Original Article

Frequency of Various Clinical and Electrocardiac Manifestation in Patients with Acute Organophosphorous Compound (OPC) Poisoning

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ABSTRACT

BACKGROUND: Worldwide, OPC are the most widely used insecticides in developing countries like Pakistan, where agriculture is the main occupation and easily available everywhere, therefore, the OPC poisoning is very common. WHO recently reports that pesticides poisoning occurs about 3 million/year with mortality > 3 lac/year and 99% belong to developing countries.
OBJECTIVE: To determine the frequency of various clinical and electrocardiac manifestation in OPC poisoning.
METHODOLOGY: Prospective observational study, conducted from Dec 2008 to April 2010 in Department of Medicine and Intensive Care Unit (ICU) at Liaquat University of Medical & Health Sciences, Jamshoro / Hyderabad.
RESULTS: Out of 70 adult patients, 28(40%) were males and 42(60%) were females. The nature of OPC poisoning was suicidal in 58 (82.86%) and accidental/incidental in 12 (17.14%). There were 43 (61.43%) farmers, 21 (30%) house-workers and 6 (8.57%) college students. There was a high ratio of insecticides (Melathion, Parathion, and Mite/rat House fly killer Carbamates) by ingestion/inhalation route. The cardiac manifestations were Sinus Tachycardia in 20(28.6%), Non Cardiac Pulmonary Edema and Sinus Bradycardia 15(21.4%) each, Hypertension in 13(18.6%) and Hypotension in 07(10%). Common ECG changes noted in our study were prolonged QTc – interval among 28(40%), prolonged P-R interval in 11(15.7%), atrial fibrillation, ventricular Tachycardia and extra systole were found as; 06 (8.6%), 05 (7.1%) and 05 (7.1%) respectively. Common neurological findings were flaccid paralysis in 28(40%) patients with respiratory muscle involvement in 10 cases, delirium in 11(17.5%), impairment of consciousness in 8(11.4%), and extrapyramidal features, fasciculation's, convulsions, and cranial nerve involvement were in 6 (8.6%), 5(7.1.%), 7(10%) and 5(7.1%) respectively.
CONCLUSION: In routine hospital practice, the suicidal cases are very common due to acute OPC poisoning. Many cases are hospitalized with critical condition with predominant involvement of cardiac and neurological features. Early diagnosis with appropriate treatment with specific antidots and ICU management can minimize the fatal consequences of OPC poisoning. It is further recommended that more studies are required to provide awareness regarding this important public health problem.

KEY WORDS: OPC, Poisoning, Suicide, Cardiac and neurological manifestations.

INTRODUCTION

Worldwide, OPC are the most widely used insecticides to control the insects affecting home gardening and agriculture, hence are easily available even on ordinary shops in branded (authorized/licensed company made) and un-branded (non-licensed /local/self made) forms[1]. In developing countries like Pakistan, where agriculture is the main occupation, the OPC poisoning is very common yet easily preventable current public health problem by an effective educational counseling, prompt diagnosis and specific management with Atropine and Oximes[2].
According to recent WHO report pesticides poisoning occurs about 3 million/ year with mortality > 3 lac/ year. Out of these cases 99% belong to the developing countries[3-6]. OPC includes mainly two compounds i.e. Organophosphates (Parathion, Melathion, Phosphamidon, Carbophenothion etc) & Carbamates (Carbaryl, Aldicarb, Aminocarb, Methomyl, Oxamyl) etc. These both compounds are also called anticholinesterases, because they inhibit the enzyme acetyl cholinesterase, which causes an increase in acetylcholine activity at Muscarinic & Nicotinic receptors in the central nervous system[7]. Cardio respiratory failure is an important cause of death after PC poisoning, possibly due to Acute Cholinergic Crisis (Muscarinic & Nicotinic Crisis), Intermediate Syndrome (IMS) and

Central Nervous System Depression respectively[8,9].

A. Acute Cholinergic Crisis: These are following two types[10].

1. Muscarinic Features (Wadia type-1 syndrome): These are; miosis, excessive sweating, bronchorrea & bronchospasm (non-cardiogenic pulmonary edema), bradycardia and hypotension.
2. Nicotinic Features (Wadia type-2 syndrome): These are; striated muscle fasciculations, muscle weakness, paralysis, tachycardia and hypertension.

B. Intermediate Syndrome (IMS): After the resolution of acute cholinergic crisis or inadequate Oxime treatment, patient clinically develops acute respiratory failure, bulbar/nuchal weakness, proximal limb weakness and depressed deep tendon reflexes[11].

