

PREDICTORS OF MORTALITY IN ACUTELY INTOXICATED PATIENTS ADMITTED TO INTENSIVE CARE UNIT IN MENOUFIA UNIVERSITY HOSPITAL

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ABSTRACT

Background: Acute poisoning is a major cause of suicide and public health problem all over the world. Evaluation of the morbidity and outcome of admitted patients can assess the efficacy of treatment, making it possible to take better decisions and to further improve quality of care. **Objectives:** The present study was aimed to study multiple factors associated with fatal poisoning of the patients admitted to ICU and to assess APACHE II Scoring System in prediction of poisoning outcome. **Material and Methods:** in this prospective study, from January 2019 to December 2019, critical patients with acute poisoning admitted to ICU, Menoufia University hospitals-Egypt were enrolled into this study. Data including demographic features, clinical and lab findings, Acute Physiology and Chronic Health Evaluation (APACHE II) at admission, mode and route of poisoning, the need for mechanical ventilation or vasoactive agents, duration of mechanical ventilation and ICU stay were documented, collected and analyzed by the relevant statistical methods. All patients were studied till death or discharge from the ICU. **Results:** During the study period, 152 out of 1745 patients admitted to the Menoufia poisoning control center (MPCC) were admitted to the ICU. Out of them, 54 died and 98 survived. The majority were in age group (20-40) years. Females were (62.5%) of the total cases. Intentional poisoning was predominant. Pesticides were the most commonly employed poison including aluminium phosphide and organophosphorus compounds. Aluminium phosphide was highly toxic. High APACHE II score, mechanical ventilation and inotropic support were associated with high mortality. **Conclusion:** Some findings were correlated with outcome in acute poisoning and can be used as guidance for risk assessment and treatment planning of the patients. The higher the APACHE II score, the more serious the condition becomes. Proper counseling to counteract the stressful situations to reduce fatalities. In addition, some policy should be applied to control the easy availability of poisons in the society.

Keywords: Acute poisoning, intensive care unit, Mortality

INTRODUCTION

Poisoning is the major cause of suicide and constitutes a public health problem with various patterns of acute toxicity in different regions of the world. It is an important

medical emergency and carries a high morbidity and mortality rate especially in developing countries, resulting in hospitalization and consumption of health care resources (Khodabandeh et al., 2012 and Jha & Yadav, 2014). Agricultural

pesticides and envenomation are common causes of poisoning in developing countries while the drug's misuse is commonly seen in industrial and developed countries (Murali et al., 2009 & Rajbanshi, et al., 2018).

Intensive Care Unit (ICU) represents the highest level of continuing patient care and treatment by highly trained and qualified staff (Ashwini et al., 2016). Poisoned patient with severe intoxication admitted at an ICU due to the potentially unpredictable clinical course. Acutely intoxicated patients associated with profound alteration in any vital sign, hemodynamic instability, altered mental status, severe metabolic acidosis or electrolyte disturbances likely require ICU admission (Kirk, 2011). Early diagnosis and rapid treatment are critical for better outcome (Oreby et al., 2016).

Different scoring systems have been developed for prediction the outcome of critically ill patients. APACHE II is frequently used because it is reliable, inexpensive and easily measurable. The APACHE II score is depending on acute physiological parameters and other clinical information. It calculates the probability of mortality independent of diagnosis. It is less disease specific than other severity measurements (Chhangani et al., 2015).

MATERIAL AND METHODS

This is a prospective clinical study that was carried out on patients admitted to ICU, Menoufia University Hospitals, during the period from 1st January 2019 to 31th December 2019 after taking informed consent by the studied cases or guardians after explanation of the aim of the study. All collected personal information was treated confidentially. The study plan was approved by Institutional ethical committee following

the permission of the authority of the Menoufia poisoning control center.

Study design and grouping

All acutely poisoned patients of both sexes, ICU-Menoufia University Hospitals over one year, 2019 were included in the current study. Clinical sheet was designed to be fulfilled for every patient including demographic (gender, age, residence and marital status), toxicological and investigational data. According to age, the patients were grouped into three groups: First: less than 20 years; Second: from 20 to 40 years and Third: more than 40 years. APACHE II score was calculated for each patient (appendix). The need for mechanical ventilation or vasoactive agents, duration of mechanical ventilation and ICU stay were documented. Patients were classified according to the outcome into 2 groups survivors and non-survivors.

