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Evaluation of The risk Factors Influencing The prognosis of Elderly Patients with Acute Poisoning Admitted to Poison Control Center, Ain Shams University Hospitals during 2022

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Abstract

Background: Poisoning in elderly people is frequently more severe, with greater complications and a higher risk of death. **This study aimed to** explore the risk factors affecting the prognosis of elderly individuals with acute intoxication. **Subjects and Methods:** A prospective study involved all individuals sixty years of age or older with acute intoxication admitted to the Poison Control Center of Ain Shams University Hospitals during 2022. **Results:** There were 72 elderly individuals with acute intoxication were enrolled in this study, with 56 survivors (77.78%) and 16 non-survivors (22.22%). The majority of patients (83.33%) were between 60 and 74 years. Accidental intoxication and suicidal attempts were equally represented. The majority of acutely intoxicated elderly patients had one or more underlying chronic comorbidities and the oral route was more common. CVS drugs, CNS drugs, and pesticides were the major causes of acute poisoning in elderly patients. CVS complications were the most frequent reason of ICU admission in the elderly patients. The PSS score and APACHE II score were 3 ± 0 and 29.25 ± 3.55 in the non-survivors, 1.52 ± 0.60, and 7.92 ± 1.81 in the survivors. Long hospitalization was correlated with a high APACHE II score. The presence of respiratory manifestations, the need for mechanical ventilation, PSS score, and the APACHE II score were the independent risk factors of poor prognosis. **Conclusion:** The presence of respiratory manifestations, the need for mechanical ventilation, the PSS score, and the APACHE II score were the prognostic factors in elderly patients with acute poisoning. This study recommends taking precautions against poisoning in the elderly, particularly those who are at a high risk of suicide.

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Introduction

Worldwide, acute intoxication is a serious public health concern that results in high rates of morbidity and fatality. It mostly affects young populations, with less than 3% of the involved patients being in people aged 60 years or older in most studies. Majority of the poisoning incidents in the elderly over 65 years old were unintentional (Hu et al., 2010).

There are several classifications about the beginning of elderly, but according to common definitions, it usually begins at the age of 60 years. The percentage of elderly individuals in the world's population has risen significantly. During 2015, 10% of population is 60 years or above; by 2050, 20% of population will be 60 years or older (Zanaty and Elagamy, 2016).

In many ways, elderly people vary from younger adults. There are physiological changes occur with age. Due to their higher incidence of comorbidities and extensive use of medications for chronic diseases, elderly people are more vulnerable to acute poisoning and its associated complications (Chen-Chang, 2010).

While the elderly represent a relatively small percentage of patients referred to hospitals for acute self-poisoning, their poisoning is frequently more severe, complications are more common, and fatalities are more frequent (Mortazavi et al., 2012).

The management of the elderly poisoned patients is more complicated than that of younger patients due to the existence of many physical, psychiatric, and social disorders, as well as possible obstacles in diagnosing poisoning. There are three major challenges in diagnosing acute intoxication in the elderly. At first, it may be difficult to determine whether the patient has overdosed. Second, the existence of pre-existing disorders may mask the clinical picture, and finally, the medicine may produce physical manifestations that are similar to prevalent problems of old age (Chen-Chang, 2010; Zanaty and Elagamy, 2016).

Continuous efforts have been made to develop scoring systems that could be applied to better allocate resources, anticipate outcomes in individuals with severe disease, and support clinical decision-making, especially for patients in critical care units. When assessing the poisoning severity caused by many organ

system affection, the Acute Physiology and Chronic Health Evaluation II score (APACHE II) is a helpful guide (Mahrous et al., 2011; Kim et al., 2013).

The European Association of Poison Centers and Clinical Toxicologists, the International Programme on Chemical Safety, and the European Commission collaborated to develop the Poisoning Severity Score (PSS), which is based on an easy grading scale. It has been demonstrated that the poisoning severity score is useful for assessing the severity of different intoxication cases. It enables the comparison of the severity and outcomes of the intoxications (Akdur et al., 2010; Roberts and Brett, 2014).

Aim of the Work

This study aimed to explore the risk factors affecting the prognosis of elderly individuals with acute intoxication.

Subjects and Methods

A cross sectional prospective hospital-based observational study involved patients aged 60 years and older of both sexes admitted to Poison Control Center, Ain Shams University Hospitals (PCC-ASUH) during 2022.

The study had been approved by the Research Ethics Committee of Faculty of Medicine Ain Shams University (Approval number FMASU MS 375/2022). Additionally, an approval had been obtained from the general director of the PCC -ASUH.

Every patient or their caregiver has given their informed written consent to be included in the study.

The diagnosis of acute poisoning in the elderly was made based on history, physical examination, routine and toxicological laboratory assessment. All elderly were treated according to the PCC-ASUH guidelines.

For every patient, the following parameters were studied:

Socio-Demographic characteristics as age, sex, residence and marital status. Intoxication data of the patient as toxic agent(s), manner of poisoning, route of exposure, the time interval between exposure and arrival to the PCC-ASUH, presence of co-ingestion of other drugs or agents, pre-hospital management and comorbidities. Data regarding clinical assessment, general examination including vital signs and conscious level by Glasgow coma scale (GCS) and systemic examination which included respiratory, cardiovascular, central nervous system, etc.

Scoring systems including poisoning severity score (PSS) and the Acute Physiology and Chronic Health Evaluation II (APACHE II) score, which were calculated for every admitted patient.