C. Central Nervous System Features*:* Such as; confusion, unconsciousness, fatigue, psychosis, seizures, ataxia, dysarthria, extra pyramidal features and respiratory depression[12].

Apparently OPC poisoning is very common suicidal offence when compared to accidental/incidental ingestion

METHODS

This prospective observational study was conducted from December 2008 to April 2010 in Department of Medicine and Intensive Care Unit (ICU) at Liaquat University of Medical & Health Sciences, Jamshoro / Hyderabad. The aim was to determine the frequency of various clinical and electrocardiac manifestation in OPC poisoning.

Inclusion Criteria

Patients of adult age of both sex were included in the study. A proforma was designed for study which includes detail history and examination to diagnose the OPC poisoning. Especial emphasis was given to cardiac and neurological features. Record of patients with pre existing cardiac disorders and on medication for cardiac disease were evaluated specially to find out the effects of drugs on current electrocardiac manifestation which were being observed in current study

The diagnosis was based on:

- History of ingestion of OPC.
- Specific clinical features.
- Clinical improvement after Atropine and/or Pralidoxime.
- RBC (True cholinesterase) or Plasma (Pseudo Cholinesterase):

According to the laboratory findings:

(Normal Blood Level of Acetylcholine is >50%).

Mild poisoning: When Acetylcholine Blood Level = between 20-50%.

Moderate poisoning: When Acetylcholine Blood Level= between 10-20%.

Severe poisoning: When Acetylcholine Blood Level = Less than 10% of the base line.

All morbid and fatal complications due to OPC poisoning can be prevented if patient arrive timely, history given correctly or diagnosed correctly and managed on proper standards in tertiary care hospital[13,14].

Exclusion Criteria

All patients with diagnosis of Gullien Berry Syndrome, periodic paralyses, mysthenai gravis were excluded from the study. Relevant investigations were carried out like CBC, ECG, UCE, BS and Urinedr. RBC (true cholinesterase) or plasma (pseudo cholinesterase), EMG NCS were necessary investigations but not available at our institute. Statistical analysis was performed on SPSS version 10.0 and frequencies of various clinical and electrocardiac manifestation was calculated.

RESULTS

Seventy (70) patients inducted in this study after obtaining informed consent. Out of them 28(40%) were males and 42(60%) were females and M:F ratio was 1:1.5. The ages were between 20-55 years. The nature of OPC poisoning was suicidal in 58 (82.86%) and accidental/incidental in 12 (17.14%). There were 43 (61.43%) farmers, 21 (30%) house-workers and 6 (8.57%) college students.

During study we found high ratio of insecticides (Melathion, Parathion, and Mite/rat or House fly killer Carbamates) by ingestion/inhalation route. Cardiac features are shown in **Table I**. Here we found Sinus Tachycardia in 20(28.6%), Non Cardiac Pulmonary Edema and Sinus Bradycardia was found 15(21.4%) in each, while Hypertension was found in 13(18.6%) and Hypotension was observed in 07(10%) respectively.

Whereas as, common electrocardiographical (ECG) changes were observed prolonged QTc – interval among 28(40%), prolonged P-R interval in 11(15.7%). Atrial Fibrillation, Ventricular Tachycardia (Non-polymorphic V.T) and Extra Systole were found as 06 (8.6%), 05 (7.1%) and 05 (7.1%) respectively.

In our study neurological manifestations were shown in **(Table II)**, Miosis noted in almost all patients, common neurological finding in our study was flaccid paralysis with predominant involvement of proximal muscles noted in 28 (40%) patients, (with respiratory muscle involvement in 10 cases), and delirium in 11 (15.7%) patients. Other neurological findings were impairment of consciousness 8 (11.4%), convulsions 7 (10%), extra pyramidal features 6 (8.6%), fasciculation in 5 (7.1%), and cranial nerve palsies (EOM involvement) in 5 (7.1%) patients.

TABLE I: CARDIAC FEATURES OF ACUTE OPC POISONING

Cardiac features	Male	Female	Total (%)
Non-cardiac pulmonary edema	07	08	15 (21.4%)
Sinus tachycardia	08	12	20 (28.6%)
Sinus bradycardia	05	10	15 (21.4%)
Hypertension	04	09	13 (18.6%)
Hypotension	04	03	07 (10%)

TABLE II: NEUROLOGICAL MANIFESTATIONS IN ACUTE OPC POISONING

Neurological Manifestations	Male	Female	Total (%)
Flaccid Paralysis	11	17	28 (40%)
Delirium	3	8	11 (15.7%)
Impairment of Consciousness	4	4	08 (11.4%)
Convulsions	3	4	07 (10%)
Extra Pyramidal Features	2	4	06 (8.6%)
Fasciculations	3	2	05 (7.1%)
Cranial Nerve Palsies	2	3	05 (7.1%)

