ROLE OF WHITE BLOOD CELL TO PLATELET RATIO AS A PREDICTOR OF SEVERITY AND OUTCOME IN ACUTE ORGANOPHOSPHATE POISONING

Manar Ali Elsayed[1], Mona Atef[1], Marwa Gabr Ahmed [1]

[1]Department of Forensic Medicine and Clinical Toxicology, Faculty of Medicine, Zagazig University, Egypt.

ABSTRACT

Background: Acute organophosphorous poisoning (OPP) is a fatal medical emergency necessitating rapid evaluation plus aggressive management. **Aim of the work**: Assessment of white blood cell/ platelet ratio (WPR) role in predicting severity and outcome of acute OPP patients. **Subjects and Methods**: A retrospective study; implemented on acute OPP cases who were presented to Zagazig University Hospitals and Zagazig Poison Control Unit over one year. Data were gathered from patients' records including full history, clinical examination findings and investigations requested. Patients were categorized according to their fate into two groups; good and poor outcome. **Results**: Out of the 89 cases with confirmed OPP, 79 (88.7%) signified good outcome cases while 10 (11.3 %) were bad outcome. Most cases (69.7%) were in age group (20-40). Females were predominant (57.3%). Suicidal route, CNS toxicity were dominant in poor outcome group. Intermediate syndrome, poison severity score, lactate, white blood cell count, WPR, ICU admission and needing mechanical ventilator were significantly high while Glasgow coma scale, PH, mean arterial blood pressure, pseudocholinesterase and platelets were significantly low in the poor outcome group. Best cutoff value of WPR was ≥0.106, sensitivity 100%, specificity 74.7% and accuracy 77.5%. The area under curve (0.848) revealed high significance. **Conclusion:** Patients with a high WPR had the worse outcome. WPR is determined to be the most significant correlated predictor with other predictors of poor outcome as low GCS and high PSS. **Recommendation**: WPR could be recommended as a simple and applicable biomarker to predict severity and outcome of acute OPP.

Keywords: *Acute organophosphate toxicity, Biomarker, White Blood Cell/Platelet ratio, Severity, Outcome prediction*

Corresponding author: Dr. Manar Ali Elsayed
Email: aquamarine_8920@yahoo.com
ORCID: 0000-0001-5867-0996

INTRODUCTION

Organophosphate compounds (OPCs) are considered the commonly used pesticides for agricultural fields. Unfortunately, they are used for self-harm and suicidal purposes because of their low price and easy accessibility (***Malik et al., 2022***). Organophosphate poisoning (OPP) becomes a medical emergency needing prompt evaluation and aggressive management and may cause harm after their absorption via several routes as inhalation, ingestion, and skin contact (***Naughton and Terry, 2018***).

The toxic mechanism of OPCs is acetylcholinesterase enzyme suppression, which is responsible of degradation of acetylcholine neurotransmitter leading to excessive stimulation of both the muscarinic and nicotinic receptors, causing a cholinergic crisis. Many patients may need ICU care and respiratory support due to CNS depression induced by OPCs (***Hulse et al., 2020***).

The classic clinical presentation of acute OPP includes muscarinic manifestations in the form of vomiting, diarrhea, urination, miotic pupils, chest secretions, bronchospasm, bradycardia, salivation, lacrimation and hypotension. Furthermore, overstimulation of nicotinic receptors at the sympathetic ganglia and neuromuscular junctions results in tachycardia, hypertension, muscle weakness and fasciculations (***Pannu et al., 2021***). CNS toxicity is presented by coma, convulsions and respiratory failure (***Hodeib and Ghonem, 2024***).

Standard treatment regimen of acute OPP involved: patient resuscitation (when indicated), dermal and/or gastric decontamination with administration of 1gm/kg activated charcoal as a single dose.

Antidotal therapy (atropine and oxime) was considered according to the patients' assessment. Atropine (1 to 3 mg IV) was given as direct IV dose and repeated every 10 minutes *(Hodeib and Ghonem, 2024)*. The end point of atropine therapy was when the chest was clear. Then, atropine was maintained as continuous intravenous infusion of 10–20% of the total loading dose every hour *(Eddleston et al., 2008)*. Oxime therapy was given for nicotinic manifestations and CNS toxicity enhancing the reactivation of the depressed acetylcholinesterase enzyme *(Roberts and Aaron, 2007)*.

Early predicting the outcome of OPP cases is a challenging matter. Numerous studies were done on different markers that could predict the severity of acute OPP including low plasma cholinesterase levels, low Glasgow coma scale (GCS) score, PH, leukocytosis, serum bicarbonate, elevated creatinine, poison severity score (PSS), the probable complications as pneumonia, comorbidities and prolonged hospital admission *(Dong et al., 2020)*.