Diagnosis of agent of poisoning was based on the history of ingestion or exposure taken from the patient or the patient's family (or attendants), characteristic clinical features and the toxicological laboratory examination of biological samples.

APACHE II score ranges from 0 to 71 points. To calculate the APACHE II score, the sum of 12 common physiological and laboratory values was added to a mark adjusting for patient age and a mark adjusting for chronic health problems (severe organ insufficiency or immunocompromised patients) (Knaus et al., 1985).

Statistical analysis

The statistical analysis of data was performed by using personal computer and SPSS programs statistical package for social science version 23 (SPSS Inc. Released

2015. IBM SPSS statistics for windows, version 23.0, Armonk, NY: IBM Corp.).

The description of the data was done in the form of Number (No), percentage (%) mean (\bar{x}) and standard deviation (SD). Student's t-test was used for comparison of nominal variables between two groups of normally distributed data, while Mann Whitney's test was used for comparison of quantitative variables between two groups of not normally distributed data.

- Chi-square test (χ^2) and Fischer's Exact test were used for categorical variables.

- Receiver operator characteristic (ROC) with respective points of maximal accuracy for sensitivity and specificity were generated to determine biomarker performance.

- Univariate Logistic regression analysis was done to ascertain the effect of certain variable as a predictor for mortality.

- P value of < 0.05 was considered statistically significant.

RESULTS

Through the study period, a total of 152 patients (out of 1745 patients admitted to the Menoufia poisoning control center) admitted to ICU representing 8.7%. Out of ICU- admitted patients, 54 died. The mortality rate was 35.5%. Table (1) demonstrates that 57 male (37.5%) and 95 female (62.5%) patients included in the study. The results show a peak incidence (57.1% in survivors and 51.9% in non-survivors) in age group (20-40) years, followed by age group > 40 years (23.5% and 31.5% for the survivors and the non survivors respectively). The least was among age group (< 20) years.

Large proportion (58.6%) of all studied cases came from rural areas; the remaining 41.4% were from urban areas. The largest percentage of cases was single (53.1% in survivors and 59.3% in non-survivors), while 30.6% of survivors and 25.9 % of non survivors were married. The remaining cases were widow and divorced. The relation regarding sex, age, resident and marital status was not statistically significant between the two groups.

The results illustrated that 52% of cases who survived and 88.9% of dead cases were suicidal, while the remaining percent were accidental. The difference between the two groups was significant ($P < 0.001$). There were no homicidal cases in the period of study. The most common route was oral ingestion 71.4% of survivors and 90.7% of non survivors, followed by dermal exposure and inhalation with significant difference between the survivors and non survivors ($P < 0.05$).

The time passed since poison administration to hospital arrival was < 6 hours in 77.6% of survivors and 38.9% of non survivors. This difference was statistically significant ($P < 0.001$). The system used for severity grading was the APACHE II. The mean values were found to be higher for non-survivors (18.87 ± 8.03) than survivors (9.74 ± 7.35) with significant difference between the two groups ($P < 0.001$).

Mechanical ventilation was required in 23.5% of survivors and in 87% of non-survivors. The mean duration of mechanical ventilation was 0.53 ± 1.17 days in survivors and 5.79 ± 3.96 days in non-survivors. The duration of ICU stay in 64.3% of survivors was less than 2 days while 51.9% of non-survivors stayed more than 7days. The difference was statistically significant ($P < 0.001$) regarding the use of inotropes,

mechanical ventilation, duration of mechanical ventilation and ICU stay (Table 2).

Average arterial blood gas values were demonstrated in table (3) as follows: pH mean values were found to be more acidotic in non-survivors (7.19 ± 0.16) than survivors (7.30 ± 0.12). Higher mean values of PaO₂ were observed in survivors (82.90 ± 9.79) compared to non survivors (72.27 ± 8.30). While, the mean values of PCO₂ for survivor cases (42.99 ± 11.64) were higher than non-survivor cases (54.63 ± 13.51). The mean values of serum bicarbonate were 18.98 ± 2.07 mEq/L for the survivors and 17.38 ± 1.21 mEq/L for the non survivors. There was a significant difference between the two groups regarding pH, PaO₂ PCO₂ and serum bicarbonate.

