ACADEMIA Letters

DIAGNOSTIC AND PROGNOSTIC VALUE OF ELECROCARDIOGRAPHY IN ACUTE CHOLINESTRASE INHIBITORS POISONING

Mohamed Abdel Sattar Hassanin Maha Ghanem Fahmy Charl Haidy Megahed Naglaa Salama

Cholinesterase inhibitors are widely used in agriculture as insecticides, in industry, in technology as softening agents and additives to lubricants and in military technology as chemical weapons. It is absorbed by any route including, trans-dermal, the lung, trans-conjunctival, across the GIT mucosa. The clinical manifestations of organophosphorus poisoning depend on many factors that include: the type of the agent, the quantity, the route of entry to the body, the fat solubility, its rate of endogenous hydrolysis and how tightly it binds to the enzyme active site. These clinical manifestations include, muscarinic, nicotinic and central effects.

This study was designed to

- Estimate the frequency of ECG abnormalities among patients suffering from acute cholinesterase inhibitors poisoning admitted to Alexandria Poison Center and Emergency Department of Alexandria University Main Hospital throughout out 6 months (1st of February 2015 to 31st of July 2015).

- Relate the severity of poisoning with these ECG abnormalities.
- Correlate these ECG abnormalities with patient outcome.

Academia Letters, June 2021 ©2021 by the authors — Open Access — Distributed under CC BY 4.0

Corresponding Author: Maha Ghanem, ghanemmaha63@gmail.com

Citation: Abdel Sattar Hassanin, M., Ghanem, M., Charl , F., Megahed, H., Salama, N. (2021). DIAGNOSTIC AND PROGNOSTIC VALUE OF ELECROCARDIOGRAPHY IN ACUTE CHOLINESTRASE INHIBITORS POISONING. Academia Letters, Article 1435. https://doi.org/10.20935/AL1435.

Subjects and method

- Study design: A hospital based prospective descriptive case series approach was conducted.
- Study setting Alexandria Poison Center and Emergency Department of Alexandria University Main Hospital.
- The study was approved from the Ethical Committee of the Faculty of Medicine, Alexandria University.Written informed consents were obtained from patients or closest relative if they are not capable of reading and / or signing the consent.
- Study Subjects: 50 patients of both sexes (24 males and 26 females) suffering from acute cholinesterase inhibitors poisoning.
- Patients with history of cardiovascular, respiratory, hepatic, and neuromuscular diseases were excluded.
- A clinical sheet was used to assess the patients. The following items were used in the sheet; personal history, including name, address (residency), age, gender, route of poisoning, circumstances of poisoning and past medical history. Clinical examination: vital signs (pulse, blood pressure, respiratory rate, and temperature), physical findings (pupil size and reaction), muscarinic manifestations, nicotinic manifestations, central nervous system manifestations and level of consciousness. Severity categorization was done via GCS and POP score. In addition to investigations: ECG, serum cholinesterase level, arterial blood gases (pH, PCO2, HCO3, PO2, Na+, K+, O2 saturation).

Results

- Regarding demographic data: Twenty-four (48%) of cases were males and 26 patients (52%) were females. Twenty-one females (80.8%) and 37.5% of males took the poison intentionally (suicidal), while most males (62.5 %) took the poison accidently. There was a statistically significant difference between genders regarding circumstance of exposure (P= 0.002).

- **Regarding history of exposure:** The highest incidence of suicidal cases (78.1%) was in age group from 20 years to less than 30 years, followed by cases in age group less than 20 years (44.4 %), then cases at age from 30 years to less than 40 years (20 %), while no case was at the age of more than 40 years (0.0 %). There was a statistically significant difference between

Academia Letters, June 2021 ©2021 by the authors — Open Access — Distributed under CC BY 4.0

Corresponding Author: Maha Ghanem, ghanemmaha63@gmail.com

Citation: Abdel Sattar Hassanin, M., Ghanem, M., Charl , F., Megahed, H., Salama, N. (2021). DIAGNOSTIC AND PROGNOSTIC VALUE OF ELECROCARDIOGRAPHY IN ACUTE CHOLINESTRASE INHIBITORS POISONING. Academia Letters, Article 1435. https://doi.org/10.20935/AL1435.

age groups regarding circumstance of exposure (MCp= 0.001).

- **Regarding clinical examination:** The present study demonstrated that the most prevalent muscarinic manifestations were excessive salivation and sweating, present in 92 % of patients, also miosis was present in 82 % of patients, followed by vomiting which was present in 68 % of patients. The least presented symptoms were bradycardia which accounted for 40 % of patients and no bradypnea was noted. Whereas the most prevalent nicotinic manifestation was altered sensorium, present in 70% of patients, also tachypnea was present in 68% of patients, followed by fasciculation was present in 48%. The least presented nicotinic manifestations were tachycardia (22%) and convulsions (18%).

