Original Article


# Role of Paraoxonase-1 Enzyme in Prediction of Severity and Outcome of Acute Organophosphorus Poisoning: A Prospective Study

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# ABSTRACT

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**Background:** Human serum paraoxonase-1 (PON-1) hydrolyzes organophosphate

compounds (OPC) and so significantly alters an individual’s susceptibility to the toxicity of these chemicals. **Aim:** The study was designed to assess the serum PON- 1 activity in patients with OPC poisoning and to correlate its level with the severity and outcome of acutely organophosphate poisoned patients. **Patients and methods:** This was a prospective clinical study that was performed at Benha Poison Treatment and Toxicological Research Unit (BPTTRU), Benha University Hospitals, Egypt, for one year, from 1 August 2020 till 31 July 2021. Patients were divided into case and control groups. Socio-demographic information of patients, clinical findings, treatments given, length of hospital stay and outcome were collected into datasheets. Patients were classified according to degree of toxicity according to Peradeniya Organophosphorus Poisoning (POP) scale. Blood samples were collected from patients to assess pseudocholiesterase and PON-1 activities. **Results:** Reduction of serum pseudocholinesterase and paraoxonase-1 (PON-1) activities in poisoned patients and patients can be graded according to (POP) scale into: mild, moderate and severe cases. **In conclusion:** This study concluded that serum paraoxonase-1 (PON-

1) activity was significantly lower in patients with severe organophosphorus compounds (OPC) poisoning as compared to patients with moderate poisoning. Lower PON-1 activity was significantly associated with lower serum cholinesterase and poorer outcomes. PON-1 activity may be considered as an indicator of prognosis in OPC poisoning.

# Keywords: Pseudocholinesterase; Organophosphorus compounds; POP Scoring; Paraoxonase-1

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# Introduction

Pesticides refer to a wide range of

chemicals that are employed to increase agricultural output. Several pesticides have been shown to have severe negative impacts on human health, including acute toxicity (accidental poisoning deaths, particularly in impoverished nations) and chronic toxicity (even at low concentrations) (Trellu et al., 2021). In the central nervous systems of mammals and insects, organophosphate compounds (OPC) inhibit acetylcholinesterase irreversibly by inhibiting acetylcholine breakdown during nerve impulse transmission. Continuous neuronal excitation causes a variety of hazardous symptoms in mammals and insects, **including slowed heart rate, pinpoint e**ye pupils, and seizures and respiratory failure (RF) which is the leading cause of OPC poisoning morbidity and fatality (Zhai et al., 2021).

The diagnosis is based on the individual's medical history, physical examinations, and toxidromes of acute poisoning. Predicting the severity, prognosis, and complications related to poisoning requires a variety of clinical observations, electrocardiography, and blood or urine sample results. Electrolytes, the complete blood count, and arterial blood gas are virtually always tested (Kim et al., 2022).

Acetylcholine is found to be considerably in almost whole of the autonomic preganglionic fibers which consists of the enite postganglionic fibers along with the peripheral parts of the ANS (Autonomic nervous system. In addition it also comprises of the cholinergic fibers which are the sympathetic post ganglionic nerve fibres (Kaur et al., 2019).

The paraoxonases family consists of three enzymes: Paraoxonase-1 (PON-1), paraoxonase-2 (PON-2) and paraoxonase-3 (PON-3), all having antioxidant and hydrolase

activities. Despite the fact that PON enzymes are found throughout the human body, they are mostly generated in the liver. They are found in a variety of tissues and are mostly linked to cell membranes and certain lipoproteins, while a free enzyme has been discovered in the blood (Reichert et al., 2021).

Analyzing PON-1 activity in those who have ingested OPC would be helpful in: (I) evaluating the severity of poisoning, (II) estimating the capability of the patient to detoxify OPC, and (III) recognizing PON-1's prognostic significance due to interindividual differences in PON-1 activity (Samy et al., 2019).

# Aim of work:

The aim of this work is to evaluate serum

paraoxonase-1 (PON-1) activity in patients with organophosphorus poisoning and to correlate serum PON-1 with the severity and outcome of acutely organophosphate poisoned patients admitted to the Benha Poison Treatment & Toxicological Research Unit (BPTTRU).

# References

Abd Alkareem, M., and Khater, A. (2019):

Evaluation of copeptin level and Peradeniya score as predictors of severity and outcome in acute organophosphorus pesticides poisoned patients admitted to the Poison Control Center Ain Shams University Hospitals (a prospective study). Ain Shams Journal of Forensic Medicine and Clinical Toxicology, 3 3(2), 104-

112.