THE AIM OF THE WORK

The target of this study was to assess the significance of white blood cell to platelet ratio (WPR) in predicting the outcome and severity of acute OPP cases. As it is included within the initial routine investigation (Complete Blood Count) so, physicians can use it, as an applicable biomarker, in predicting the outcome besides beginning quick aggressive management for OPP patients. This may reduce mortality proportion and save patients from OPP induced delayed sequelae.

SUBJECTS AND METHODS

Study design and setting.

It is a retrospective cohort, hospital-based study. It was implemented at Zagazig Poison Control Unit (ZPCU) at Zagazig University Hospital (ZUH) on acute op intoxicated patients presented over one year from September 2021 till September 2022. Data were collected from patients' records which are present in the Medical Affairs Office at ZUH at Zagazig, Egypt.

Patients

Acute OPP patients admitted to ZUH with confirmed diagnosis from September 2021 till

September 2022, who achieved the inclusion criteria, were registered in this study (89 cases). For accurate diagnosis of acute OPP cases the following criteria were applied; history of exposure, signs and symptoms of the classic toxidrome, medical examination, routine and specific investigations. Hospital records were incorporated in the study in order to obtain a realistic evaluation of acute intoxication pattern, incidence and outcome among patients presented to ZPCU.

Inclusion criteria:

Toxicological history of oral exposure to organophosphorous compound, adult patients ≥18 years, plus confirmed diagnosis of acute OPP.

Exclusion criteria:

Co-ingestion of chemicals other than organophosphates, cases with acute infection and inflammation, patients with comorbidities like chronic lung diseases, heart failure, renal impairment, hepatic cirrhosis, blood disorders, and chronic medications use cases were ruled out from this study. Both lactating and pregnant females were also excluded.

Ethical consideration:

This work has been legalized by the IRB (Institutional Review Board) authority of Faculty of Medicine, Zagazig *(Agreement No: ZUMEDIRB#10178/301122)*.

Also, individuals' information was saved anonymous on a way to assure data privacy. Standard treatment was given to all admitted patients as guided by the resident toxicologist according to ZPCU protocol of management.

Methods

Patients' data were gathered carefully from hospital files including:

● History: Personal data (age, sex, marital status and residence), toxicological history including recognition of the poison type, manner of poisoning (accidental, suicidal, occupational, homicidal) as well as, past and medical history of co-morbidities, blood disorders, inflammatory condition.

● Clinical Examination: Clinical data were taken from the patients' files including systemic examination, vital signs (pulse, mean arterial blood pressure [MABP], respiratory rate [RR], and temperature), and conscious level evaluation by GCS. Also, the

main presentation was recorded either muscarinic or nicotinic or central.

● Laboratory investigations: Results of laboratory investigations were also collected. These laboratory findings include pseudocholinesterase level (PCHE), CBC (WBCs, platelets), arterial blood gases (PH), serum lactate.

● Poison severity score was documented for cases in accordance to the patient's most severe signs or symptoms into 5 grades according to *Persson et al. (1998)* as follows:

- Grade 0: point to asymptomatic
- Grade 1: symptoms are mild, transient, and spontaneously resolving.
- Grade 2: prolonged evident symptoms
- Grade 3: symptoms are severe or life-threatening
- Grade 4: death

● Place of admission (ward or ICU), need for mechanical ventilation, OPP induced complications and mortality rate were assessed.

● Outcome procedures: All 89 patients of the current study were sub-grouped in accordance to their fate into good outcome and bad outcome. The bad outcome cases included patients with OPP induced complications (intermediate syndrome) and the non-survived ones.

Statistical Analysis:

All data were statistically analyzed using SPSS 20.0 for windows (*SPSS Inc., USA 2011*). Quantitative data were expressed as the mean±SD and median (interquartile range), and qualitative data were expressed as number and percentage. The student "t" test was used for comparing means of 2 independent groups of normally distributed quantitative data. Mann-Whitney U test was used for comparing means of 2 independent groups of not normally distributed quantitative data. Categorical variables percentage were analyzed using Chi-square test or Fisher exact test when appropriate. Pearson correlation coefficient was calculated to assess association between study variables, (+) sign indicate direct correlation while (-) sign indicate inverse correlation, also values near to 1 indicate strong correlation while values near 0 indicate weak correlation. Receiver operating characteristic curve

(ROC) was used to assess prognostic performance of WPR score in predicting the outcome of acute OPP cases. P-value<0.05 was considered statistically significant, p-value<0.01 was considered highly statistically significant, and p-value ≥0.05 was considered statistically non-significant (*SPSS Inc., 2011*).

RESULTS

In this study, the whole number of acute OPP patients who achieved the inclusion criteria and were presented to ZUH during the period from September 2021 to September 2022 was 89 cases. Patients were categorized according to their fate into 2 groups; good outcome and bad outcome.