Poisoning severity was assessed using PSS when the most intense manifestations occur (Persson et al., 1998). PSS grading was defined as follows: (0): None, no manifestations, (1): Mild, transient manifestations, (2): Moderate, Pronounced manifestations, (3): Severe or life threatening manifestations and (4): Death.

The APACHE II score was determined using the standard method, taking into account the patient's age and chronic health status in addition to clinical and biological data collected during the first 24 hours of ICU admission. The worst value was utilized if a variable was measured more than once during that period. There are twelve physiological factors in APACHE II. The points in the APACHE II score go from 0 to 71 (Vincent and Moreno, 2010).

Data about the patient's treatment, the length of their stay in the inpatient ward or ICU were recorded.

Elderly in this study were divided according to their outcome into two groups, survivors and non-survivors group.

Statistical Analysis:

The collected data were updated, coded, and arranged for statistical analysis using SPSS (Statistical package for Social Science) version 20 software. Data were shown, and appropriate analysis was carried out according to the kind of data found for every variable.

For descriptive statistics: Mean and standard deviation were done for numerical data. Frequency and percentage were obtained for non-numerical data.

For analytical statistics: Comparison between survivors and non-survivors groups was tested by using Chi-square test for qualitative data, and by using Independent t-test for quantitative data. Correlation analysis was used to assess the strength of association between two quantitative variables. Linear regression analysis was used to assess predictors of outcome. Receiver operating characteristic curve (ROC) was used to assess predictors of outcome with its cut off points, sensitivity, specificity, positive Predictive Value and negative Predictive Value. P-value less than 0.05 and 0.001 was considered significant and highly significant respectively.

Results

The number of acutely poisoned patients presented to poison control center during the study duration was 21847, out of them 280 patients aged 60 years or more, representing about 1.28%, only 72 patients admitted to inpatient or ICU who are involved in this study.

As regard outcome, 56 patients were discharged representing 77.78% (survivors group) and only 16 patients died representing 22.22% (non-survivors group). There was 80.36% of survivors and 93.75% of non-survivors in the age range of 60 to 74 years old. Males comprised 56.94% of the studied patients, a greater proportion than females. Most of the elderly patients (91.67%) came from urban regions and married. There were no significant statistical difference as regard age, sex, residence and marital status among the studied groups. The majority of patients (84.72%) did not have any special habits, 8 patients (11.11%) were smokers and 3 patients (4.17%) were addicts (2 opioid addicts and 1 alcoholic abuser). There was highly statistical difference between survivors and non-survivors regarding special habits of medical importance as presented in table (1).

Table (2) showed that the majority of patients consumed the toxic agent orally (90.28%). Accidental intoxication and suicidal attempts were equally represented. Regarding delay time, majority of patients (89.06%) were presented within the first 24 hours of poisoning. No pre-hospital treatment was offered to the majority of patients (95.83%) before arrival to the

PCC-ASUH. CVS drugs, CNS drugs and pesticides were the major causes of toxicity in elderly patients representing 25% equally followed by corrosive exposure (6.94%).A single toxin was responsible for the poisoning of about 91.67% of the patients. There was significant statistical difference among the studied groups as regard manner of poisoning.

As regard medical comorbidities, hypertension (44.44%) came at the top of diseases affecting the elderly followed by diabetes mellitus and cardiac diseases. Psychiatric problems were present in 9 patients representing 12.50% of all patients as presented in table (3).

Table (4) illustrated that the mean of systolic blood pressure, diastolic blood pressure and mean arterial pressure were significantly lower among non-survivors with significantly higher pulse and respiratory rate than survivors.

As shown in table (5), gastrointestinal manifestations were the commonest manifestations representing 54.17% of all patients followed by nervous manifestations representing 41.67% of all cases. There were highly significant statistical differences as regard cyanosis, nervous manifestations, cardiovascular manifestations and respiratory manifestations between survivors and non-survivors.

Table (6) illustrated that 40.28% of patients recorded PSS (2) while two patients were completely asymptomatic (PSS 0) and admitted for follow up. Mean ± SD of APACHE II score was 12.67 ± 4.68. There was highly significant statistical difference among the studied groups as regard PSS on admission and APACHE II score, where all non-survivors were classified as severe PSS with high APACHE II score.

Table (7) showed that 42 patients (58.33) required ICU admission. Hospital admission duration longer than one day was observed in 52.78% of the studied patients. CVS complications were the commonest causes of hospital admission. There was significant statistical difference regarding hospital admission duration and highly significant statistical differences regarding hospital admission site and cause of admission between survivors and non-survivors.

There was no correlation between PSS and hospital admission duration in the studied patients. While, long hospitalization was associated with high APACHE II score as presented in table (8) and figure (1).

As shown in table (9), activated charcoal was given to 19.44% and intravenous fluids were used in 80.56% of all patients. The majority of patients received symptomatic and supportive treatment representing 98.61% and 100% respectively. Only 20 patients received antidotes, 14 patients needed mechanical ventilation and two patients needed hemodialysis representing 27.78 %, 19.44% and 2.78% respectively. There were highly significant statistical differences among studied groups regarding endotracheal intubation, mechanical ventilation and hemodialysis.

In table (10) through the use of linear regression analysis for parameters affecting outcome, it was found that the P-value of respiratory manifestations (0.021) and the P-value of mechanical ventilation (0.016) were significantly associated with mortality. The P-value of PSS (<0.001) and the P-value of APACHE II score (<0.001) was highly significantly associated with mortality, hence they were the independent risk factors of poor prognosis.