Abdel Baseer, K. A., Gad, E. F. and Abdel Raheem, Y. F. (2021): Clinical profile and outcome of acute organophosphate poisoning in children of Upper Egypt: a cross-sectional

study. BMC pediatrics, 21 (1), 1-8.

Acikalin, A., Dişel, N. R., Matyar, S., Sebe, A., Kekec, Z., Gokel, Y. and Karakoc, E. (2017): Prognostic factors determining morbidity and mortality in organophosphate poisoning. Pakistan journal of medical science, 33 (3), 534-539.

Akdur, O., Durukan, P., Ozkan, S., Avsarogullari, L., Vardar, A., Kavalci, C. and Ikizceli, I. (2010): Poisoning severity score, Glasgow coma scale, corrected QT interval in acute organophosphate poisoning. Hum Exp Toxicol., 29 (5), 419-425.

Ahmed, A., Ali, L., Shehbaz, L., Nasir, S., Rizvi, S. R. H., Zaeghum, M. and Aman, Z. A. (2016): Prevalence and characteristics of organophosphate poisoning at a tertiary care

centre in Karachi, Pakistan. Pakistan Journal Of Surgery, 32 (4), 269-273.

Al Jumaan, M. A., Al Shahrani, M. S., Al

Wahhas, M. H. and Al Sulaibeakh, A. H. (2015): Organophosphate poisoning: A 10-year experience at a tertiary care hospital in the kingdom of Saudi Arabia. Saudi Journal of Medicine and Medical Sciences, 3 (1), 22-25. Alsulimani, L. K., Baajlan, O., Alghamdi, K., Alahmadi, R., Bakhsh, A. and Abualenain, J. (2022): Effects of not intubating non-trauma patients with low Glasgow Coma Scale scores: A retrospective study. The Journal of Medicine, Law & Public Health., 2 (1), 83-90.

Ahmed, S. M., Das, B., Nadeem, A. and Samal,

R. K. (2014): Survival pattern in patients with acute organophosphate poisoning on mechanical ventilation: A retrospective intensive care unit-based study in a tertiary care teaching hospital. Indian J Anaesth., 58 (1), 11-

17.

Amin, D. M., Abaza, M. T., El Azawy, D. S. and Ahmed, A. I. (2018): Morbidity and mortality indicators in acute organophosphate poisoning in Zagazig University Hospital, Egypt: retrospective study. Occupational

Diseases and Environmental Medicine, 6 (4),

130-140.

Amir, A., Raza, A., Qureshi, T., Mahesar, G. B., Jafferi, S., Haleem, F. and Khan, M. A. (2020): Organophosphate poisoning: demographics, severity scores and outcomes from National Poisoning Control Centre, Karachi. Cureus., 12 (5), e8371.

Aslan, S., Cakir, Z., Emet, M., Serinken, M., Karcioglu, O., Kandis, H. and Uzkeser, M. (2011): Acute abdomen associated with organophosphate poisoning. J Emerg Med., 41(5), 507-512.

Ananthi, P. and Jeyaraj, C. L. (2018): Association of serum paraoxonase-1

phenotypes with activity of serum cholinesterase in acute organophosphorus compound poisoning. Indian Journal of Basic

and Applied Medical Research, 7 (2), 356-365. Aslan, S., Cakir, Z., Emet, M., Serinken, M.,

Karcioglu, O., Kandis, H. and Uzkeser, M.

(2011): Acute abdomen associated with organophosphate poisoning. The Journal of Emergency Medicine, 41 (5), 507-512. Bajracharya, M., Khadka, P., and Wagle, L. (2018): A retrospective study of poisoning cases in Manmohan Memorial Teaching Hospital. JMMIHS., 4 (1), 55-65.

Balali-Mood M, Balali-Mood K. (2008): Neurotoxic disorders of organophosphorus compounds and their managements. Arch Iran Med., (1), 65-89.

Balali-Mood, M. and Saber, H. (2012): Recent advances in the treatment of organophosphorous poisonings. Iranian journal of medical sciences, 37 (2), 74-91.

Banday, T. H., Tathineni, B., Desai, M. S. and Naik, V. (2015): Predictors of morbidity and mortality in organophosphorus poisoning: a case study in rural hospital in Karnataka, India. N Am J Med Sci., 7(6), 259-265.