Table (3) also shows that both groups of patients had normal mean serum levels of sodium (137.32 ± 5.18 mEq/L for the survivors and 138.22 ± 3.01 mEq/L for the non survivors). Regarding serum potassium level, the mean was recorded 3.79 ± 0.80 mEq/L for the survivors with lower values for the non survivors (3.44 ± 0.52 mEq/L). High (AST) levels were detected in survivors (82.95 ± 131.41 u/L) and in non-survivors (92.29 ± 108.53 u/L). Increased serum levels of (ALT) were detected in both survived (50.69 ± 52.92 u/L) and non-survived cases (53.22 ± 46.01 u/L). The mean serum level of creatinine was higher in non survivors (1.38 ± 0.52 mg/dl) than survivors (1.15 ± 0.53 mg/dl). The difference between the two groups regarding serum potassium, AST and creatinine levels was statistically significant.

Table (4) demonstrates that phosphides, followed by OP and snake bites were the main causes of poisoning. Maximum number of deaths was due to phosphides (63%), followed by OP

insecticides (16.7%). Four patients were caused by drug overdose (three were digitalis overdose and one due to sedative-hypnotic). Relationship between agents of poisoning with patient outcome revealed statistically significant difference regarding phosphides ($P < 0.001$).

Table (5) illustrates classification of patients according to their APACHE II score. More survivors were in the lower ranges of APACHE II score as 32.7 % of survived cases had score range (0-5) and 26.5 % of them had score range (6-10) followed by 16.3% of them in the score range (11-15). The major percent of non survivors was found in higher scores of APACHE II as 24.1 % of mortality cases had score range (16-20) and 22.2 % of them had score range (21-25) followed by 18.5 % of them in the score range (26-30). Patients with APACHE II score >30 died. The difference between survivors and non survivors was statistically significant in the ranges (0-5), (6-10), (21-25), (26-30) and (>30) of APACHE II score.

Based on the Receiver operating characteristics (ROC) curve for prediction of mortality using APACHE II score: at a cutoff value of or greater than 12.50, sensitivity is 75.9 %, specificity 72.4%, positive predictive value (PPV) 60%, a negative predictive value (NPV) of 85%, and accuracy 74% fig. (1).

Logistic regression analysis of the predictors of mortality showed that use of inotropes was the most predicting factor for mortality in the studied cases (OR= 27.667; CI: 11.220-68.222, $P < 0.001$) followed by the need for mechanical ventilation (OR=21.894; CI: 8.714-55.010, $P < 0.001$). Delay time ≥ 6 hours, APACHE II, increased PCO₂, hypoxia and acidosis were significant predictors of death ($P < 0.001$) as shown in (Table 6).

Table 1: Analysis of Demographic data for survivors and non-survivors admitted to ICU for poisoning.

Variables		Survivors (n =98)		Non-Survivors (n =54)		Total (n =152)		Test of significance	P value
		No	%	No	%	No	%		
Gender	Male	35	35.7	22	40.7	57	37.5	$\chi^2=0.375$	0.540
	Female	63	64.3	32	59.3	95	62.5		
Age (years)	< 20	19	19.4	9	16.7	28	18.4	$\chi^2=1.166$	0.558
	20-40	56	57.1	28	51.9	84	55.3		
	> 40	23	23.5	17	31.5	40	26.3		
Residence	Urban	41	41.8	22	40.7	63	41.4	$\chi^2=0.896$	0.896
	Rural	57	58.2	32	59.3	89	58.6		
Marital status	Single	52	53.1	32	59.3	84	55.3	FE=0.828	0.836
	Married	30	30.6	14	25.9	44	28.9		
	Divorced	6	6.1	4	7.4	10	6.6		
	Widow	10	10.2	4	7.4	14	9.2		

χ^2 =chi squared test, **FE**= Fisher's Exact test

Table 2: Clinical information for survivors and non-survivors admitted to ICU for poisoning.

