, Iyer SS et al stated that abnormal ST-T wave changes and progressive fall in voltage or low voltage were the commonest ECG changes encountered. Abnormal ECG changes were present in 40% of mild cases, 87% of moderate cases, 100% of severe organophosphate poisoning cases¹.

A M Saadeh, N A Farsakh, M K Al-Ali et al studied the frequency, extent and pathogenesis of cardiac complications accompanying organophosphate and carbamate poisoning. They concluded that cardiac complications often accompany poisoning with these compounds particularly during first few hours. 46 cases records (24 females and 22 males) were reviewed. ECG manifestations were, prolonged QTc interval (67%), Elevated ST segment (24%), inverted T waves (17%) Prolonged PR interval (9%), Atrial fibrillation (9%), Ventricular tachycardia (9%), Extrasystoles (6%), Ventricular fibrillation (4%). Hypoxemia, Acidosis and electrolyte derangements are major predisposing factors².

S.B Agarwal, V.K Bhatnagar, Amol Agarwal, Usha Agarwal, K.Venkaiah, S.K Nigam, S.K Kashyap et al studied complete clinical profile of organophosphate compound poisoning. In their study, sinus tachycardia, ST Segment depression and T wave inversion followed by sinus bradycardia were the most common ECG abnormalities³.

P. Karki, J.A Ansari, S.Bhandary, S Koirala studied extent, frequency and pathogenesis of cardiac and electrocardiographic manifestation of acute

organophosphate poisoning. They also studied clinical profile of organophosphate poisoning in terms of age, sex, intension, symptoms and signs, time interval between compound consumption and hospitalization, total dose of atropine given, duration of treatment with atropine, cardiac and electrocardiographic manifestations. Cardiac manifestations and electrocardiographic changes were recorded before administration of any medications ECG manifestations in there study were prolonged QTc interval (37.8%), ST/T changes i.e. , Elevated ST segment (16.2%), inverted T waves (13.5%), Prolonged PR Interval (5.4%) Atrial fibrillation (5.4%), Ventricular tachycardia (10.8%), Extrasystole (5.4%). Other cardiac manifestations were sinus tachycardia (40.5%), Sinus bradycardia(18.9%), Prolonged QTc interval (37.8%)⁴. Patients had non cardiogenic pulmonary edema (21.6%), hypertension (13.5%), hypotension (10.8%)⁴. In our study (5%) hypotension, hypertension (4%) and pulmonary edema (4%) were noticed.

Ismail Hamdi kara, Cahfer Guloglu, Aziz Karabulut, Murat Orak et al studied sociodemographic, clinical and laboratory features of cases of organophosphorus intoxication and found mean age of cases 24 ± 11 years, M/F ratio 1/3.8, mostly from low socioeconomic class and of suicidal intention, most common ECG changes were sinus tachycardia in 58.3%, ST changes in 54.2 % and T changes in 12.5%.⁵In our study majority were males(86%) . Age group of 26-35 years (40%) were more followed by 16-25 years (30%). The mean age of the study subjects was 33.7 ± 13 years .

Kumiko Taira, Yoshiko Aoyama and Miwako Kawamata studied relationship between ECG manifestations and subjective symptoms accompanying organophosphate pesticide exposure caused by aerial spray was investigated⁶.

Yurumez Y, Yavuz Y, Saglam H, Durukan P, Ozkan S, Akdur O, Yucel M evaluated 85 patients who presented to emergency department with Organophosphate poisoning and found QTc prolongation(55.5%) followed by sinus tachycardia (31.8%) were the most common electrocardiographic changes⁷. In our study majority of the patients (57%) had no changes on ECG. Sinus bradycardia was predominant ECG change noticed in 23%. Prolonged QT interval and

Atrial Fibrillation were seen in 4% each, AVNRT in 3%, PR prolongation in 2%, Sinus Tachycardia, Polymorphic VT, Torsades de pointes, VT, VF, SVT, Anterior wall MI , Second degree heart block were seen in 1% of patients.

Unlike other studies, in our study ,we studied the association between cardiac changes with fall in pseudocholine esterase enzyme levels , indicating the severity of OP compound poisoning . Cardiac changes on ECG were seen more commonly among patients having very low pseudocholine esterase levels (60.9%) when compared to the patients with low levels (32%) and normal levels of enzymes (9.1%). This association was found to be statistically significant ($p < 0.05$) Cardiac changes were seen more commonly among patients aged 46 years and above (50%) when compared to other age group and more among female patients (57.2%) when compared to male patients (40.7%).

5 | CONCLUSION

This is a cross-sectional hospital based observational study of about 100 patients admitted in a tertiary centre, SS. Institute of Medical Sciences ,Davangere over a period of 1 year. The main objective was to study the cardiac manifestations in organophosphate poisoning patients. In this study males were predominant (86%) with 26-35 year age group being more common .Majority of them did not have ECG (57%) changes , with 4 % had pulmonary edema and 5% hypotension , 4% hypertension and out of 7 patients who underwent 2D Echo , 2 of them had Acute Myocardial Infarction Cardiac changes on ECG were seen more commonly among patients having very low pseudocholine esterase levels (60.9%) when compared to the patients with low levels (32%) and normal levels of enzymes (9.1%) and thus our study helped in establishing the objective .

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