Regarding demographic and toxicological data, most organophosphate acutely poisoned patients of good outcome were from 20 to 40 years old (67.1%), females (57%), single (57%), rural residents (65.8%). Also, most OPP patients of poor outcome were from 20 to 40 years old (90%), females (60%), rural residents (60%), but married (60%). There was a highly statistically significant (p<0.001) difference between good and poor outcome groups regarding mode of poisoning and main presentation.

The highest percent of good outcome patients were accidentally poisoned (40.5%) and mainly presented by muscurinic manifestations (72.2%). While, All poor outcome patients were poisoned by suicidal manner and presented by manifestations of CNS toxicity (**Table1**).

The current results showed a highly statistically significant (p<0.001) difference among both groups regarding recovery, GCS and PSS. Where 60% of poor outcome group were died and 40% had intermediate syndrome during the admission period compared to 100% of good outcome group improved. About GCS, all examined poor outcome patients had severe score compared to 40.5% of good outcome patients had mild score. Regarding PSS, 70% and 30% of poor outcome patients had fatal and severe scores respectively compared to 38% and 36.7% of good outcome patients had mild and moderate scores respectively (**Table 2**).

Concerning examination, MABP was highly significantly (p<0.001) decreased in poor

outcome cases in comparison with good outcome ones. Regarding lab investigations, there was a highly statistically significant (p<0.001) difference among both groups regarding PH and lactate. Where all examined poor outcome patients had acidic PH and elevated lactate compared to 54.4% & 46.8% of good outcome patients respectively. Also, WBC to platelet ratio was highly notably (p<0.001) increased in poor outcome group compared to good outcome group. However, there was no statistically significant difference between good and poor outcome groups regarding the estimated PCHE enzyme **(Table 3)**.

Besides, there was a highly statistically significant (p<0.001) difference between both groups regarding admission and mechanical ventilation. Where, all poor outcome patients were admitted to ICU and mechanically ventilated. While, about two thirds of good outcome patients were admitted to ward (60.8%) and not mechanically ventilated (65.8%) **(Table 3)**. White blood cell to platelets ratio negatively correlated to PCHE, PH, GCS, and MABP. This meant that increased WPR was associated with decreased serum level of PCHE, acidic PH, low score of GCS and hypotension. While, WPR positively correlated to serum lactate level and PSS. This meant that increased WPR was associated with elevated serum lactate level and increased PSS **(Table 4)**.

The current results showed that the best cutoff point of WPR for predicting poor outcome of OPP patients on admission was ≥0.106, with sensitivity 100%, specificity 74.7% and accuracy 77.5%. The area under the curve (AUC) was statistically highly significant **(Table 5, Figure 1)**.

Table (1): Demographic data, mode of poisoning and main presentation of organophosphate poisoned patients (n=89).

Parameters	Outcome				Test of significance	p-value
	Good (n=79) (88.7%)		Poor (n=10) (11.3%)			
	No.	%	No.	%		
Age (years)						
<20	17	21.5	0	0.0	χ^2 =2.836	0.242
20-40	53	67.1	9	90.0		
>40	9	11.4	1	10.0		
Mean± SD	27.69±8.35		27.90±5.48		t=-0.075	0.940
Sex						
Male	34	43.0	4	40.6	FET	0.99
Female	45	57.0	6	60.0		
Marital status						
Single	45	57.0	4	40.0	χ^2 =2.035	0.362
Married	30	38.0	6	60.0		
Divorced	4	5.1	0	0.0		
Residence						
Rural	52	65.8	6	60.0	FET	0 .734
Urban	27	34.2	4	40.0		
Mode of poisoning						
Suicidal	27	34.2	10	100.0	χ^2 =15.833	0.001**
Homicidal	5	6.3	0	0.0		
Accidental	32	40.5	0	0.0		
Occupational	15	19.0	0	0.0		
Main presentation						
CNS toxicity	12	15.2	10	100.0	χ^2 =34.310	0.001**
Nicotinic	10	12.7	0	0.0		
Muscarinic	57	72.2	0	0.0		

Data expressed as number (no) and percentage (%), mean± standard deviation (SD)
*χ^2: Chi square test, FET: Fisher exact test, t: student t-test, non-significant (p>0.05), **: statistically highly significant (p<0.01).*

Table (2): Outcome, Glasgow coma scale (GCS) and poison severity score (PSS) of organophosphate poisoned patients (n=89).