Bilal, M., Khan, Y., Ali, S. and Naeem, A. (2014): The pattern of organophosphorus poisoning and its short-term outcomes in various socioeconomic groups. KJMS., 7(1), 11-17.

Bruins, J., Menezes, C. N. and Wong, M. L. (2019): Organophosphate poisoning at Chris Hani Baragwanath Academic Hospital 2012- 2015. Afr J Thorac Crit Care Med., 25 (3), 104-

110.

Cumin, D., Fogarin, J., Mitchell, S. J. and Windsor, J. A. (2022): Perioperative hypothermia in open and laparoscopic colorectal surgery. ANZ J Surg., 92 (5), 1125-

1131.

Chandrasekhar, V., Narayanan, R. S., Mamidala, R. and Venkatasubbaiah, K. (2019): Phosphazenes, organophosphorus chemistry” Volume 48, Eds. Allen, D. W., Loakes, D., and

Tebby, J. C. Royal Society of Chemistry, Cambridge, U. K, 400-423.

Chaudhary, R., Bhandari, R., Malla, G., Poudel,

M. and Lamsal, M. (2019): Correlation of clinical score and serum acetylcholinesterase level as a predictor of outcome among patients with acute organophosphate poisoning admitted in emergency ward of a tertiary hospital.

Journal of BP Koirala Institute of Health

Sciences, 2 (2), 19-27 .

Cherian, M. A., Roshini, C., Visalakshi, J., Jeyaseelan, L. and Cherian, A. M. (2005): Biochemical and clinical profile after organophosphorus poisoning--a placebo- controlled trial using pralidoxime. The Journal of the Association of Physicians of India, 53, 427-431.

Chuang, C. S., Yang, K. W., Yen, C. M., Lin,

C. L. and Kao, C. H. (2019): Risk of seizures in patients with organophosphate poisoning: a nationwide population-based study. International Journal of Environmental Research and Public Health, 16 (17), 3147-

3156.

Coskun, R., Gundogan, K., Sezgin, G. C., Topaloglu, U. S., Hebbar, G., Guven, M. and Sungur, M. (2015): A retrospective review of intensive care management of organophosphate insecticide poisoning: Single center experience. Nigerian journal of clinical practice, 18 (5), 644-650.

Darwish, R. T., Megahed, H. M., Attia, M. H. and El-Neily, D. A. (2017): Paraoxonase-1 gene polymorphism and enzymatic activity as a prognostic marker in cases of poisoning by

cholinesterase inhibitor pesticides among Egyptians. Ain Shams J Forensic Med Clin

Toxicol., 28 (1), 88-89.

Debnath, J., Basak, A. K., Rahman, M. Z. and Saha, A. (2018): Profile of organophosphorus poisoning. KYAMC Journal., 9 (3), 133-135. Dervišević, E., Hasić, S., Katica, M., Salihbegović, A., Ajanović, Z. and Sarajlić, N. (2022): Forensic significance of cTnI serum for the detection of terminal myocardial damage in rats (Rattus norvegicus) caused by hyperthermia. J King Saud Univ Sci., 34 (2), 101753.

Dündar, Z. D., Köylü, R., Ergin, M., Günaydin,

Y. K., Özer, R. and Cander, B. (2015): Prognostic value of red cell distribution width in patients with organophosphate poisoning. Eurasian Journal of Emergency Medicine, 14 (2), 65-69.

Dutta, P., Kamath, S. S., Bhalla, A., Shah, V. N., Srinivasan, A., Gupta, P. and Singh, S. (2015): Effects of acute organophosphate poisoning on pituitary target gland hormones at admission, discharge and three months after poisoning: A hospital based pilot study. Indian

journal of endocrinology and metabolism, 19 (1), 116-123.

Eddleston, M. and Phillips, M. R. (2004): Self poisoning with pesticides. British medical journal, 328 (7430), 42-44.

Eisa, H. S., Nomier, M. A., Arafa, M. H. and Khayal, E. E. S. (2021): Amylase and lipase enzymes as factors affecting acute organophosphorous poisoning morbidity and mortality. Zagazig Journal of Forensic Medicine & Toxicology, 19 (2), 76-99. Elagamy, S. E. and Gabr, H. M. (2019): Predictors of the need for Intensive Care Unit admission in acute organophosphorus poisoning: One year prospective study. Egypt J. Forensic Sci. Appli. Toxicol., 19 (4), 1-9. Elgohary, M., ElAshmawy, N., ElKelany, R., AboElfadl, A. and Ghada, E. S. (2013): Comparative study of paraoxonase and cholinestrase enzymes activities in diagnosis of organophosphorus insecticide intoxication. Ain Shams Journal of Forensic Medicine and Clinical Toxicology, 21 (2), 1-11.