- **Regarding assessment of severity:** The present study demonstrated that 24 patients (48%) of the studied cases were among mild POP (Peradeniya organophosphorus poisoning scale) group and 16 patients (32%) were among moderate POP group, while only 10 patients (20%) were among severe POP group with a mean of 4.50 ± 2.33 and a median of 4.0. The present study demonstrated that there was a statistical relation between prolonged QT interval and total POP score (MCp =0.032), and between normal sinus rhythm ECG and total POP score (MCp =0.013).

- **Regarding laboratory investigations:** Twenty-four cases (48 %) showed levels of serum AChE within the normal range for sex, while 26 cases (52 %) showed abnormal levels of serum AChE (lower than the normal range); 10 males and 16 females. The present study demonstrated that there was a statistical relation between ECG changes and serum acetyl cholinesterase level (MCp =0.011). PaCO2 ranged between 19.0 and 55.0 mmHg, with a mean value of 40.08 ± 8.32 and a median of 40.0. ABG of the studied patients included changes in PaCO2: respiratory alkalosis in 17 patients (34 %) and respiratory acidosis in 20 patients (40 %), while the remaining of patients (26 %) presented with normal PaCO2. The current study demonstrated statistical relation between ECG changes and initial PaCO2 (MCp= 0.014).

PaO2 ranged between 34.0 and 147.40 mmHg, with a mean value of 97.18 \pm 17.87 and a median of 77.70. ABG of the studied patients included changes in PaO2: hypoxemia in 19 patients (38 %), while most patients (62 %) presented with normal or high PaO2. The current study showed statistical relation between ECG changes and initial PaO2 (MCp= 0.027).

Bicarbonate (HCO3) ranged between 10.0 and 37.30mEq/l, with a mean value of 21.66 \pm 4.78 and a median of 21.40. ABG of the studied patients included changes in HCO3: metabolic acidosis in 22 patients (44 %) and metabolic alkalosis in 5 patients (10 %), while the remaining of patients (46 %) presented with normal HCO3 level. Na+ ranged between 133.0 – 174.0 mEq/l, with a mean value of 144.40 \pm 9.85 and a median of 142.0. ABG of the studied patients included changes in Na+: hyponatremia in only 2 patients (4 %) and hypernatremia in 11 patients (22 %), while most patients (74 %) presented with normal Na+.

Academia Letters, June 2021 ©2021 by the authors — Open Access — Distributed under CC BY 4.0

Corresponding Author: Maha Ghanem, ghanemmaha63@gmail.com

Citation: Abdel Sattar Hassanin, M., Ghanem, M., Charl, F., Megahed, H., Salama, N. (2021). DIAGNOSTIC AND PROGNOSTIC VALUE OF ELECROCARDIOGRAPHY IN ACUTE CHOLINESTRASE INHIBITORS POISONING. *Academia Letters*, Article 1435. https://doi.org/10.20935/AL1435.

K+ ranged between 2.50 - 5.50 mEq/l, with a mean value of 3.65 ± 0.70 and a median of 3.50. ABG of the studied patients included changes in K+ level: hypokalemia in 20 patients (40%) and hyperkalemia in only 1 patient (2%), while the remaining of patients (58%) presented with normal K+ level.

- Regarding electrocardiography: There were 17 patients without ECG changes while 33 patients had ECG changes. Prolonged QTc interval was encountered in 11 (22%) patients followed by sinus bradycardia and sinus tachycardia 9 patients (18%) for each. Other changes were encountered first degree heart block, VT/VF, rapid atrial fibrillation, and premature ventricular contractions 2% for each.

- Regarding outcomes: The respiratory complications encountered 36% of the cases (N=18), while cardiac complications encountered 22% of the cases (N=11). Cardiac fatalities occurred: intractable bradycardia occurred in 7 patients (14%) and malignant arrhythmia (VF, VT) occurred in 1 patient who died, while rapid AF and Heart block occurred in one patient each.

In conclusion, there was a statistically significant difference between genders with predominance of females with intention to commit suicide. There was a statistical relation between prolonged QT interval and total POP score, and between normal sinus rhythm ECG and total POP score. ECG changes encountered in 33 patients e.g. prolonged QTc interval, sinus bradycardia, sinus tachycardia first degree heart block, VT/VF, rapid atrial fibrillation, and premature ventricular contractions.

Academia Letters, June 2021

©2021 by the authors — Open Access — Distributed under CC BY 4.0

Corresponding Author: Maha Ghanem, ghanemmaha63@gmail.com

Citation: Abdel Sattar Hassanin, M., Ghanem, M., Charl , F., Megahed, H., Salama, N. (2021). DIAGNOSTIC AND PROGNOSTIC VALUE OF ELECROCARDIOGRAPHY IN ACUTE CHOLINESTRASE INHIBITORS POISONING. Academia Letters, Article 1435. https://doi.org/10.20935/AL1435.