Parameters	Outcome				Test of significance	p-value
	Good (n=79)		Poor (n=10)			
	No.	%	No.	%		
Outcome						
Died	0	0.0	6	60.0	χ^2 =89.000	0.001**
Improved	79	100.0	0	0.0		
Intermediate syndrome	0	0.0	4	40.0		
GCS						
Normal (15)	7	8.9	0	0.0	χ^2 =23.309	0.001**
Mild (14-13)	32	40.5	0	0.0		
Moderate (12-9)	21	26.6	0	0.0		
Severe (8-3)	19	24.1	10	100.0		
Mean± SD	11.29±3.12		3.20±0.632		t=8.135	0.001**
PSS						
Mild (1)	30	38.0	0	0.0	$\chi2 = 62.844$	0.001**
Moderate (2)	29	36.7	0	0.0		
Severe (3)	20	25.3	3	30.0		
Fatal (4)	0	0.0	7	70.0		

Data expressed as number (no) and percentage (%), and mean± standard deviation (SD) χ2: Chi square test,
*t: student t-test, **: statistically highly significant (p<0.01), GCS: Glasgow coma scale, PSS: poison severity score.*

Table (3): MABP, Laboratory investigations, admission place, needing mechanical ventilation of organophosphate poisoned patients (n=89).

Parameters	Outcome				Test of significance	p-value
	Good (n=79)		Poor (n=10)			
	No.	%	No.	%		
MABP						
Normal	44	55.7	0	0.0	χ^2 =15.833	0.001**
hypotension	27	34.2	10	100.0		
hypertension	8	10.1	0	0.0		
Mean± SD	78.08±13.92		59.00±3.94		t=4.292	0.001**
PH						
Normal	36	45.6	0	0.0	FET	0.001**
Acidosis	43	54.4	10	100.0		
Mean± SD	7.32±0.08		7.15±0.04		t=5.871	0.001**
Lactate						
Normal	**42**	**53.2**			FET	0.001**
Elevated	37	46.8				
Mean± SD	3.24±1.71		7.32±0.71		t=-7.402	0.001**
WBC (10^3/L) Median (IQR)	12.58 (6)		19.50 (3)		MW=-3.630	0.001**
Platelets(10^3/L)	181.42 ±45.54		152.00 ±9.592		t=2.027	0.046*
WBC/platelet **Median (IQR)**	0.08 (0.05)		0.12 (0.03)		MW=-3.576	0.001**
PCHE						
Normal	22	27.8	0	0.0	FET	0.062
Decreased	57	72.2	10	100.0		
Median (IQR)	2587 (4487)		989 (182)		MW=-1.913	0.056
Admission						
Ward	48	60.8	0	0.0	FET	0.001**
ICU	31	39.2	10	100.0		
Mechanical ventilation						
Yes	27	34.2	10	100.0	FET	0.001**
No	52	65.8	0	0.0		

Data expressed as number (no) and percentage (%), mean± standard deviation (SD) and median (Interquartile Range (IQR).
*χ2: Chi square test, FET: Fisher exact test, t: student t-test, MW: Mann-Whitney U test, non-significant (p>0.05), *: statistically significant (p<0.05), **: statistically highly significant (p<0.01), PCHE: Pseudocholinesterase, WBC: white blood cells, MABP: mean arterial blood pressure.*

Table (4): Correlation matrix between WPR, and laboratory data of organophosphate poisoned patients.

parameters	WPR	
	r	**p**
PCHE	-0.514	0.001**
PH	-0.417	0.001**
Lactate	0.523	0.001**
GCS	-0.467	0.001**
MABP	-0.346	0.001**
PSS	0.480	0.001**

*r: correlation coefficient, **: statistically highly significant (p<0.001), PCHE: Pseudocholinesterase, WPR: white blood cell to platelet ratio, GCS: Glasgow coma scale, MABP: mean arterial blood pressure.*

Table (5): Prognostic performance of white blood cell to platelet ratio in the prediction of poor outcome of organophosphate poisoned patients.

Area under curve (AUC)	0.848
Cutoff point	0.106
Sensitivity	100%
Specificity	74.7%
Positive predictive value	33.3%
Negative predictive value	100.0%
Accuracy	77.5%
P -value	0.001**