TABLE III: ECG MANIFESTATIONS IN ACUTE OPC POISONING

ECG manifestations	Male	Female	Total (%)
Elevated ST-segment	04	04	08 (11.4%)
Inverted T-waves	03	04	07 (10%)
Prolonged P-R interval	03	08	11 (15.7%)
Prolonged Q-Tc interval	11	17	28 (40%)
Atrial Fibrillation	02	04	06 (8.6%)
Ventricular Tachycardia	03	02	05 (7.1%)
Extra systole	02	03	05 (7.1%)

DISCUSSION

Worldwide, OPC are the most widely used insecticides in developing countries like Pakistan, where agriculture is the main occupation, therefore, the OPC poisoning is very common and easily available every where. WHO recently reports that pesticides poisoning occurs about 3 million/ year with mortality > 3 lac/ year and 99% belong to developing countries.

OPC include Organophosphates (Parathion, Melathion etc) & Carbamates (Carbaryl, Methomyl etc) & are called Anticholinesterases, because they inhibit the enzyme Acetyl cholinesterase, which causes an increase in Acetylcholine activity at Muscarinic and Nicotinic receptors in the Central Nervous System and cause death by cardio respiratory failure.

Literature on local studies for acute OPC poisoning is insufficient, whereas the literature on OPC poisoning either old or recent is sufficiently available in foreign studies. Saadeh et al,[15] conducted study in 46 adult patients with acute OPC poisoning over a five years period at Princess Basma Teaching Hospital (BPTH) Irbid, Jordan, they found Sinus tachycardia in 16 (35%), Sinus bradycardia in 13(28%), Hypertension in 10(22%) and none of the patient developed polymorphic VT (Torsade de-pointes). Our results nearly match with these results with the difference of numbers of patients. They found high percent of non cardiogenic pulmonary edema [20(43.4%)], prolonged QTc interval [31(67%)], Prolong PR interval 11 (15.7%), and hypotension in [08(17)] respectively.

Karki et al[16], conducted study among 37 patients with acute OPC poisoning during three years period at B.P. Koirala Institute of Health Sciences (BPKIHS) Teaching Hospital in Dharan Estern Nepal. They found non cardiogenic pulmonary edema in 08(21.6%). Similarly we found 21.6%. They found pronged QTc interval in 14(37.8%) where as we found in 40%. They found sinus bradycardia in 07(18.9%), sinus tachycardia in 15(40.5%), hypertension in 05(13.5%) and hypotension in 04(10.8%). Our results match with these results in all respects except sinus tachycardia which is high up than our result i.e. 20(28.6%). Also the M:F ratio matches with our study (1:1.5).

Another study conducted in 200 cases of acute OPC poisoning by Balali-Mood et al[17], found 70(35%) sinus tachycardia and 13(6.5%) sinus bradycardia. Their figures are lowered than our figures because of selection of large numbers of patients in their study. By Yurumez et al[18], in their study among 85 cases of acute OPC poisoning over the period of three years found sinus tachycardia in 31.8% while we found in 28.6%. QT-c interval prolongation was found in 55.5% while we found this in 40% patients. The difference in results may possibly be the selection of low numbers of patients in their study.

Bar-Meir et al[19], also found that OPC poisoning precipitates; complex ventricular arrhythmias, ST-T wave

changes, prolonged QTc interval, Torsade de-pointes and sudden cardiac death. In our study we also found the similar parameters.

In a study MA Cherian et al[20] reported that muscle weakness with pre dominant proximal muscle involvement is common in OPC poisoning with variable reports in literature between 8% to 49%, they also reported higher number of respiratory involvement in 33%. In our study common neurological findings were flaccid muscle weakness in 28 (40%) patients with respiratory muscle involvement in 10 cases. Distal muscle weakness was less common in our study, which is almost similar to the above study. Other neurological features like, extrapyramidal features and delirium were reported late in OPC poisoning but difference of early appearance of these clinical features in our study may be because of chronic low dose exposure and lack of awareness regarding use of OPC in field workers and farmers.

CONCLUSION

In routine hospital practice, the suicidal cases are very common due to acute OPC poisoning. Many cases are hospitalized with critical condition with predominant involvement of cardiac and neurological features. Early clinical assessment is important for diagnosis. Early appropriate treatment with use of specific antidots and ICU management can minimize the fatal consequences of OPC poisoning. It is recommended that more local studies are required with higher sample size regarding OPC poisoning to provide awareness regarding this important public health problem.

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