Variables		Survivors (n =98)		Non-Survivors (n =54)		Total (n =152)		χ^2	P value
		No	%	No	%	No	%		
Mode of poisoning	Suicidal	51	52.0	48	88.9	99	65.1	20.81	<0.001
	Accidental	47	48.0	6	11.1	53	34.9		
Route of poisoning	Oral	70	71.4	49	90.7	119	78.3	7.640	0.019
	Inhalation	11	11.2	2	3.7	3	5.6		
	Dermal	17	17.3	3	5.6	20	13.2		
Time (exposure/ arrival)	< 6 hours	76	77.6	21	38.9	97	63.8	22.537	<0.001
	≥ 6 hours	22	22.4	33	61.1	55	36.2		
APACHE II (mean± SD)		9.74 ± 7.35		18.87 ± 8.03		12.98 ±8.75		U=6.072	<0.001
Median		7.00		18.50		11			
Inotrope support	yes	15	15.3	45	83.3	60	39.5	67.43	<0.001
	no	83	84.7	9	16.7	92	60.5		
Mechanical ventilation	yes	23	23.5	47	87.0	70	46.1	56.627	<0.001
	no	75	76.5	7	13.0	82	53.9		
Duration of Mechanical ventilation (days) (mean± SD)		0.53 ± 1.17		5.79 ± 3.96		2.40 ± 3.57		U=8.966	<0.001
Median		0.00		5.00		0.00			
Total ICU Days	< 2 days	63	64.3	14	25.9	77	50.7	32.587	<0.001
	2-7 days	24	24.5	12	22.2	36	23.7		
	> 7 days	11	11.2	28	51.9	39	25.7		
Tracheostomy	yes	0	0.0	2	3.7	2	1.3	FE=3.678	0.125
	no	98	100.0	52	96.3	150	98.7		

SD: standard deviation, **P** significant <0.05 **APACHE II:** Acute Physiology and Chronic Health Evaluation, **ICU:** Intensive Care Unit

χ^2 =chi squared test, **FE**= Fisher’s Exact test, **U**= Mann Whitney test

Table 3: Relation between the initial laboratory parameters of patients with their outcome

	Survivors (n =98) Mean ±SD Median	Non-Survivors (n =54) Mean ±SD Median	Test of significance	P value
pH	7.30 ± 0.12 7.33	7.19 ± 0.16 7.20	t=7.724	<0.001
PaO₂ (mmHg)	82.90 ± 9.79 86.00	72.27 ± 8.30 72.0	t=6.690	<0.001
PCO₂ (mmHg)	42.99 ± 11.64 38.00	54.63 ± 13.51 60.0	t=5.332	<0.001
HCO₃ (mEq/L)	18.98 ± 2.07 19.00	17.38 ± 1.21 17.20	t=6.006	<0.001
Na⁺ (mEq/L)	137.32 ± 5.18 136.0	138.22 ± 3.01 137.00	t= 1.346	0.180
K⁺ (mEq/L)	3.79 ± 0.80 3.50	3.44 ± 0.52 3.30	t= 3.156	0.002
AST (u/L)	82.95 ± 131.41 35.50	92.29 ± 108.53 65.0	U=2.10	0.036
ALT (u/L)	50.69 ± 52.92 34.50	53.22 ± 46.01 33.0	U=0.227	0.820
Creatinine (mg/dl)	1.15 ± 0.53 1.10	1.38 ± 0.52 1.30	U=2.628	0.009

SD: Standard deviation, **P** significant <0.05 **PH:** Power of hydrogen **PO₂:** Partial oxygen pressure **PCO₂:** Partial carbon dioxide pressure **HCO₃:** Serum bicarbonate **Na⁺:** Serum sodium **K⁺:** Serum potassium **AST:** Aspartate transaminase **ALT:** Alanine transaminase
t= Students' t-test, U = Mann Whitney test