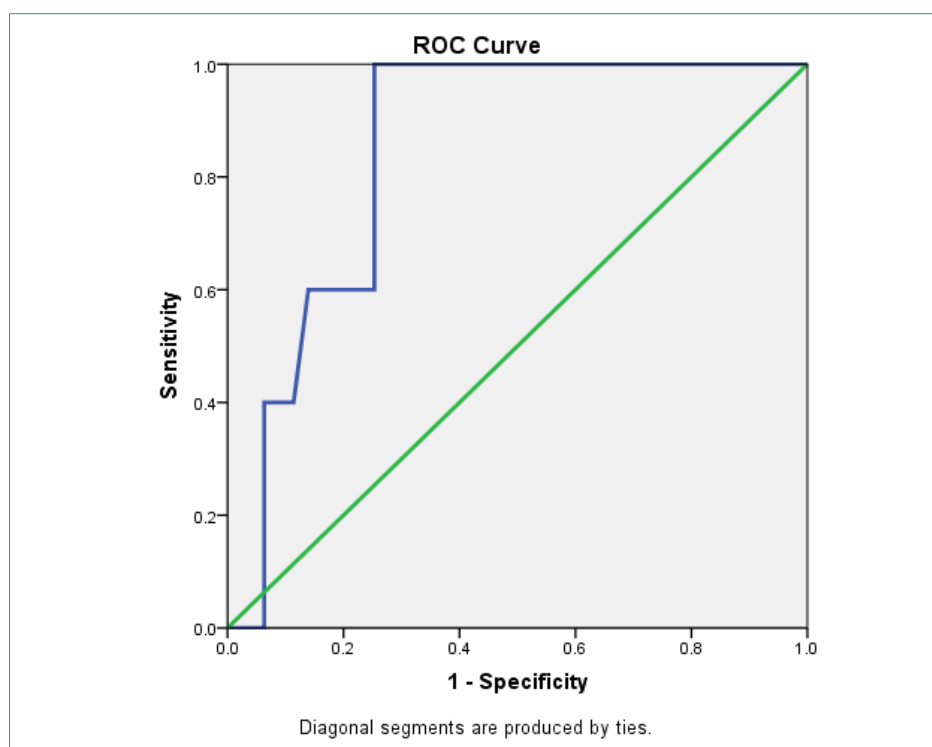***: highly significant (p<0.001), %: percentage.*

Figure (1): A receiver operating characteristic curve (ROC) curve showing prognostic performance of white blood cell to platelet ratio in predicting the poor outcome of organophosphate poisoned patients

DISCUSSION

Pesticides exposure has been linked to significant health problems in the developing countries. In Egypt, higher rates of accidental and intentional exposure to OPCs are due to easy availability plus their lower cost *(Abdel Baseer et al., 2021)*. As WHO (World Health Organization) has classified OPCs as highly toxic substances *(Tadesse et al., 2023)*, so it becomes essential to early and prompt detect the severity of poisoning for appropriate management particularly in poor resources *(Dong et al., 2021)*. For that reason, the target of this work was to assess the role of WPR as a biomarker and a predictor of severity and outcome of acute OPP cases. The overall number of acute OPP cases registered in this study were 89 cases categorized according to their fate into two groups; good outcome and bad outcome cases.

In the present study, good outcome cases represented (79 cases, 88%) while poor outcome cases represented (10 cases, 11%) of the whole cases. This result is consistent with the results of *El-Gharbawy and Wahdan (2022)* and *Sontakke and Kalantri (2023)* who reported that the poor outcome cases recorded 9.1% and 8% respectively. However, *Elagamy and Gabr (2019)* reported a bad outcome percentage of 20.5%. These dissimilarities may be clarified by the different presentations of OPP cases.

Regarding the features of acute OPP cases, data analysis showed that nearly 70% of cases were in the age group (20 to 40), mean age value was 27.8 years. This is consistent with the results of *Malik et al. (2022)* and **Krishna Moorthy et al. (2023)**.

Also, female patients were predominant representing 57% in good outcome cases and 60% in bad outcome cases and this comes in the same line with the results of *Masoud et al. (2022)* as females are more susceptible to daily stress besides the availability of OPCs as household compounds *(Mohamed et al., 2019)*.

The majority of OPP cases included in this study were from rural zones and this is consistent with the observations of *Shama et al. (2021)*. It could be explained by the widespread use of pesticides in farming, especially in agriculture rural areas in Zagazig and the Delta district and their easy availability in rural homes.

In the current work, the studied patients showed a high percentage of intentional (suicidal) intoxication which is similar to the results observed by *Pradhan et al. (2022)*. Moreover, the main presenting symptoms and signs at the time of admission in this study were muscarinic (as sweating, vomiting, diarrhea, chest secretions, bradycardia and miotic pupils). These findings were also recorded by *Kamath and Gautam (2021)*.

As regard GCS, results of the present study showed lower GCS mean values in the poor outcome cases rather than the good outcome cases. This is consistent with the results documented by *El-Gharbawy and Wahdan (2022)*. Lower GCS is often observed in severe OPP patients which may be explained by multitude of theories such as direct neurotoxic effects of OPCs, hypoperfusion and hypoxia induced by respiratory depression *(Acikalin et al., 2017)*. Also, statistical analysis of the current results showed that PSS had a significant difference among the studied groups as 70% of poor outcome cases showed fatal poisoning. This was in harmony with the studies implemented by *Shama et al. (2021)* and *El Sarnagawy et al. (2022)*.

In this study, there is significant lower MABP in the poor outcome cases, which comes in the same line with results of *Kim et al. (2013)*. Hypovolemia may be a result of fluid loss after frequent diarrhea, vomiting, diaphoresis, sialorrhea or may be due to the anti-cholinergic drugs *(Pannu et al., 2021)*. However, a study done by *Shahin and Hafez (2020)* observed normal MABP in nearly 82% of acute OPP patients. Furthermore, acidosis was more significant and frequent in poor outcome cases, manifested by lower PH and increased lactate level and this comes in line with *Lee et al. (2019)* and *El-Gharbawy and Wahdan (2022)*.