As shown in table (11) and figures (2 and 3), PSS at cut off > 2 had sensitivity 100% and specificity 98.21%. APACHE II score at cut off value > 19 had sensitivity 100% and specificity 100%. APACHE II score had the largest AUC when compared with PSS.

Table (1): Sociodemographic characteristics of survivors and non-survivors elderly patients with acute poisoning.

Outcome		Survivors (N=56) (77.78%)		Non-survivors (N=16) (22.22%)		Total (N= 72) (100%)		Test value	P-value
Sociodemographic characteristics		N	%	N	%	N	%		
Age (years)	60-74	45	80.36	15	93.75	60	83.33	t= 1.408	0.164
	75-85	9	16.07	1	6.25	10	13.89		
	>85	2	3.57	0	0.00	2	2.78		
	Range	60 - 87		60 - 77		60 – 87			
	Mean ± SD	68.429 ± 7.720		65.563 ± 4.718		67.792 ± 7.232			
Sex	Male	29	51.79	12	75.00	41	56.94	X^2= 2.735	0.098
	Female	27	48.21	4	25.00	31	43.06		
Residence	Urban	53	94.64	13	81.25	66	91.67	X^2= 2.922	0.087
	Rural	3	5.36	3	18.75	6	8.33		
Marital status	Single	2	3.57	1	6.25	3	4.17	X^2= 1.081	0.582
	Married	51	91.07	15	93.75	66	91.67		
	Widow	3	5.36	0	0.00	3	4.17%		
Special habits	No	51	91.07	10	62.50	61	84.72	X^2=12.779	**0.002****
	Smoker	5	8.93	3	18.75	8	11.11		
	Addict	0	0.00	3	18.75	3	4.17		

N: Number, SD: Standard deviation, t: Independent t-test, X2: Chi-square test, P <0.001: highly significant (**)

Table (2): Intoxication characteristics of survivors and non-survivors elderly patients with acute poisoning.

Toxicological characteristics		Survivors (N=56)		Non-survivors (N=16)		Total (N=72)		Test value	P-value
		N	%	N	%	N	%		
Route of exposure	Unknown	0	0.00	1	6.25	1	1.39	X^2=7.971	0.093
	Oral	52	92.86	13	81.25	65	90.28		
	Inhalational	2	3.57	1	6.25	3	4.17		
	Sting and bite	2	3.57	0	0.00	2	2.78		
	Injection	0	0.00	1	6.25	1	1.39		
Manner of poisoning	Accidental	32	57.14	4	25.00	36	50.00	X^2=5.143	**0.023***
	Suicidal	24	42.86	12	75.00	36	50.00		
Pre-hospital treatment	No	53	94.64	16	100.00	69	95.83	X^2=0.894	0.639
	Faulty treatment	2	3.57	0	0.00	2	2.78		
	Proper treatment	1	1.79	0	0.00	1	1.39		
Delay time (hours)	≤ 24	45	86.54	12	100.00	57	89.06	t =1.852	0.069
	> 24	7	13.46	0	0.00	7	10.94		
	Range	1 – 96		1 -9		1 – 96			
	Mean ± SD	12.510±5.239		3.750±1.500		10.867±15.052			
Type of toxic agents (toxic grouping)	CVS drugs	15	26.79	3	18.75	18	25.00	X^2=12.664	0.316
	CNS drugs	16	28.57	2	12.50	18	25.00		
	Pesticides	13	23.21	5	31.25	18	25.00		
	Gaseous	1	1.79	1	6.25	2	2.78		
	Corrosive	3	5.36	2	12.50	5	6.94		
	Analgesic	2	3.57	0	0.00	2	2.78		
	Animal bite	2	3.57	0	0.00	2	2.78		
	Oral hypoglycemic	1	1.79	0	0.00	1	1.39		
	Food poisoning	1	1.79	0	0.00	1	1.39		
	Plant	2	3.57	1	6.25	3	4.17		
	Chemotherapy	0	0.00	1	6.25	1	1.39		
	Unknown	0	0.00	1	6.25	1	1.39		
Co-ingestion	No	51	91.07	15	93.75	66	91.67	X^2= 0.117	0.732
	Yes	5	8.93	1	6.25	6	8.33		

N: Number. SD: Standard deviation, X2: Chi-square test, t: Independent t- test, P <0.05: significant (*), CVS drugs: Cardiovascular drugs, CNS drugs: Central nervous drugs.

Table (3): Comorbidities in survivors and non-survivors elderly patients with acute poisoning.