Table 4: Agents of poisoning and their relation to patient outcome

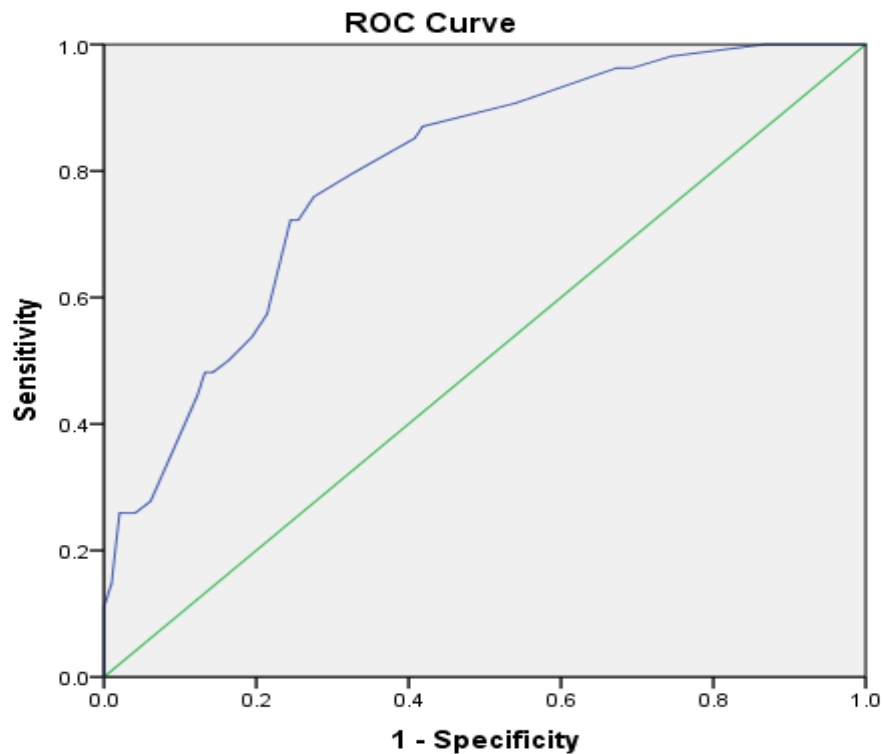
	Survivors (n =98)		Non-Survivors (n =54)		Total (n =152)		Z test	P value
	No	%	No	%	No	%		
Phosphides	18	18.4	34	63.0	52	34.2	5.37	<0.001*
Organophosphorus	28	28.6	9	16.7	37	24.3	1.55	0.150
Snake bite	12	12.2	3	5.6	15	9.9	1.02	0.306
Carbon monoxide	11	11.2	2	3.7	13	8.6	0.100	0.200
Corrosive	8	8.2	1	1.9	9	5.9	1.21	0.225
Kerosene	6	6.1	2	3.7	8	5.3	0.26	0.798
Methanol	5	5.1	2	3.7	7	4.6	0.01	0.991
Hydrogen Cyanamide	5	5.1	1	1.9	6	3.9	0.53	0.593
Drug overdose	4	4.1	0	0.0	4	2.6	0.98	0.327
Para-phenylenediamine	1	1.0	0	0.0	1	0.7	0.32	0.747

*significant P <0.001

Table 5: Range of APACHE II score among studied patients in relation to the patient outcome

APACHE II Scores	Survivors (n =98)		Non-Survivors (n =54)		Total (n =152)		Z test	P value
	No	%	No	%	No	%		
0-5	32	32.7	2	3.7	34	22.4	3.90	<0.001*
6-10	26	26.5	6	11.1	32	21.1	2.02	0.043*
11-15	16	16.3	7	13.0	23	15.1	0.31	0.758
16-20	12	12.2	13	24.1	25	16.4	1.67	0.095
21-25	8	8.2	12	22.2	20	13.2	2.19	0.028*
26-30	4	4.1	10	18.5	14	9.2	2.64	0.008*
>30	0	0.0	4	7.4	4	2.6	2.20	0.027*

* Significant p <0.05



Diagonal segments are produced by ties.

Figure 1: Receiver operating characteristics (ROC) curve for prediction of mortality using APACHE II score: AUC was 0.797, at point of or greater than 12.50, sensitivity is 75.9 %, specificity 72.4%, PPV 60%, NPV 85%, accuracy 74%.

Table 6: Logistic regression analysis of the predictors of mortality

Variable	P value	Odds ratio	95% CI	
			Lower	Upper
Delay time \geq 6 hours	<0.001	5.429	2.631	11.20
PCO₂	<0.001	1.069	1.040	1.099
PO₂	<0.001	0.896	0.862	0.933
APACHE II	<0.001	1.147	1.093	1.204
Mechanical ventilation	<0.001	21.894	8.714	55.010
Inotropes	<0.001	27.667	11.220	68.222
PH	<0.001	0.005	0.000	0.060

CI: confidence interval

DISCUSSION

Poisoning is on the rise despite of great efforts to combat its occurrence. The general public awareness that poisoning causes almost painless death, leads to rapid rise of death incidence due to poisoning (**Harish et al., 2006**).

Over one year, 2019, the ICU admitted poisoned cases represented 8.7% of the total Menoufia poisoning control center (MPCC) admissions. This coincided with the Iranian study of **Taghaddosinejad et al., (2012)** who revealed that patients requiring ICU admission constituted 8% of the total cases admitted for treatment of poisoning.

The mortality rate was 35.5% (54 cases out of 152). This was higher than the study of **Singh et al., (2018)** who recorded a mortality rate of 27%. The high mortality in the current study can be explained by ICU admission was strictly limited to obviously severe and life-threatening poisoning due to the presence of a lower intensity setting "intermediate care" in Menoufia poisoning control center (MPCC).