Lactic acidosis is considered a risk factor for OPP induced mortality. Hypotension accompanied with hypoperfusion, electrolytes disturbance and muscle fasciculations induced hyperlactatemia may contribute to acidosis in acute OPP *(Subikshavarthni and Selvan, 2019)*.

To aid confirming the diagnosis, PCHE was estimated, all poor outcome cases (10 cases) showed a high significant decrease in PCHE levels while (72.2%) of the good outcome cases showed a depressed enzyme estimation which come in harmony with the study of *Eisa et al. (2021)*.

Regarding the place of admission, there is a high significant value between the place of patient's admission and the outcome of cases. There were 10 poor outcome cases, all of them were admitted to the ICU as they required mechanical ventilation while (60.8%) of the good outcome cases were admitted to the ward. This was similar to the work accomplished by *Nour El den et al. (2024)*.

The principal target of this study was to assess the role of WPR as a biomarker of severity and outcome of acutely OPP cases. In the present study, as regards WPR, results showed a high significant difference among the studied groups. Furthermore, at a cutoff point 0.106, 100% sensitivity, 74.7% specificity and 77.5% accuracy WPR could predict the poor outcome of OPP cases with good performance (AUC =0.848). This come in harmony with the results of *Malik et al. (2022)* which was implemented on acute OPP patients in Rawalpindi Hospital, Pakistan. Elevated WBC count is a biomarker of inflammation, so it might be a predictor of bad outcomes in OPP cases *(Wu et al., 2017)*. Also, *Kumar et al. (2018)* showed that WBC count on admission could be used as a predictive biomarker in patients with OPP.

In the current work, decreased platelet count was significant in the poor outcome cases and this was similar to the study of *Pechuho et al. (2014)* who observed that thrombocytopenia was detected in severe OPP cases, admitted after suicidal attempt.

It is not recognized whether OPCs could trigger damaging the megakaryocytic line production, whereas the effects on the WBC count may be due to a functional response to stress *(Mu et al., 2021)*

An elevated WPR, in this study, showed a strong and significant correlation with other parameters pointing the poor outcome of OPP cases as low GCS, PH, PCHE, MABP and high lactate and PSS. This observation was in harmony with the results of *Malik et al. (2022)* who declared that WPR was verified to have a stronger and more significant association with bad outcome.

In addition**,** *Dundar et al. (2014)* reported that the OPP patients who required mechanical ventilator had a significantly greater WPR. In medical emergencies, WPR has showed excellent performance in predicting the poor outcome of ischemia induced cardiac and neurological insults *(Abdulhadi et al., 2018)* and *(Zhang et al., 2023)* respectively.

Complete blood count is one of the commonly accessible investigations in any healthcare structure obtaining quickest results. Thus, the WPR may be a valuable hematological biomarker that could predict the severity and outcome of a case with acute OPP *(Malik et al., 2022)*.

CONCLUSION

According to the current study, many predictors could help identifying the severity and poor outcome of OPP cases as low GCS, PH, MABP and high lactate and PSS. WPR, a hematological parameter presented within the initial CBC, was examined and determined to be strongly correlated with the severity and bad outcomes of acute OPP with significant performance.

RECOMMENDATIONS

● Further studies including larger samples of acute OPP cases to be carried out at different poison control centers.

● White blood cell/ platelet ratio is recommended to be applied in predicting the severity and outcome of acute OPP patients as a simple and available biomarker.

Limitations of the study: Being a single center study, and deficient studies evaluating WPR in OPP.

REFERENCES

1. **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, Pediatr.,21 (1):98.*

2. **Abdulhadi, B.; Naranjo, M.; Krishnamoorthy, P. et al. (2018):** White blood cell count to platelet ratio: A novel biomarker for predicting outcomes in patients on circulatory support devices. *JACC., 71:810.*

3. **Acikalin, A.; Dişel, N. R.; Matyar, S. et al . (2017):** Prognostic Factors Determining Morbidity and Mortality in Organophosphate Poisoning. *Pak. J. Med. Sci., 33(3):534-539.*

4. **Dong, N.; Liu, J.; Wang, Z. et al. (2020):** Development of a practical prediction scoring system for severe acute organophosphate poisoning. *J. Appl. Toxicol., 40 (7):889–896.*

5. **Dong, N.; Wang, S. and Li, X. (2021):** Prognostic nomogram for the severity of acute organophosphate insecticide self-poisoning: a retrospective observational cohort study. *BMJ. Open, 11(5):e042765.*

6. **Dundar, Z.D.; Ergin, M.; Koylu, R. et al. (2014):** Neutrophil-lymphocyte ratio in patients with pesticide poisoning. *J. Emerg. Med., 47(3):286–293.*