Comorbidities			Survivors (N=56)		Non-survivors (N=16)		Total (N=72)		Chi-Square	
			N	%	N	%	N	%	X^2	P-value
Medical comorbidities	HTN	No	29	51.79	11	68.75	40	55.56	1.450	0.228
		Yes	27	48.21	5	31.25	32	44.44		
	DM	No	40	71.43	12	75.00	52	72.22	0.079	0.778
		Yes	16	28.57	4	25.00	20	27.78		
	Cardiac	No	49	87.50	13	81.25	62	86.11	0.406	0.524
		Yes	7	12.50	3	18.75	10	13.89		
	Renal	No	55	98.21	16	100.00	71	98.61	0.290	0.590
		Yes	1	1.79	0	0.00	1	1.39		
	Neurological	No	51	91.07	15	93.75	66	91.67	0.117	0.732
		Yes	5	8.93	1	6.25	6	8.33		
	Malignancy	No	55	98.21	16	100.00	71	98.61	0.290	0.590
		Yes	1	1.79	0	0.00	1	1.39		
	Hepatic	No	55	98.21	16	100.00	71	98.61	0.290	0.590
		Yes	1	1.79	0	0.00	1	1.39		
	Respiratory disease	No	52	92.86	13	81.25	65	90.28	1.910	0.167
		Yes	4	7.14	3	18.75	7	9.72		
	Orthopedic	No	54	96.43	15	93.75	69	95.83	0.224	0.636
		Yes	2	3.57	1	6.25	3	4.17		
	Endocrine	No	55	98.21	16	100.00	71	98.61	0.290	0.590
		Yes	1	1.79	0	0.00	1	1.39		
Psychiatric comorbidities		No	49	87.50	14	87.50	63	87.50	0.000	1.000
		Yes	7	12.50	2	12.50	9	12.50		
Medical & Psychiatric comorbidities		No	51	91.07	15	93.75	66	91.67	0.117	0.732
		Yes	5	8.93	1	6.25	6	8.33		

N: number, X2: Chi-square test.

Table (4): Vital signs of survivors and non-survivors elderly patients with acute poisoning.

Vital signs		Survivors (N=56)	Non-survivors (N=16)	Total (N=72)	Independent t-test	
					t	P-value
Pulse	**Range**	45 - 130	38 - 166	38 – 166	-2.626	**0.011***
	Mean ± SD	82.321 ± 18.491	101.375 ± 42.470	86.556 ± 26.638		
SBP	**Range**	70 - 180	50 - 200	50 – 200	2.215	**0.030***
	Mean ± SD	122.500 ± 21.930	103.750 ± 48.973	118.333 ± 30.673		
DBP	**Range**	50 - 110	20 - 140	20 – 140	2.458	**0.016***
	Mean ± SD	77.679 ± 14.012	63.750 ± 13.838	74.583 ± 20.688		
MAP	**Range**	57 – 133	30 – 160	30 – 160	2.317	**0.023***
	Mean ± SD	92.161 ± 16.232	77.063 ± 38.734	88.806 ± 23.686		
°C	**Range**	36.5 - 37.5	35 - 38.5	35 - 38.5	0.799	0.427
	Mean ± SD	36.889 ± 0.238	36.756 ± 1.184	36.860 ± 0.586		
RR	**Range**	12 - 28	6 - 50	6 - 50	-4.346	**<0.001****
	Mean ± SD	18.464 ± 4.294	26.438 ± 11.308	20.236 ± 7.241		

N: Number, SD: Standard deviation, t: Independent t- test, °C: Temperature, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, MAP: Mean Arterial pressure, RR: Respiratory rate, P <0.05: significant (*), P <0.001: highly significant (**)

Table (5): Clinical manifestations in survivors and non-survivors elderly patients with acute poisoning.

Clinical manifestations		Survivors (N=56)		Non-survivors(N=16)		Total(N=72)		Chi-Square	
		N	%	N	%	N	%	X^2	P-value
Cyanosis	**Absent**	56	100.00	12	75.00	68	94.44	14.824	**<0.001****
	Present	0	0.00	4	25.00	4	5.56		
Pupil	**Normal**	39	69.64	7	43.75	46	63.89	4.337	0.114
	Constricted	16	28.57	9	56.25	25	34.72		
	Dilated fixed	1	1.79	0	0.00	1	1.39		
Cutaneous	**No**	53	94.64	16	100.00	69	95.83	0.894	0.344
	Yes	3	5.36	0	0.00	3	4.17		
Eye	**No**	55	98.21	15	93.75	70	97.22	0.918	0.338
	Yes	1	1.79	1	6.25	2	2.78		
Nervous	**No**	39	69.64	3	18.75	42	58.33	13.261	**<0.001****
	Yes	17	30.36	13	81.25	30	41.67		
Musculoskeletal	**No**	51	91.07	13	81.25	64	88.89	1.215	0.270
	Yes	5	8.93	3	18.75	8	11.11		
GIT	**No**	28	50.00	5	31.25	33	45.83	1.762	0.184
	Yes	28	50.00	11	68.75	39	54.17		
CVS	**No**	44	78.57	4	25.00	48	66.67	16.071	**<0.001****
	Yes	12	21.43	12	75.00	24	33.33		
Respiratory	**No**	50	89.29	5	31.25	55	76.39	23.239	**<0.001****
	Yes	6	10.71	11	68.75	17	23.61		
Urinary	**No**	55	98.21	16	100.00	71	98.61	0.290	0.590
	Yes	1	1.79	0	0.00	1	1.39		

N: Number, X^2: Chi-square test, P <0.001: highly significant (**), GIT: Gastrointestinal manifestations, CVS: Cardiovascular manifestations.

Table (6): PSS score on admission and APACHE II score of survivors and non-survivors elderly patients with acute poisoning.

Score		Survivors (N=56)		Non-survivors (N=16)		Total (N=72)		Independent t- test	
		N	%	N	%	N	%	t	P-value
PSS on admission	**None (0)**	2	3.57	0	0.00	2	2.78	-9.786	**<0.001****
	Minor (1)	24	42.86	0	0.00	24	33.33		
	Moderate (2)	29	51.79	0	0.00	29	40.28		
	Severe (3)	1	1.79	16	100.00	17	23.61		
	Range	0 - 3		3 – 3		0 - 3			
	Mean ± SD	1.518 ± 0.603		3.000 ± 0.000		1.847 ± 0.816			
APACHE II	**Range**	3 - 19		25 – 37		3 - 37		-19.993	**<0.001****
	Mean ± SD	7.929 ± 1.818		29.250 ± 3.550		12.667 ± 4.676			

N: Number, SD: Standard deviation, t: Independent t- test, P <0.001: highly significant (**), PSS: Poisoning severity score, APACHE II: the Acute Physiology and Chronic Health Evaluation II score.