El-moneim, W. A., Al-Maghraby, M., Elhameed, S. Y. A., Omran, G. A. and Almaz,

D. (2019): Prognostic value of insecticide type and enzymatic activities on severity of acute insecticides poisoning. Egypt J. Forensic Sci. Appli. Toxicol., 19 (3), 49-63.

El-Sheikh, A., Hashem, A., Elgohary, M., Elfadl, A. A. and Lashin, H. (2017): Evaluation of the potential cardiotoxic effects in acute organophosphate toxicity as a prognostic factor. Tanta Med J., 45 (3), 115-121.

Grzegorzewska, A. E., Adamska, P., Iwańczyk- Skalska, E., Ostromecka, K., Niepolski, L., Marcinkowski, W. and Jagodziński, P. P. (2021): Paraoxonase-1 concerning dyslipidaemia, cardiovascular diseases, and mortality in haemodialysis patients. Sci Rep., 11 (1), 1-16.

Gunduz, E., Dursun, R., Icer, M., Zengin, Y., Gullu, M. N., Durgun, H. M. and Gokalp, O. (2015): Factors affecting mortality in patients with organophosphate poisoning. J Pak Med Assoc., 65 (9), 967-72.

Hamrahian, S. M. and Falkner, B. (2022): Approach to hypertension in adolescents and young adults. Curr Cardiol Rep., 24(2):131- 140.

Hernández, A. F., López, O., Pena, G., Serrano,

1. L., Parrón, T., Rodrigo, L. and Pla, A. (2008): Implications of paraoxonase-1 (PON1) activity and polymorphisms on biochemical and clinical outcomes in workers exposed to pesticides. In The paraoxonases: Their role in disease development and xenobiotic metabolism (pp. 221-237). Springer, Dordrecht.

Hildebrandt, B., Wust, P. and Ahlers, O. (2002): The cellular and molecular basis of

hyperthermia. Critical Reviews in Oncology/Hematology, 43 (1), 33-56. Hiremath, P., Rangappa, P., Jacob, I. and Rao,

1. (2016): Pseudocholinesterase as a predictor

of mortality and morbidity in organophosphorus poisoning. Indian J Crit Care Med., 20 (10), 601-604.

Jokanović, M., Kosanović, M., Brkić, D. and Vukomanović, P. (2011): Organophosphate induced delayed polyneuropathy in man: an overview. Clinical neurology and neurosurgery, 113 (1), 7-10.

Kamath, S. D., and Gautam, V. K. (2021): Study of organophosphorus compound poisoning in a tertiary care hospital and the role of Peradeniya Organophosphorus Poisoning scale as a prognostic marker of the outcome. J Family Med Prim Care., 10 (11), 4160. Kaushal, J., Khatri, M., and Arya, S. K. (2021): A treatise on Organophosphate pesticide pollution: Current strategies and advancements in their environmental degradation and elimination. Ecotoxicology and Environmental Safety, 207, 111483.

Kaur, A., Anand, C., Singh, T. G., Dhiman, S., and Babbar, R. (2019): Acetylcholinesterase inhibitors: a milestone to treat neurological disorders. Plant Arch, 19, 1347-1359. Khamankar, D. R., Pawade, P. Y. and Khode,

B. V. (2021): Accident analysis and blackspot identification at Chandrapur City. IJSRSET., 8 (2), 428-439.

Kim, Y. O., Kim, H. I. and Jung, B. K. (2022):

Pattern of change of C-reactive protein levels and its clinical implication in patients with acute poisoning. SAGE Open Med., 10, 20503121211073227.

Kozaci, N., Gkel, Y., Açıkalın, A. and Satar, S. (2012): Factors Affecting the prognosis in Acute Insecticide Intoxications Containing Organic Phosphorus. JAEM /Akademik Acil Tip Olgu Sunumlari Dergisi, 11 (2), 93-97. Kumar, S., Agrawal, S., Raisinghani, N. and

Khan, S. (2018): Leukocyte count: A reliable

marker for the severity of organophosphate intoxication?. Journal of Laboratory Physicians, 10 (2), 185-188.