7. **Eddleston, M.; Buckley, N. A.; Eyer, P. et al. (2008):** Management of acute organophosphorus pesticide poisoning. *Lancet, 371(9612): 597–607.*

8. **Eisa, H. S.; Nomier, M. A.; Arafa, M. H. et al. (2021):** Predictors of severity and survival in acute cases of organophosphorous poisoning at Zagazig university hospitals: Prospective cohort study. *Toxicol. Int.,28: 185-201.*

9. **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. *EJFSAT., 19(4):1–9.*

10. **El-Gharbawy, D. and Wahdan, A. (2022):** Predictors of major outcome in acute organophosphorus poisoned cases. *EJFSAT., 22(4): 99–114.*

11. **El-Sarnagawy, G. N.; Abdelnoor, A. A; Abuelfadl, A. A. et al. (2022):** Comparison between various scoring systems in predicting the need for intensive care unit admission of acute pesticidepoisoned patients. *Environ. Sci. Pollut. Res., 29(23):33999–34009.*

12. **Hodeib, A. A. E. and Ghonem, M. M. (2024):** Identifying Predictors of Intensive Care Unit Admission and Mortality among Acute Organophosphorus Poisoned Patients. *ESCTJ. 12(1): 97-110.*

13. **Hulse, E. J.; Haslam, J. D.; Emmett, S. R. et asl. (2020):** Organophosphorus nerve agent poisoning: managing the poisoned patient. *Br. J. Anaesth., 123(4):457–463.*

14. **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. Fam. Med. Prim. Care, 10(11):4160-4167.*

15. **Kim, Y. H.; Yeo, J. H.; Kang, M. J. et al (2013):** Performance Assessment of the SOFA, APACHE II Scoring System, and SAPS II in Intensive Care Unit Organophosphate Poisoned Patients. *J. Korea. Med. Sci., 28(12):1822-1826.*

16. **Krishna Moorthy, D. G. S. R.; Priya, S. M.; &Rajesh, K. et al. (2023):** Performance of new Poisoning Mortality Score in comparison with SOFA and APACHE II scores in acute organophosphate poisoning. *JEMTAC., 2023(1):9*

17. **Kumar, S.; Agrawal, S.; Raisinghani, N. et al. (2018):** Leukocyte count: A reliable marker for the severity of organophosphate intoxication? *J. Lab. Physicians, 10(02):185–188.*

18. **Lee, S.; Kim, D.; Kim, T. et al. (2019):** Anion gap and base deficit are predictors of mortality in acute pesticide poisoning. *Hum. Exp. Toxicol., 38:185-192.*

19. **Malik, A.; Awais, M. A.; Shafiq, S. et al. (2022):** White Blood Cell to Platelet Ratio as a Marker of Adverse Outcome in Organophosphate Poisoning: A Retrospective Cross-Sectional Survey. *J. Rawalpindi Med. College, 26(3).*

20. **Masoud, W.; Heshmat, M.; Soliman, N. et al (2022):** The role of cortisol and thyroid stimulating hormone in prognosis of acute anticholinesterase pesticides poisoned patients admitted to Tanta Poison Control Center. *Ain Shams J. Forensic Med. Clin. Toxicol. 38(1):33–45*

21. **Mohamed, S.; Hasb Elnabi, M.; Moussa, M. et al. (2019):** The accuracy comparison of scoring Systems in the Outcome Prediction of acute organophosphate poisoning. *Ain Shams J. Forensic Med. Clin. Toxicol, 33(2):8–15.*

22. **Mu, Y.; Hu, B.; Gao, N. et al. (2021):** Prognostic value of the neutrophil-to-lymphocyte ratio in acute

organophosphorus pesticide poisoning. *Open Life Sci., 16(1): 703–710.*

23. **Naughton, S. X. and Terry, A. V. (2018):** Neurotoxicity in acute and repeated organophosphate exposure. *Toxicol. 408:101–112.*

24. **Nour El den, F. I.; Hammad, S. A.; Allam, H. A. et al. (2024):** Study of Acute Anticholinesterase Poisoning Cases and the Predictive Relevance of Caspase Markers. *Menoufia Med. J., 37 (2):17-27.*

25. **Pannu, A.; K. Bhalla, A.; Vishnu, R. I. et al. (2021):** Cardiac injury in organophosphate poisoning after acute ingestion. Toxicol. Res., 10 (3):446–445.