Table (7): Hospital admission (site, duration and cause) of survivors and non-survivors elderly patients with acute poisoning.

Hospital admission		Survivors (N=56)		Non-survivors (N=16)		Total (N=72)		Test value	P-value
		N	%	N	%	N	%		
Hospital admission site	In patient	30	53.57	0	0.00	30	41.67	X^2= 14.694	**<0.001****
	ICU	26	46.43	16	100.00	42	58.33		
Hospital admission duration (days)	≤ One day	25	44.64	9	56.25	34	47.22	t = -2.390	**0.020***
	> One day	31	55.36	7	43.75	38	52.78		
	Range	0.5- 6		0.125 - 28		0.125-28			
	Mean ± SD	2.025±1.355		4.625±1.877		2.602±1.001			
Cause of admission	Follow up	15	26.79	0	0.00	15	20.83	X^2= 17.082	**0.004****
	CVS causes	8	14.29	10	62.50	18	25.00		
	CNS causes	12	21.43	2	12.50	14	19.44		
	Cholinergic causes	10	17.86	2	12.50	12	16.67		
	GIT causes	10	17.86	2	12.50	12	16.67		
	Metabolic causes	1	1.79	0	0.00	1	1.39		

N: Number, SD: Standard deviation, X2: Chi-square test, t: Independent t- test, P <0.05: significant (*), P <0.001: highly significant (**), ICU: Intensive care unit, CVS: Cardiovascular system, CNS: Central nervous system, GIT: Gastrointestinal tract.

Table (8): Correlation among hospital admission duration in relation to PSS score and APACHE II score in the studied patients.

	Hospital admission duration (days)	
	R	P-value
PSS score	0.052	0.663
APACHE II score	0.238	**0.044***

r: Correlation coefficient, P <0.05: significant (*).

Table (9): Management in survivors and non-survivors of elderly patients with acute poisoning.

Management		Survivors (N=56)		Non-survivors (N=16)		Total (N=72)		Chi-Square	
		N	%	N	%	N	%	X^2	P-value
Decontamination	No	39	69.64	11	68.75	50	69.44	3.954	0.266
	AC	12	21.43	2	12.50	14	19.44		
	GL	4	7.14	1	6.25	5	6.94		
	Paraffin oil	1	1.79	2	12.50	3	4.17		
Enhanced elimination	No	8	14.29	3	18.75	11	15.28	1.021	0.600
	IV fluids	45	80.36	13	81.25	58	80.56		
	MDAC	3	5.36	0	0.00	3	4.17		
ET intubation	No	55	98.21	3	18.75	58	80.56	50.168	**<0.001****
	Yes	1	1.79	13	81.25	14	19.44		
Mechanical Ventilation	No	55	98.21	3	18.75	58	80.56	50.168	**<0.001****
	Yes	1	1.79	13	81.25	14	19.44		
Hemodialysis	No	56	100.00	14	87.50	70	97.22	7.200	**0.007****
	Yes	0	0.00	2	12.50	2	2.78		
Antidotes	No	38	67.86	14	87.50	52	72.22	2.393	0.122
	Yes	18	32.14	2	12.50	20	27.78		
Symptomatic treatment	No	0	0.00	1	6.25	1	1.39	3.549	0.060
	Yes	56	100.00	15	93.75	71	98.61		
Supportive treatment	No	0	0.00	0	0.00	0	0.00	-	-
	Yes	56	100.00	16	100	72	100		

N: Number, X2: Chi-square test, P <0.001: highly significant (**), AC: Activated Charcoal, GL: Gastric Lavage, MDAC: Multiple Dose Activated Charcoal. ET: Endotracheal intubation

Table (10): Linear regression analysis for factors affecting outcome.

Variable	Unstandardized Coefficients		Standardized Coefficients	t	P-value
	B	Std. Error	Beta		
Special habits	-0.055	0.049	-0.065	-1.126	0.265
Manner of poisoning	0.033	0.043	0.040	0.772	0.444
Pulse	0.001	0.001	0.050	0.728	0.470
SBP	-0.001	0.005	-0.058	-0.155	0.878
DBP	-0.003	0.008	-0.167	-0.433	0.666
MAP	0.003	0.012	0.166	0.237	0.813
RR	0.004	0.004	0.068	1.079	0.286
Cyanosis	-0.120	0.134	-0.066	-0.897	0.374
Nervous	0.026	0.045	0.031	0.590	0.558
CVS	-0.059	0.058	-0.067	-1.019	0.313
Respiratory	0.147	0.062	0.215	2.383	**0.021***
PSS on admission	0.390	0.040	0.760	9.786	**<0.001****
APACHE II	0.030	0.005	0.688	6.089	**<0.001****
Hospital admission duration(days)	-0.002	0.006	-0.014	-0.242	0.809
Hospital admission site	-0.027	0.051	-0.032	-0.531	0.598
Cause of admission	0.000	0.017	-0.001	-0.018	0.986
ET intubation	0.003	0.169	0.003	0.018	0.986
mechanical ventilation	0.239	0.097	0.228	2.479	**0.016***
Hemodialysis	0.040	0.137	0.016	0.288	0.774
Dependent Variable: Outcome					

SBP: systolic blood pressure, DBP: diastolic blood pressure, MAP: mean arterial pressure, RR: respiratory rate, CVS: cardiovascular symptoms, ET: endotracheal tube, P <0.05: significant (*), P <0.001: highly significant (**).