The current study revealed that most of the cases were in the age group (20-40 years) which is similar with observations of **Chaudhary et al., (2013)**. People in this age group are usually more vulnerable to various emotional conflicts due to their immaturity to cope the stress, their inability to carry new responsibilities, family problems, psychiatric illness, academic failures and poor communication with family (**Ahmed et al., 2014**).

Females were dominant and this can be explained by the fact that females are easily emotionally and mentally affected by the issues such as household violence and love affair failures (**Rajbanshi et al., 2018**). Young female used suicidal attempts to oblige her family to do her wishes.

Most cases belonged to the rural area. Menoufia is an agriculture governorate, also farming activity and grain storing is more in rural areas with easy access to toxic pesticides especially organophosphates and phosphides which constituted the most common agent of poisoning in the studied cases. Menoufia University Hospital is a reference hospital for cases of poisoning in Menoufia governorate. Cases of poisoning

from rural areas are referred to Menoufia poisoning control center (MPCC). This coincided with the Egyptian study of **Oreby et al., (2016)** that was carried out on patients with acute poisoning admitted to ICU of El-Mansoura General Hospital.

Suicidal poisoning represented 65.1 % of the total studied cases (52% of Survivors and 88.9% of dead cases) due to easy availability and the thinking that poisoning will be less painful. Similarly, **Sulaj et al., (2015)** studied toxic cases treated in ICU and recorded that the intentional poisoning constituted 87.2% of cases with no cases involving homicidal poisoning. Moreover, **Boshehri et al., (2012)** in their study found that most of died cases were poisoned intentionally. This is in contrast with the study of **Coşkun et al., (2013)** in Turkey who found that the mortality rate due to accidental poisoning was significantly higher than suicidal poisoning. They explained that lower fatality in their suicidal cases may be due to small amount of ingested poison to draw attention only, vomiting after ingestion and rapid referral to the hospital.

The most common route of poisoning was ingestion (78.3%) followed by dermal exposure (13.2%) then inhalation (5.6%) of the total cases as the highest numbers of admitted cases were intoxicated due to suicidal ingestion of organophosphates and phosphides. This was in agreement with the work of **Boshehri et al., (2012)**.

Acute poisoning is as all medical emergencies, early diagnosis followed by rapid decontamination and definitive treatment are lifesaving. The time passed since poison administration was ≥ 6 hours in 61.1% of non-survivors. This was similar with observations of **Coşkun et al., (2013)**.

Longer ICU stay was observed in non-survivors because of high poison load and they were mechanically ventilated and some of them developed secondary complications. These patients, though on ventilator, keep worsening and die eventually. This finding is in conformity with those of other workers who recorded lower mortality in short-stay patients (less than two days in the ICU) than in long-stay patients (**Ashwini et al., 2016**).

Mechanical ventilation and inotropic support were needed in most of dead cases in ICU. These results were in accordance with the study of **Mathai and Bhanu (2010)** who found that the need for mechanical ventilation and vasoactive drugs is associated with high mortality in aluminum phosphide (ALP) poisoned patients.

This study revealed that hypoxia is associated with high mortality rate. Partial oxygen pressure (PO_2) was significantly decreased in non survivors. This was previously confirmed by other researchers. **Barco et al., (2008)** stated that intubation was required in cases of severe OP poisoning with respiratory failure due to muscarinic manifestations or an intermediate syndrome. Moreover, **Jayashree and Singhi, (2011)** demonstrated that hypoxemia on arrival is associated with higher need for mechanical ventilation and higher incidence of secondary pneumonia with prolonged ICU stay.

The current study demonstrated a significant difference between blood pH in relation to the outcome. The study of **Assaf et al., (2019)** was in the same line. **Abd Elghany et al., (2018)** mentioned that acidosis was related to higher fatality in aluminum phosphide poisoning.

Lower potassium levels were recorded in non survivors. This was previously

recorded by **El-Sarnagawy, (2017)**. Hypokalemia aggravates muscular weakness and the clinical burden in poisoned patients. The morbidity and mortality related to hypokalemia are secondary to cardiac arrhythmia or respiratory failure (**Prasad, 2014**).

Increased serum levels of (AST) and (ALT) were detected in both groups with higher (AST) levels especially in non-survivors. Similarly, **Risal et al., (2019)** recorded elevation of serum aminotransferases mainly AST levels in OP poisoning cases. **Prasad et al., (2016)** demonstrated elevation of (AST) and (ALT) levels in acute zinc phosphide poisoning and found to be significant with mortality. Hepatocyte injury leads to altered cell membrane permeability with excessive leakage of transaminases. Periportal cells have relatively more ALT, while the cells near the central vein which are more likely involved in toxic insults have more AST, causing a predominance of AST elevation (**Kasarala and Tillmann, 2016**). Aminotransferases especially AST are also elevated due to rhabdomyolysis (**Weibrecht et al., 2010**).

