

Frequency of electro-cardiographic changes in patients of acute organophosphate poisoning at tertiary care hospital Larkana, Pakistan

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Abstract

Background and Aims : The organophosphate (OP) poisoning is one of the important preventable public health problems in developing countries. It is estimated that OP pesticide self-poisoning kills around 200,000 people every year. The aim of the study was to determine the frequency of electrocardiographic (ECG) changes in acute OP poisoning at tertiary care hospital Larkana, Pakistan.

Methods: It was an observational retrospective study of the patients who were diagnosed with acute OP poisoning during the period of four years January 2012 to December 2015 at medical emergency department, Shaheed Mohtarma Benazir Bhutto Medical University Hospital Larkana, Pakistan. A sample of 223 patients between 16-45 years with definite history of OP ingestion, were included in study. Patients with the history of cardiac disease, diabetes mellitus, hypertension, chronic renal failure & disturbed electrolytes were excluded.

Results: Mean age was 29.61 ± 8.656 years with range of 16-45 years. Duration of OP ingestion ranged from 30 to 300 minutes with mean of 167.53 ± 45.26 minutes. Sixty five percent patients were in their 3rd and 4th decades of life. Males were 122 (54.71%) while 101 (45.29%) were females. ECG changes found in 145 (65.02%) with tachycardia and bradycardia was 85 (38.1%) and 60 (26.9%) respectively. The ST elevation was noted in 59 (26.5%), depression in 50 (22.4%), T wave changes observed in 51 (22.9%) patients. QTc interval was prolonged in 129 (57.85%).

Conclusion: ECG changes are frequent in OP patients. QTc interval followed by sinus arrhythmias were most common changes observed. ECG should be done in all the patients who present with OP poisoning.

Keywords : Acute organophosphate poisoning, ECG changes, QTc interval, ST elevation.

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Introduction:

Organophosphate (OP) compounds are widely used as pesticides to control in agricultural, industrial and indoor pests globally.¹⁻³ The OP poisoning is one of the important preventable public health problems in developing countries. It is estimated that OP pesticide self-poisoning kills around 200,000 people every year.⁴ A high incidence of mortality has been reported in past and is attributed to delay in diagnosis and improper treatment.^{5,6}

Since agriculture is the main occupation in Pakistan, OP compounds are widely and easily available in ordinary shops.⁷ It has been also reported that OP poisoning is the most common method for suicide in Pakistan as well as in other developing countries.⁸⁻¹¹ These compounds are also known as anticholinesterase because they inhibit the enzyme acetylcholine activity at nicotinic and muscarinic receptors and central nervous

system.^{6,12,13} We conducted this study to determine the frequency of electrocardiographic changes in acute organophosphate poisoning patients at tertiary care hospital Larkana, Pakistan.

Methods:

It is an observational retrospective study of the patients who were diagnosed with OP poisoning during the period of four years January 2012 to December 2015 at medical emergency Department, Shaheed Mohtarma Benazir Bhutto Medical University (SMBBMU) Hospital Larkana, Pakistan. We included all patients between 16-45 years of age with definite history of OP poisoning ingestion within 24 hours and with characteristic manifestations of poisoning including excessive salivation, miosis and fasciculation. Patients with age above 45 years, history of cardiac diseases, diabetes mellitus, hypertension, chronic renal

failure or patients taking drugs (Calcium channel blockers, beta blockers, digoxin, tricyclic anti-depressants, Anti-convulsants and Lithium) which have effect on cardiac function were excluded. Patients with electrolyte imbalance were also excluded from the study.

Data Collection Procedure:

The data were retrospectively collected from the hospital medical records and were reviewed. All patients who fulfilled inclusion and exclusion criteria were enrolled in this study. The ethical approval was taken from SMBBMU hospital Ethical review committee before conducting the study. General and clinical examination parameters were collected including; age, gender, time elapsed from ingestion of OP poison and arrival at the emergency department, route of poisoning, initial mental status (Glasgow Coma Scale), initial vital signs and ECG were collected and classified according to the degree of poisoning;

Mild: No symptoms, normal vital functions, normal pupils in presence of ECG changes.

Moderate: Muscle twitches, increased perspiration (increased sweating), pupillary changes (constricted but not pinpoint), tachypnea, early pulmonary oedema (occasional crepts).