Kumar, T. V., Pillai, S. K. R., Chan-Park, M. B. and Sundramoorthy, A. K. (2020): Highly selective detection of an organophosphorus pesticide, methyl parathion, using Ag–ZnO– SWCNT based field-effect transistors. J. Mater. Chem. C., 8 (26), 8864-8875.

Lee, J., Lee, Y., Park and Y. et al., (2013): The difference in Creactive protein value between initial and 24 hours follow-up (D-CRP) data as a predictor of mortality in organophosphate poisoned patients, Clinical Toxicology. 51, 29–

34.

<https://doi.org/10.3109/15563650.2012.745939>

Lin, C. C., Hung, D. Z., Chen, H. Y. and Hsu,

K. H. (2016): The effectiveness of patient- tailored treatment for acute organophosphate poisoning. Biomedical journal, 39 (6), 391-399. Linton, J. J., Eagles, D., Green, M. S., Alchi, S., Nemnom, M. J. and Stiell, I. G. (2022): Diagnosis and management of wide complex tachycardia in the emergency department. CJEM., 1-11.

Longhitano, Y., Zanza, C., Romenskaya, T., Saviano, A., Persiano, T., Leo, M. and Racca,

F. (2022). Single-Breath Counting Test pnon- invasive respiratory support requirements in patients with COVID-19 pneumonia. J Clin Med., 11 (1), 179-189.

Moussa, M., Mohamed, S., Hilal, M., Elnabi,

M. and Zaki, N. (2018): Predictive value of triage vital signs and conscious level for outcome evaluation in acutely organophosphate poisoned patients. Ain Shams Journal of Forensic Medicine and Clinical Toxicology, 31(2), 33-40.

Murabito, P., Astuto, M., Sanfilippo, F., La Via, L., Vasile, F., Basile, F., Cappellani, A., Longhitano, L., Distefano, A. and Li Volti, G. (2022): Proactive management of intraoperative hypotension reduces biomarkers of organ injury and oxidative stress during elective non-cardiac surgery: A pilot randomized controlled trial. J Clin Med., 11 (2), 392- 403.

Pannu, A. K., Bhalla, A., Vishnu, R. I., Garg, S., Dhibar, D. P., Sharma, N. and Vijayvergiya,

R. (2021): Cardiac injury in organophosphate poisoning after acute ingestion. Toxicology Research, 10 (3), 446-452.

Patil, S. L. and Vasepalli, P. (2014): Prognostic value of clinical and lab parameters in assessing

the severity of organophosphorus compound

poisoning. Indian Journal of Basic and Applied Medical Research., 4 (1), 77-91.

Peter, J. V., Sudarsan, T. I. and Moran, J. L. (2014): Clinical features of organophosphate poisoning: A review of different classification systems and approaches. Indian journal of critical care medicine: peer-reviewed, official publication of Indian Society of Critical Care Medicine, 18 (11), 735-745.

Pinakini, K. S. and Kumar, T. M. (2006): Serial cholinesterase estimation in carbamate poisoning. Journal of Clinical Forensic Medicine, 13 (5), 274-276.

Prasad, D. R., Jirli, P. S., Mahesh, M. and Mamatha, S. (2013): Relevance of plasma cholinesterase to clinical findings in acute organophosphorous poisoning. Asia Pacific Journal of Medical Toxicology, 2 (1), 23-27. Reichert, C. O., Levy, D. and Bydlowski, S. P. (2021): Paraoxonase role in human neurodegenerative diseases. Antioxidants, 10 (1), 1-26.

Richard, S. A., Frank, E. A. and D'Souza, C. J. (2013): Correlation between cholinesterase and paraoxonases-1 activities: series of pesticide poisoning subjects. BioImpacts*: BI,* 3 (3), 119-

122.

Samy, K. L. J., Adole, P., Pandit, V. and Vinod,

K. (2019): Serum paraoxonase-1 activity in patients with organophosphate poisoning: A potential indicator of prognosis. Asia Pac J Med Toxicol., 8 (2), 50-55.

Sato, H., Ito, Y., Ueyama, J., Kano, Y., Arakawa, T., Gotoh, M. and Kamijima, M. (2016): Effects of Paraoxonase 1 gene polymorphisms on organophosphate insecticide metabolism in Japanese pest control workers. Journal of Occupational Health, 58 (1), 56-65. Seabury, R. W., Sullivan, R., Stork, C. M. and Holland, M. (2013): The persistent pesticide: a review of organophosphate poisoning. New York state poison centers. A Quarterly Publication, 2103, 1-11.