26. **Pechuho, S. I; Sattar, R. A.; Kumar, S. et al. (2014):** Respiratory failure and thrombocytopenia in patients with organophosphorus insecticide poisoning. *Rawal. Med. J., 39: 246-250.*

27. **Persson, H. E.; Sjöberg, G. K.; Haines, J. A. et al. (1998):** Poisoning severity score. Grading of acute poisoning. *J. Toxoxicol. Clin. Toxi., 36(3): 205–213.*

28. **Pradhan, M.; Upadhyay, H. P.; Shrestha, A. et al. (2022):** Epidemiological Study of Organophosphorus Poisoning at College of Medical Sciences and Teaching Hospital, Bharatpur, Nepal. *JCMS. Nepal, 18(3):304–310.*

29. **Roberts, D. M. and Aaron, C. K. (2007):** Management of acute organophosphorus pesticide poisoning. *BMJ., 334(7594):629–634.*

30. **Shahin, M and Hafez, A. (2020):** Comparison of different scoring systems in poisoning with cholinesterase inhibitors. *MJFMCT., 28(1):25–42.*

31. **Shama, W. S.; El-Gharbawy, D. M.; Wahdan A. A. et al. (2021):** Assessment of the efficacy of four scoring systems in prediction of acute organophosphorous poisoning outcome. *Tanta Med. J. 49(3):187–197.*

32. **SPSS Inc. (2011):** IBM SPSS Statistics Base 20. *Chicago, IL: SPSS Inc.*

33. **Sontakke, T. and Kalantri, S. (2023):** Predictors of Mortality in Hospitalized Patients with Pesticide Poisoning. *Cureus, 15(7):e41284.*

34. **Subikshavarthni, S. and Selvan, R. (2019):** Arterial Blood Gas as a Prognostic Tool in Organophosphorus Poisoning Patients–A Prospective Observational Study. *Int. J. Sci. Study, 7:82-87.*

35. **Tadesse, B.; Kibret, H.; Heluf, H. et al (2023):** Pattern and outcome of acute organophosphate poisoning at health facilities of Harari Region Eastern Ethiopia. *SAGE Open Med., 11.*

36. **Wu, X.; Meng, J.; Li, Y. et al. (2017):** undefined.Prognostic factors and prognostic value of acute organophosphorus pesticide poisoning. pesquisa.bvsalud.org.*Available from:https://pesquisa.bvsalud.org/portal/re source/pt/wpr-792684.*

37. **Zhang, W.; Wang, Y.; Zhang, Q. et al. (2023):** Prognostic significance of white blood cell to platelet ratio in delayed cerebral ischemia and long-term clinical outcome after aneurysmal subarachnoid hemorrhage. *Front. Neurol., 14: 1180178.*

دور خلايا الدم البيضاء الى نسبة الصفائح الدموية كمتنبأ بخطورة ونتائج حالات التسمم الحاد بالفوسفات العضوية

منار على السيد¹، منى عاطف¹، مروة جبر أحمد¹

¹قسم الطب الشرعى والسموم الاكلينيكية، كلية الطب البشرى، جامعة الزقازيق، مصر

الملخص العربى

المقدمة: التسمم الحاد بالفوسفات العضوية من اخطر المشاكل الصحية ذات معدلات اعتلال ووفيات عالية.

الهدف من الدراسة: تحدد كفائة المتنبأ (نسبة خلايا الدم البيضاء الى الصفائح الدموية) كمؤشر لخطورة ومخرجات حالات التسمم الحاد بالفوسفات العضوية

المرضى وطرق البحث: أجريت هذه الدراسة على حالات التسمم الحاد بالفوسفات العضوية الذين تم استقبالهم بمستشفيات جامعة الزقازيق على مدار عام وتم تجميع الحالات من سجلات المرضى حيث تم تسجيل التاريخ الشخصى والسمى وتسجيل شده التسمم والتحاليل التى اجريت للمرضى وتم تقسيم الحالات الى مجموعتين (مجموعة جيدة النتائج واخرى سيئة النتائج)

النتائج: من بين ال ٨٩ حالة ، كانت المجموعة جيدة النتائج تمثل ٨٨.٧% بينما كانت المجموعة سيئة النتائج ١١.٣%. وكانت معظم الحالات (٦٩.٧%) فى الفئة العمرية (٢٠ الى ٤٠). وكانت الاناث هيا الفئة السائدة (٥٧.٦%) وكذلك التسمم عن طريق الانتحار. واظهرت النتائج ان المجموعة سيئة النتائج كان لديها انخفاض ذا دلالة احصائية فى مقياس الوعى جلاسكو وحموضة الدم وضغط الدم الشريانى ونسبة انزيم الكولين استريز بينما حدث ارتفاع ذا دلالة احصائية فى المجموعة سيئة النتائج فى شدة السمية وعدد خلايا الدم البيضاء واللاكتات ومتنبأ نسبة خلايا الدم البيضاء الى الصفائح الدموية.

الخلاصة: يمكن لنسبة خلايا الدم البيضاء الى الصفائح الدموية التنبؤ بخطورة ووفيات حالات التسمم الحاد بالفوسفات العضوية