Severe: Pin point pupils, frank pulmonary oedema (coarse crepitation), respiratory paralysis, unconsciousness, or a combination of these.

First ECG was taken in emergency department by an experienced technicians and were reviewed by researcher and consultant physician. ECG analysis included rate, QTc interval, ST segment and T wave changes. A pre-designed questionnaire was used for data collection. The effect modifiers were controlled initially by selection criteria (inclusion and exclusion).

The mean ± SD of numeric response variables as age was calculated. Categorical response variables like gender (M/F), Severity (mild/moderate/severe), QTc interval (normal/prolonged), ST segment (normal/elevated/depressed), T-wave (normal/inverted/peaked), sinus tachycardia and sinus bradycardia were presented in frequency and proportion. All the statistical analysis was conducted using Stata statistical software 14 (Stata Corp LP, 4905 Lakeway Drive, College Station, Texas 77845, USA) where p-value < 0.05 was considered statistically significant.

Results:

A total number of 223 patients were identified and included in the study. The mean ± SD age of patients was 29.61 ± 8.6 years with range of 16-45 years. The duration from ingesting organophosphate till reaching hospital ranged from 30 to 300 minutes with a mean duration of 167.53 ± 45.26 minutes. Sixty seven percent of the patients were in their 3rd and 4th decades of life as shown in the table 1. We did not find statistically significant results between ECG changes and age of the patients (P-value 0.33). There were 122 (54.71%) male while 101 (45.29%) were females. The signs and symptoms according to the severity of poisoning (mid, moderate and severe) were 90 (40.36%), 80 (35.87%) and 53 (23.77%) respectively.

Table 2 shows frequencies of different ECG changes in the study population. About sixty five percent had one or other ECG change, while in 78 (34.98%) such changes were not observed. In these 145(65.02%) of the patients, heart rate was altered either elevated or decreased [Tachycardia 85 (38.1%) or Bradycardia 60(26.9%)], while other 78(35%) had normal heart rate. The ST segment elevation was noted in 59 (26.5%), depressed in 50 (22.4%) and normal in 114 (51.1%) of the

patients. Thirteen percent (29) had T wave inversion, peaked/ Tall T wave was observed in 22 (9.9%) patients, while majority 172 (77.7%) patients had a normal T wave. Accordingly QTC interval was prolonged in 129 (57.85%).

Regarding clinical manifestation in OP poisoning patients of current study, salivation was present in 212 (95%), lacrimation 178 (80%), diarrhea in140(63%), GI upset in 167 (75%), vomiting 212 (95%), diaphoresis 176 (79%), miosis in 203 (91%), muscle fasciculation 158 (71%), cramping and weakness in 185 (83%), restlessness in 203 (91%), confusion in 185 (83%), tremors in 114 (51%), seizures in 87 (39%) and coma was noted in 154 (69%) patients.

Table 1: Distribution of the patients according to elctrocardiographic changes.

Characteristics	ECG changes N=223		P value
	Yes n= 145 (65.02%)	No n = 78 (34.98%)	
Age category			
16-20 Years	27 (18.6%)	19 (24.3%)	0.33
21-30 Years	46 (31.7%)	24 (30.8%)	
31-40 Years	47 (32.4%)	28 (35.9%)	
41-45 Years	25 (17.2%)	7 (8.9%)	
Gender			
Male	85 (58.6%)	37 (47.4%)	0.10
Female	60 (41.4%)	41 (52.6%)	
Poisoning severity			
Mild	58 (26.0%)	32 (41.0%)	0.95
Moderate	53 (36.5%)	27 (34.6%)	
Sever	34 (23.5%)	19 (24.4%)	

Table 2: Frequency of different electrocardiographic changes in study population (N=223) due to organophosphosphate poisoning.

ECG Change	Measure	Frequency	Percent
Heart rate	Tachycardia	85	38.1
	Bradycardia	60	26.9
	Normocardia	78	35
ST segment	Normal	114	51.1
	Elevated	59	26.5
	Depressed	50	22.4
T wave	Normal	172	77.1
	Inverted	29	13
	Peaked/Tall	22	9.9
QTC Interval	Normal	94	42.11
	Prolonged	129	57.85

Discussions:

The current study was undertaken to determine the rate of various ECG findings in the OP poisoning patients. Mean age of our patients was 29.61 ± 8.656 years. The youngest patient with OP poisoning was 16 years old while the eldest was 45 years old.