Senarathne, R., Hettiaratchi, U., Athiththan, L., Peiris, H., Sarathchandra, C., Senanayake, H., and Siribaddana, S. (2022): Selected liver markers in predicting the severity of organophosphate and carbamate poisoning. Journal of Environmental and Public Health, 2022.

Senarathne, R., Hettiaratchi, U., Athiththan, L., Peiris, H., Sarathchandra, C., Senanayake, H., and Siribaddana, S. (2022): Selected liver markers in predicting the severity of organophosphate and carbamate poisoning. Journal of Environmental and Public Health, 2022.

Shama, W. S., El-Gharbawy, D. M., Wahdan,

A. A., and Hashem, A. A. (2021): Assessment of the efficacy of four scoring systems in prediction of acute organophosphorous poisoning outcome. Tanta Med J., 49 (3), 187. Shivaramu, M. G., Vijay Kumar, A. G. and Kumar, U. (2015): A comprehensive analysis of poisoning cases in rural area: A retrospective autopsy study. Scholars Journal of Applied Medical Sciences, 3, 565-567.

Shusil, M. P. K., and Agarwal, A. (2020): Demographic profile and pattern of presentation of organophosphorus poisoning at Tertiary Care Hospital Agra. Indian Journal of Forensic Medicine & Toxicology, 14 (3), 39-

44.

Sözmen, E. Y., Mackness, B., Sözmen, B., Durrington, P., Girgin, F. K., Aslan, L., (2002): Effect of organophosphate intoxication on human serum paraoxonase. Hum Exp Toxicol., 21, 247-252.

Sungur, M. and Güven, M. (2001): Intensive care management of organophosphate insecticide poisoning. Crit Care., 5 (4), 1-5. Sunny, M. H. U. H., Ashrafi Akter Zahan, D., Das, B. K., and Bahar, M. I. (2019): A

Retrospective study of death due to organophosphorus poisoning In North Zone Area of Bangladesh, Sch Int J Tradit Complement Med., 2 (1): 1-4.

Syafrudin, M., Kristanti, R. A., Yuniarto, A., Hadibarata, T., Rhee, J., Al-Onazi, W. A. and Al-Mohaimeed, A. M. (2021): Pesticides in drinking water-a review. Int. J. Environ. Res. Public Health, 18 (2), 468.

Tallat , S., Hussien, R., Mohamed, R.H., Abd El Wahab, M.B., Mahmoud, M. (2020): Caspases as prognostic markers and mortality predictors in acute organophosphorus poisoning. J Genet Eng Biotechnol., 18 (1), 10. Trellu, C., Vargas, H. O., Mousset, E., Oturan,

N. and Oturan, M. A. (2021): Electrochemical technologies for the treatment of pesticides. Current Opinion in Electrochemistry, 26, 100677.

Twayana, R. S., Pandey, R., Shrestha, S., Vaidya, N., Shrestha, H., and Subedi, N. (2019): Clinical correlation of the severity and outcomes of the organophosphorus compound poisoning cases admitted to Kathmandu University Hospital based on POP score and

serum pseudocholinesterase level-a prospective observational study in Nepal. Int J Intern Emerg Med., 2 (1), 1016.

Umeh, C., Giberson, C., Kumar, S., Aseri, M. and Barve, P. (2022): A multicenter retrospective analysis on the etiology of bradycardia in COVID-19 patients. Cureus., 14 (1), e21294.

Vandana, K. and Channabasappa, S. R. (2021): A retrospective study of socio-demographic profile and pattern of poisoning cases at Tertiary Care Hospital. Indian Journal of Forensic Medicine & Toxicology, 15 (2), 1799-

1805.

Verma, M. S., Tsaloglou, M. N., Sisley, T., Christodouleas, D., Chen, A., Milette, J. and Whitesides, G. M. (2018): Sliding-strip microfluidic device enables ELISA on paper. Biosens Bioelectron., 99, 77-84.

Yu, J., Weng, Y. and Chen, K. (2012): Triage vital signs predict in-hospital mortality among emergency department patients with acute poisoning: a case control study. BMC Health Services Research. 12 (1), 262-270 .

Zayed, A. A., Ahmed, A. I., Khattab, A. M. T., Mekdad, A. A. and Abdelaal, G. (2015): Paraoxonase-1 and cytochrome P450 polymorphisms in susceptibility to acute organophosphorus poisoning in Egyptians. Neurotoxicity, 51, 20-26.