Table (11): The receiver operating characteristic curve of PSS score and APACHE II score.

	Cutoff	AUC	Sensitivity	Specificity	PPV	NPV	Accuracy
PSS on admission	>2	0.991	100.0	98.21	94.1	100.0	99.1%
APACHE II score	>19	1.00	100.0	100.0	100.0	100.0	100%

AUC: Area under Curve. PPV: Positive Predictive Value. NPV: Negative Predictive Value.

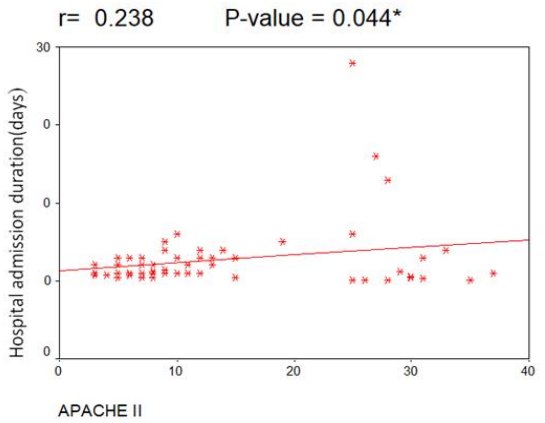

Figure (1): Pearson correlation between APACHE II and hospital admission duration.

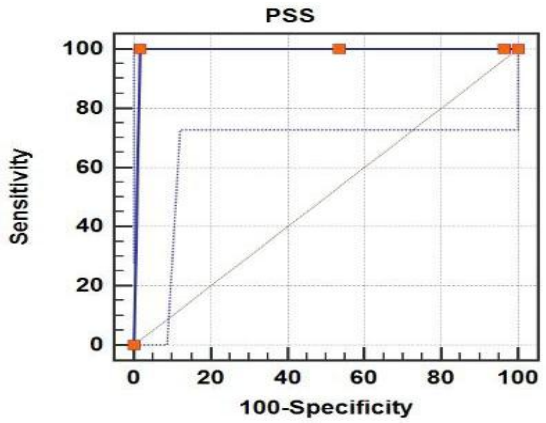

Figure (2): Receiver Operating Characteristic (ROC) curve of PSS score as early prognostic factor

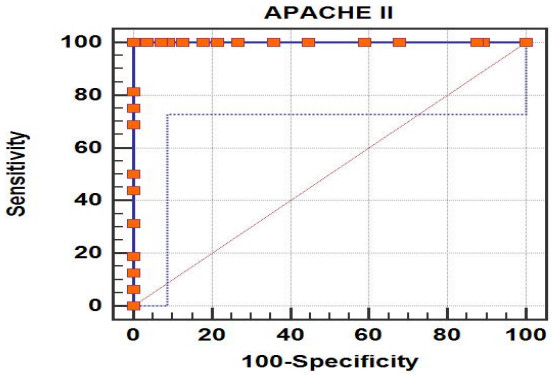

Figure (3): Receiver Operating Characteristic (ROC) curve of APACHE II score as early prognostic factor

Discussion

In many developing and developed countries alike, toxic exposures are now among the most frequent causes of acute medical conditions. In this way, the elderly are not an exceptions and poisoning is a serious health issue especially in this specific age group (Moghadamnia and Abdollahi, 2002).

The older people can become poisoned due to numerous circumstances, like: declining health, losing a spouse, loss of independence and retirement which can be all considered as contributing or precipitating factors to toxicity in this age group who once exposed to poisoning, they have the highest mortality. This high mortality rate observed requires caution regarding the risk factors and the prognostic criteria of intoxication in the elderly (Willis and Gupta, 2007).

Acutely intoxicated patients 60 years of age or older of both sexes, and admitted in the inpatient and ICU, were included in this study.

In the current study, total number of acutely intoxicated patients received by the PCC during the study period was 21847 patients, out of them 280 patients aged 60 years or more, representing about 1.28%, only 72 patients admitted to inpatient or ICU. This was in agreement with the findings revealed by Abdelhamid et al., (2021) where the total number of patients with acute poisoning presented to the PCC-ASUH during 2019 was 22301 cases. This representing 1.12% of the total number of patients attended to the PCC, only 91 cases admitted to inpatient or ICU.

In the present study, 56 patients were discharged representing 77.78% and only 16 patients died representing 22.22% as regard outcome.

This result was consistent with Wu et al., (2017) where 82.5% of patients recovered, while 17.5% died in their study in China. In contrary, Zanaty and Elagamy, (2016) reported that the outcome of elderly patients in their study in Egypt was 90.6% recovered and 9.4% died.

In this study, the mean age was 67.79 ± 7.23 years. The majority of patients (83.33%) were between 60 and 74 years, demonstrating a decrease in number as people age.

These findings were nearly the same as that recognized by Doak et al., (2009). In addition, this finding is consistent with the report on elderly patients in Tehran (Karbakhsh and Zandi, 2008). On the other hand, Hu et al., (2010) reported that the patients aged 75 to 85 years were 52.2% and less than 30% were between 60-74 years in Taiwan.