Higher creatinine levels were recorded in non survivors. Phosphides induced toxic myocarditis causes severe haemodynamic instability leading to hypotension which is accompanied by acute tubular necrosis. Phosphine gas is excreted through respiration and urination, so inadequate renal perfusion and decreased urine output can affect outcome in acute phosphides poisoning (**Farzaneh et al., 2018**). In another study on organophosphorus poisoning mortality in India by **Banday et al., (2015)**, they observed altered renal function between the survivors and non survivors and stated that the renal injury may be due to direct action of the organophosphate causing tubular necrosis or

secondary mechanisms causing hypovolemic shock and rhabdomyolysis.

Mortality was high in patients with acute pesticide poisoning, especially phosphides poisoning. Since rodents usually share human environments, rodenticides represent a great danger to individuals and are among the most lethal compounds routinely found in homes (**Nalabothu et al., 2015**).

The case fatality rate from phosphides alone was 65.4% (34/52 cases). **Singh et al., (2011)** observed 100% mortality in patients presented with aluminium phosphide poisoning admitted in intensive care unit. It is widely used as a rodenticide and as a grain preservative. Easy availability, low cost and social believes about its painless fatal outcome may direct persons to use its tablets for suicide. Multi-organ involvement and unavailability of any antidote led to maximum deaths due to ALP poisoning (**Nejad et al., 2012**).

The pattern of poisoning deaths varies in different geographical areas. **Krakowiak et al., (2017)** in their study in Poland reported that Alcohol poisoning was responsible for maximum number of fatal cases followed by pharmaceutical agents.

A female patient was presented with suicidal ingestion of a black stone which is added to henna. She developed altered liver and kidney functions. Paraphenylenediamine (PPD) is widely used in several industrial products and added to black henna used as temporary tattoo and hair dye to increase its effectiveness. It is an oxidative chemical that can cause hypersensitivity reactions and systemic effects as angioedema, rhabdomyolysis and acute renal failure (**Elevli et al., 2014**). Another case was

reported by **Şık and Çıtak, (2016)** in Turkey after its dermal application.

The present study showed that the initial APACHE II score is a useful prognostic indicator and can predict the outcome of critically poisoned patients. It was useful for stratifying patients according to the severity of their illness. The higher the score was, the higher the mortality rate was. The APACHE II score cut-off point between survivors and non-survivors was determined to be 12.5 with a sensitivity of 75.9 % and specificity 72.4%. **Kang et al., (2009) and Coskun et al., (2015)** found that the initial APACHE II score was a significant predictor of outcome in acute organophosphate poisoning. **Louriz et al., (2009); Mathai and Bhanu (2010) and Abd Elghany et al., (2018)** found that APACHE II score was positively correlated with mortality in acute aluminum phosphide poisoning.

This was also recorded by **Eizadi Mood et al., (2011)** in prediction of outcome of patients with mixed drug poisoning-induced coma. Moreover, **El-Gharbawy and Khalifa, (2019)** studied Egyptian patients of acute carbon monoxide poisoning and found a statistically significant difference between the survived and non-survived cases regarding the values of APACHE II.

CONCLUSION

Mortality in patients can be predicted by clinical and laboratory parameters. Mortality is directly proportionate to the lag time in initiation of treatment, clinical severity, mechanical ventilation and inotropic therapy. Acidosis and hypoxia were also significant predictors of outcome of acutely intoxicated patients. Rapid diagnosis, early effective treatment and good ICU supportive care will decrease mortality

rate in these cases. Aluminium phosphide is the leading cause of deaths observed in Menoufia.

The APACHE II score was discriminator between survivors and non-survivors. The results of the current study demonstrate its value for prediction of outcome in critically poisoned patients.

RECOMMENDATIONS

- Accelerate the transport of poisoned patients to treatment centers.
- Obtaining the maximum information possible from the accompanying persons as well as from the first care givers facilitates rapid diagnosis and early treatment.
- Patients presented with acidosis or hypoxia should be closely monitored and aggressively treated.
- Laws controlling the availability of pesticides can help reduce cases of these preventable causes of death with restricting the sale and storage of aluminium phosphide.
- Less toxic alternatives to aluminium phosphide and organophosphorus compounds should be developed with increasing the awareness of the public to the high fatality of these poisons.