Zhai, R., Chen, G., Liu, G., Huang, X., Xu, X.

M., Li, L., Zhang, Y., Wang, J., Jin, M., Xu, D.

and Abd El-Aty, A. M. (2021): Enzyme inhibition methods based on Au nanomaterials for rapid detection of organophosphorus pesticides in agricultural and environmental samples: A review. J Adv Res., 37, 61-74. Zhang, X., Sui, H., Li, H., Zheng, J., Wang, F.,

Li, B. and Zhang, Y. (2014): Paraoxonase

activity and genetic polymorphisms in northern Han Chinese workers exposed to organophosphate pesticides. Experimental Biology and Medicine, 239 (2), 232-239.

# يبرعلا صخلملا

**داحلا ممستلا ةجيتنو ةدشب ؤبنتلا يف 1-زينوسكوأارابلا ميزنا رود ةيلبقتسم ةسارد :ةيوضعلا ةيروفسفلا تابكرملاب**

**دبع دمحم يدياهو 4لودأ وراكناش تنشاربو 3نيدلا فرش باهولا دبع ريبعو 2يعفاشلا نابعش بابرو 1يسمارتلا ركبوبأ رون**

**5رخف نمحرلا**

اهنب ةعماج -بطلا ةيلك -ةيكينيلكلإا مومسلاو ىعرشلا بطلا ديعم 1

اهنب ةعماج -بطلا ةيلك - ةيكينيلكلإا مومسلاو ىعرشلا بطلا دعاسم ذاتسأ 2

اهنب ةعماج -بطلا ةيلك - مومسلاو يعرشلا بطلا ذاتسأ 3

دنهلا ،يريشيدنوب ،جرختلا دعب يبطلا ثحبلاو ميلعتلل للارهاوج دهعم -ةيويحلا ءايميكلا دعاسم ذاتسأ 4

اهنب ةعماج -بطلا ةيلك -ةيكينيلكلإا مومسلاو يعرشلا بطلا سردم 5

.ةيئايميكلا داوملا هذه ةيمسل درفلا ةيلباق ريبك لكشب ريغي يلاتلابو ةيوضعلا ةيروفسفلا تابكرملا للحي 1-زينيسكوا ارابلا ميزنا **:ةيفلخلا** ةيوضعلا ةيروفسفلا تابكرملا ممست نم نوناعي نيذلا ىضرملا نم ةلسلس يف 1-زينيسكوا ارابلا ميزنا طاشن مييقتل ةساردلا ميمصت مت ةيلبقتسم ةيريرس ةسارد هذه تناك **:قرطلاو ىضرملا** .يوضعلا تافسوفلاب داحلا ممستلاب نيباصملا ىضرملا جئاتنو ةدش عم هاوتسم طبرو 31 ىتح 2222 سطسغأ 1 نم ، دحاو ماع ةدمل ، رصمب اهنب ةعماج تايفشتسم يف ممستلا ثاحبأو مومسلا جلاع ةدحو يف اهؤارجإ مت ةيريرسلا جئاتنلاو ، ىضرملل ةيجولويمدبلاا تانايبلا عمج مت .ةطباضلا ةعومجملا و تلااحلا ةعومجم ىلإ ىضرملا ميسقت مت .2221 ويلوي بسح ةيمسلا ةجرد بسح ىضرملا فينصت مت .تانايبلا قاروأ يف جئاتنلاو ىفشتسملا يف ةماقلإا ةدمو ، ةمدقملا تاجلاعلا ططخو ،

**:جئاتنلا** .1-زينيسكوا ارابلا زيرتسنيلوكلا يميزنإ ةطشنأ مييقتل ىضرملا نم مدلا تانيع عمج مت .)اينيداريب( يوضعلا روفسفلا ممست سايقم ممست سايقمل اًقفو ىضرملا فينصت نكميو ممستلاب نيباصملا ىضرملا يف 1-زينيسكوا ارابلا زيرتسنيلوكلا يميزنإ ةطشنأ ضافخنا

-زينيسكوا ارابلا مادختسا نكمي هنأ ىلإ ةساردلا هذه تصلخ **:جاتنتسلاا** .ةديدشو ةطسوتمو ةفيفخ تلااح :ىلإ )اينيداريب( يوضعلا روفسفلا

.ةيوضعلا ةيروفسفلا تابكرملاب داحلا ممستلاب نيباصملا ىضرملا جئاتنب ؤبنتلاو صيخشتلل 1