The present study reported that male intoxicated patients were represented at a higher rate than females (56.94% and 43.06% respectively). This is in line with the findings of Afzali et al., (2015) study in Iran. In contrast to other research done in Egypt and Poland where females more than males. This discrepancy may be attributed to the higher susceptibility of men to stress, addiction, and access to toxic substances as opposed to females (Piekarska-Wijatkowska et al., 2016; El-Hawary et al., 2019).

In the present study, most of cases (91.67%) came from urban regions. This finding go in a harmony with that of Cook et al., (2008) who attributed this to the stressed environment in urban regions compared to rural ones. Unlikely, Hu et al., (2010) assumed that rural dwellers outnumbered the urban ones in Taiwan.

In the present study, the majority of patients were married representing 91.67%. This finding was similar to Khodabande et al., (2012) who reported that suicidal intoxication may be primarily caused by marital issues and financial strain between married couples.

In the present study, the majority of patients (84.72%) did not have any special habits (e.g. smoking and addiction), 8 patients were smokers and 3 patients (4.17%) were addicts. These numbers were nearly similar to that observed by Abdelhamid et al., (2021) where 72% elderly patient did not have any special habits. On the contrary, Afshari et al., (2004), reporting 54% of patients were opiate addicts.

In this study, there was no significant statistical difference as regard age, sex, residence and marital status among the studied groups. This was consistent with the findings published by Zanaty and Elagamy, (2016) where there was no significant relation between age and sex of patients with outcome.

Regarding route of exposure in the current study, ingestion was the commonest, accounting for 90.28% of all cases followed by other routes as inhalational exposure (4.17%). These results were like to those recorded by Wu et al., (2017) and Cassidy et al., (2008) who revealed that the main route of toxicity was ingestion with percent of 83.60 % and 91% respectively.

In the current study, there was no significant statistical difference as regard route of exposure among the studied groups. On the other hand, Wu et al., (2017) reported significant difference between survival group and death group regarding poisoning route.

In the present study, accidental intoxication and suicidal attempts were equally represented. These findings were different to those recorded by Mühlberg et al., (2005) who reported that accidental poisoning represented more than 50% of the total number of toxicity. These findings did not agree with Sam et al., (2009); Kim et al., (2010), where suicidal intoxication topped the list (more than 70%), explaining this by the fact that the elderly are at high risk for suicide and poisoning might be a highly successful way to accomplish this objective. Furthermore, they are more liable to commit suicide more than once, attributing this to many factors as financial problems, social isolation and dependence, or presence of multiple medical or psychiatric diseases. Some studies revealed that the majority of exposures in the elderly were accidental and other studies recognized deliberate self-harm as the most frequent reason for intoxication (Afzali et al., 2015; Abdelhamid et al., 2021).

In the present study, no pre-hospital treatment was offered to the majority of patients (95.83%) before arrival to the PCC, while proper treatment occurred in only 1.39% of the studied patients. These results agreed with those recorded by Moghadamnia and Abdollahi,

(2002), attributing this to the early arrival of most of the patients to the ED before consulting other medical services.

In the present study, It was recognized that CVS drugs, CNS drugs and pesticides were the major causes of toxicity in elderly patients representing 25% equally followed by corrosive exposure representing 6.94%. This was in agreement with the results reported by Abdelhamid et al., (2021) who revealed that centrally acting drugs was the commonest agent (19.2%). According to Kaeley et al., (2019), the possible reason for increasing toxicity of drugs could be that the geriatric patients are already taking these medications for multiple diseases. Organic and functional brain illnesses, such as dementia, delirium, depression, bipolar disorders, etc., are more common in older adults and psychoactive drugs are necessary for the efficient treatment of these disorders(Abdelhamid et al., 2021). In another study done in geriatric patients by Zanaty and Elagamy, (2016), 49.4% of cases were intoxicated with organophosphate substances while 18.8% were drugs.

Ingestion of corrosives by children are usually unintentional and harmless, given the small quantities ingested. On the other hand, ingestion in adults is usually intentional, involving larger quantities with more serious sequelae. In the elderly, most cases are accidental. They can arise from product misuse, inappropriate storage, misidentification, or confusion, leading to even more serious consequences due to their comorbidities, unlike younger populations (Cruz et al., 2023).

Tandon, (2007) reported that several factors could affect the type of reported toxic agents in the elderly as socio-economic factors, culture, degree of development and society structure of each country. All these factors are responsible for the variations seen in various places of the world and perhaps in different parts of the same country.

In the current study, poisoning by a single agent was observed in the majority of cases (91.67%). This was in accordance with Karbakhsh and Zandi, (2008) who mentioned that single agent was observed in 80% of cases. However, Jung et al., (2008) revealed co-ingestion of two or more drugs in 40% of studied patients. This can be attributed to presence of several comorbidities for which polymedications were accessible. Additionally, inappropriate drug usage, improper storage or mistaken identities due to dementia and confusion in the older people may result in a higher incidence of mixed accidental intoxications.

In the present study, there was no significant statistical difference as regard type of toxic agents and co-ingestion in survivors and non-survivors. In contrast, Wu et al., (2017) observed that there was statistical significant difference between the survival and death group regarding cause of poisoning.