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Appendix

Acute Physiology and Chronic Health Evaluation II (Knaus et al., 1985).

	+4	+3	+2	+1	0	+1	+2	+3	+4
Temperature rectal	≥ 41	39-40.9		38.5-38.9	36-38.4	34-35.9	32-33.9	30-31.9	≤29.9
Mean arterial pressure	≥160	130-159	110-129		70-109		50-69		≤49
Heart rate	≥180	140-179	110-139		70-109		50-69	40-54	≤39
Respiratory rate	≥ 50	35-49		25-34	12-24	10-11	6-9		≤5
PaO ₂					>70	61-70		55-60	<55
Arterial pH	≥7.7	7.6-7.69		7.5-7.59	7.33-7.49		7.25-7.32	7.15-7.24	<7.15
Serum sodium	≥180	160-179	155-159	150-154	130-149		120-129	111-119	≤110
Serum potassium	≥7	6-6.9		5.5-5.9	3.5-5.4	3-3.4	2.5-2.9		<2.5
Serum creatinine	≥3.5	2-3.4	1.5-1.9		0.6-1.4		<0.6		
Hematocrit (%)	≥60		50-59.9	46-49.9	30-45.9		20-29.9		<20
White blood cell count (1000s/mm ³)	≥40		20-39.9	15-19.9	3-14.9		1-2.9		<1
15 minus GCS									

Age points (years):

<44 0

45-54 2

55-64 3

65-74 5

≥ 75 6

Chronic health points:

If a patient has history of severe organ system insufficiency or is immunocompromised

For non-operative or emergency post-operative patients 5 points

For elective post-operative patients 2 points

الملخص العربي

متنبئات الوفاة بمرضى التسمم الحاد الذين تم إدخالهم وحدة العناية المركزة بمستشفى جامعة المنوفية

ملخص البحث:

المقدمة: يعتبر التسمم الحاد من حالات الطوارئ الهامة وهو سبب شائع للدخول لوحدة العناية المركزة حيث يتطلب التشخيص المبكر والبدء السريع في العلاج.

الهدف من الدراسة: تهدف هذه الدراسة إلى تقييم خصائص مرضى التسمم الحاد الذين تم إدخالهم وحدة العناية المركزة وتقييم مقياس أباتشى الثانى فى التنبؤ بمعدلات الوفاة.

الحالات و طرق البحث: تم إجراء هذه الدراسة على 152 مريضاً الذين تم إدخالهم وحدة العناية المركزة فى مستشفى جامعة المنوفية - مصر خلال فترة بين بداية يناير 2019 إلى نهاية ديسمبر 2019 حيث تم جمع البيانات الإجتماعية و الديمغرافية و البيانات الخاصة بالتسمم لكل مريض وكذلك تم إجراء الفحص الإكلينيكي والأبحاث المعملية وحساب مجموع نقاط مقياس أباتشى الثانى لكل مريض عند دخوله وحدة العناية المركزة وتم تقسيم الحالات إلى مجموعتين (مجموعة المتعافين بعد التسمم ومجموعة الوفيات).

النتائج: أظهرت نتائج هذه الدراسة أن معظم المرضى من الإناث (62.5% من إجمالى الحالات) ومن المناطق الريفية كما أظهرت النتائج أن معظم الحالات كانت نتيجة التسمم الإنتحارى (65.1% من إجمالى الحالات) و قد توفى 54 مريضاً من إجمالى الحالات المشاركة فى البحث. وكان أكبر عدد من الحالات قد تسمم بالمواد الكيميائية الزراعية. و يمثل التسمم بفوسفيد الزنك نسبة كبيرة من الوفيات.

الإستنتاج و التوصية: لقد تبين وجود ارتباط ذات دلالة إحصائية بين كل من حموضة الدم ، التنفس الصناعى والعلاج بمقويات عضلة القلب وحدوث الوفاة. وإنه من الممكن إستخدام نظام التسجيل أباتشى الثانى فى تقييم شدة الخطورة والتنبؤ بحالات الوفيات لمرضى التسمم الحاد داخل وحدة العناية المركزة. كما أن التدخل السليم فى وقت مبكر لعلاج هذه المخاطر من قبل الطبيب المعالج ربما يقلل نسبة الوفيات ويحسن من نتائج هذه الحالات.