# تايصوتلا

:يلي امب ةيصوتلا نكمي ،ةيلاحلا ةساردلا جئاتن نم

تابكرمب داحلا ممستلا نم نوناعي نيذلا ىضرملا نم اهيلع لوصحلا مت يتلا ةيفارغوميدلا تانايبلل لماكلا قيثوتلا نم دكأتلا بجي .1 ةيئاقو ةطخ ريوطتب حمست يتلاو ىرخأ ىلإ ةنس نم ةلكشملا روطتو ، طمنو ،ثودح يف تاريغتلا ةبقارمب حامسلل يوضعلا روفسفلا

.ةلكشملا هذه لحل ةلاعف ةدحو نم رصنعك " مومسلا تامولعم زكرم" ءاشنإ نإف اذل ،ةجيتنلاو ممستلا ةدش نم لك ىلع رثؤي ضرعلا يف ريخأتلا نأ ةقيقح .2 تامولعملا ميدقت ةمدخ اضياو ةعاسلا رادم ىلع هميدقتل فورعم بيو عقومو سكافو فتاه مقرب ممستلا ثاحباو مومسلا جلاع

.ةفلتخملا ممستلا عاونأ جلاع لوح ءابطلأل ةعيرسلا حئاصنلاو

:للاخ نم تابكرملا هذهل يراحتنلااو يضرعلا ضرعتلا نم دحلا نكمي .3 رثكأ تابيكرت ريفوتو ؛ةيعارزلا تايواميكلا هذه نيزختو عيزوتو عيب نأشب ةمراص تاعيرشت ؛كلذ يف امب ىدملا ةريصق ةطخ 

.قاوسلأا نم ةيمسلا ةديدش تافلآا تاديبم بحسو اًنامأ

لحم لحتل اهريوطتو اهعيسوت يغبني يتلاو تافلآا ةحفاكمل ةيئايميك ريغ ةليدب قرطل جيورتلا ؛كلذ يف امب ىدملا ةليوط ةطخ 

.يوضعلا روفسفلا تابكرم نم ةيمسلا ةديدش تافلآا تاديبم مادختسا

ءاقبإ كلذكو تاميلعتلا مادختساو رطاخملا نع تامولعم ىلع يوتحت يتلاو ةفوصوملا ةيلصلأا تاوبعلا يف تابكرملا هذه نيزخت 

.لافطلأا لوانتم نع ةديعب ةيلزنملا تاديبملا نيمدختسملل اهؤارجإ متي يتلا ةيميلعتلا جماربلا للاخ نم اهقيقحت نكمي يتلاو عمتجملا ىوتسم ىلع ةمزلالا ةيئاقولا ريبادتلا لك  دنع ةيلولأا تافاعسلإا حرش ةيمسلا ضارعأو ، اهل ضرعتلا بنجت ةيفيكو ،تابكرملا هذه ةيمسب يعو قلخل ماعلا روهمجلاو

.اهل ضرعتلا

سايقلا ةمظنأ نم ماظن وهو )اينيداريب( يوضعلا روفسفلا ممست سايقم كلذ يف امب ةيكينيلكلاا تارشؤملا مادختساب ةدشب ىصوي .4 يف ةصاخ تامولعملاب اندمي هنا ثيح ةيوضعلا ةيروفسفلا تابكرمـلاب داحلا ممستلا جئاتنو ضارعأب طبترت يتلا ةعيرسلاو ةطيسبلا كلذو ازيكرت رثكأ ةقدب مهتعباتمب حمسي امم ةديدشلا ةيمسلا يوذ ىضرملا ديدحت نم تاضرمملاو ءابطلأا نيكمتو ئراوطلا مسق

.كلذ دعب ثدحت ىتلا تافعاضملا ىدافتل

.جئاتنلاب ؤبنتلل ةملاعو ةدشلا مييقتو صيخشتلل ةادأك 1-زينوسكوأارابلا ميزنلإ ةركبملا تاسايقلا مادختسا نكمي .5 ةساردلا جئاتن ديكأتل ريبك ةنيع مجح يف 1-زينوسكوأارابلا ميزنلإ ةيلسلستلا تاسايقلا كلذ يف امب تاساردلا نم ديزم ءارجإب ىصوي .6

.ممستلا ةدش مييقتلو صيخشتلا ديكأتل ةينيتورلا تاصوحفلا نم اءً زج 1-زينوسكوأارابلا ميزنإ سايق نوكي نأ بجي .ةيلاحلا