This approximated with other studies at local and international level. Accordingly, Balouch GH, et al¹⁴ found that overall mean age of OP poisoning was 27.35 ± 8.63 years. A Turkish study Yurumez Y, et al¹² found mean age 32.2 ± 14.9 years. While the study from Nepal at a tertiary care teaching hospital found that the mean age of OP poisoning patients was 26.85 years.¹³

In our study there was higher number of cases who were in their 3rd and 4th decades of life. It is hypothesized that in our set up these decades of life imposes great psychological pressure on one's life. Marriage, family life, employment issues and social issues produce much physical, mental, financial and psychological burden on an individual. In case of inability to cope with these, one is highly prone to react through suicidal activity and for which organophosphate are cheapest and easy method in our country.

Turabi A, et al¹⁵ in a large study conducted at National poison centre, in Pakistan found that 44.77% were in age group 15-20 years of age, which is quite different from our finding. This difference was due to the reason the aforementioned study included all age patients and all modes of poisoning which were out of scope of the current study. In our study the numbers of male patients was about 55% and females were 45%. While, Balouch GH, et al¹⁴ the percentage of male patients (69%) was higher than females. Contrary to this trend of male to female ratio, Karki P, et al¹³ found that male were only 41% while females were 59%.

Sixty five percent of patients with OP poisoning in current study had one or the other type of abnormality in ECG. Most common finding was prolonged QTc interval which was prolonged in 57.8% patients with a mean corrected QT interval of 0.513 ± 0.048 seconds. This was followed by altered heart rates. 38.1% patients had tachycardia while bradycardia was noted in 26.9% OP poisoning patients. These finding closely resemble those found by other studies. Saadeh AM, et al in their study describe that among OP poisoning patients electrocardiographic finding showed that prolonged QTc interval was present in 67% while sinus tachycardia in 35% and sinus bradycardia in 28% patients.¹⁶

Similarly Yurumez Y, et al describe that the prolongation of the QTc interval seen in 55.5% followed by sinus tachycardia among 31.8% & bradycardia in only 1.2% patients.¹² They further found that the mean corrected QT interval (QTc interval) was 0.435 ± 0.052 seconds. Likewise Taira K, et al¹⁷ study showed QTc was prolonged in 56.4% patients. This shows that QTc though a non-specific ECG finding, is more frequent in OP poisoning patients.

In current study 26% patients had elevated ST segment, 22.4% had depression of ST segment. T wave abnormalities were least commonly seen viz; 13% had an inverted T wave on ECG while only 9.9% and a peaked T wave. Yurumez Y, et al¹² describe that the elevation of the ST segment and low amplitude T waves were seen in 15 cases (17.6%). The study by Balouch GH and coworkers found that ST elevation was present in 10.3%, and the T-inversion was present in 11.5%.¹⁴ While the study by Saadeh AM, et al noted that 41% patients had one or other ST-T abnormalities on ECG.¹⁶

Regarding clinical manifestation of the patients in our study, salivation was present in 95%, lacrimation 80%, diarrhea in 63%, GI upset in 75%, vomiting 95%, diaphoresis 79%, miosis in 91%, muscle fasciculation 71%, cramping and weakness in 83%, restlessness in 91%, confusion in 83%, tremors in 51%, seizures in 39% and coma was noted in 69% patients. When compared to other studies these were found to be similarly prevalent with only minute difference of some clinical features.^{13, 14, 18}

Our study also had some limitations. We collected data from one hospital through its records. As a result, all assessment parameter were not included like amount of ingestion and arrival

of time after ingestion of may be underestimated or overestimated. Secondly Glasgow Coma Scale can also be affected by ingestion of alcohol and OP insecticides. However, current study detected and presented the evidence on ECG changes in OP poisoning cases at local level which can be helpful for policy makers and health care providers.

Conclusion:

The study concludes that ECG changes are frequent in patients of OP poisoning. QTc interval followed by sinus tachycardia and bradycardia were the most common changes observed. Less common changes were ST segment and T wave. These findings also recommend that ECG assessment should be done in all the patients who present with OP poisoning.

Conflicting Interests:

None

Authors' Contributions:

MHS has participated in study design, data analysis and interpretation, draft writing, editing and submission. MM, RB, and MAS participated in study design, data entry, analysis, data interpretation and editing. All authors read and approved the final manuscript.

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