As regard medical comorbidities, hypertension (44.44%) came at the top of diseases affecting the elderly followed by diabetes mellitus and cardiac diseases. Psychiatric problems were present in 9 patients representing 12.50% of all patients. Nearly similar to results were assumed by Kim et al., (2010) who reported that chronic medical and psychiatric problems occurred in 45% and 13% respectively. They considered these comorbidities as well as polypharmacy as important risk factors responsible for suicidal intoxication in this age group. However, in a study done by Gavrielatos et al., (2006), chronic obstructive pulmonary disease was the most obvious comorbidity in the studied geriatric patients, existing in 45% of patients followed by hypertension (30%) then diabetes mellitus (15%) and lastly arthritis (10%).

Regarding vital signs in this current study, extremities of vital signs including respiratory rate, blood pressure and pulse rate had significant effect on outcome. These findings were nearly the same as that recognized by Yu et al., (2012) who revealed that abnormal vital signs were predictors of patients' mortality. In addition, Assaf et al., (2019) reported that there were statistically significant difference between respiratory rate, blood pressure and pulse between survivors and non-survivors group in acutely poisoned cases admitted in ICU of PCC-ASUH of all ages. In contrary, Mood et al., (2011) reported that there were non-significant difference between the mean of pulse, respiratory rate and mean arterial blood pressure of survivors and non-survivors of mixed drug poisoning-induced coma in Iran.

In this study, most of cases had no cyanosis and only four patients had cyanosis representing 5.56% of all patients. In addition, the majority of patients had normal reactive pupil, constricted pupil up to pinpoint pupil was present in 25 patients representing 34.72% of all patients but only one case had dilated fixed pupil. These findings were nearly the same as that recognized by Zanaty and Elagamy, (2016), who reported that constricted and pinpoint pupils and cyanosis were seen in some cases of organophosphates and snakebite.

In the present study, there was highly significant statistical difference between survivors and non-survivors as regard cyanosis, nervous manifestations, cardiovascular manifestations and respiratory manifestations. These findings were nearly similar to that reported by Zanaty and Elagamy, (2016), who recorded that there was highly significant difference between clinical findings in poisoned cases as metabolic acidosis, hypoxia and coma with outcome. On contrary, Kaeley et al., (2019) found that acute renal failure, ARDS and jaundice were significantly associated with death.

In the present study, the range of PSS among studied patients on hospital admission was 0 - 3. Most of patients (40.28%) presented to the PCC with score (2) followed by score (1) in 33.33%. During the study only 16 patients died representing 22.22% with PSS score (4). These results go in a harmony with Karbakhsh and Zandi, (2008) who reported PSS in a study done in Tehran that revealed the occurrence of score (2) in more than 50% of elderly cases followed by score (1) in 25% of cases with death occurring in 7% of cases.

Unlikely, Abdelhamid et al., (2021) revealed that the majority of the elderly cases (52.4%) had a

PSS (1), followed by a PSS (0) in 17.2% of patients, while mortality occurred in 2.8% of patients.

The mean of PSS score was 1.52 ± 0.60 in the survivors and 3 ± 0 in non-survivors. There was highly significant statistical difference among the studied groups as regard PSS on admission, where all non-survivors were classified as severe. This result was similar to Wu et al., (2017), who reported that the mean of PSS score was 2.27 ± 0.81 in the survival group and 2.97 ± 0.18 in the death group and there was significant difference between survival group and death group as regard PSS score. Zaghary et al., (2021) mentioned that there was a significant statistical difference between PSS and the outcome of acutely intoxicated individuals of different ages. Additionally, Cairns and Buckley, (2017) concluded that severe or fatal degree of PSS were associated with complications or mortality despite differences in age, demographic data and toxic substances accustomed to cause poisoning.

In the present study, the APACHE II score was 29.25 ± 3.55 in the non-survivors and 7.92 ± 1.81 in the survivors. There was highly significant statistical difference between survivors and non-survivors as regard APACHE II score.

This result go in harmony with Wu et al., (2017) who revealed that the mean of APACHE II score was 12.80 ± 5.30 in the survival group and 19.80 ± 2.80 in the death group and there was significant difference between survival group and death group as regard APACHE II score. In addition, Jiang et al., (2018) reported that the APACHE II score in the elderly death group significantly higher than this in the elderly survival one.

In the present study, the death was significantly higher among patients admitted ICU. This finding is nearly identical to Sacanella et al., (2009), who reported that prolonged ICU stay associated with poor outcome, might be due to age-related variables, pre-morbid conditions, and the requirement for mechanical ventilation, hemodialysis, or other interventional procedures in ICU.

The commonest causes of ICU admission were CVS complications especially severe hypotension, bradycardia and heart block, occurring in 25% of cases in this study. However, Senanayake and Karalliedde, (2007), reported another cause, like acute renal failure, affecting more than 50% of patients.

In this study, long hospitalization was associated with high APACHE II score. The results agreed with Moussa et al., (2018) who observed positive correlation between APACHE II score and duration of hospital admission in acutely organophosphate poisoned patients of all ages. In addition, Naved et al., (2011) reported that there was statistically significant positive correlation between APACHE II score and hospital stay duration.

In the current study, death was significantly higher among patients having endotracheal intubation, mechanically ventilated and who had hemodialysis. This finding is in line with Sacanella et al., (2009), who attributed poor outcome in elderly patients admitted in ICU to mechanical ventilation, hemodialysis, and other interventional procedures.

In this study, respiratory manifestations, PSS, APACHE II score and mechanical ventilation were the independent risk factors of poor prognosis.

This was in accordance with Wu et al. (2017) who assumed that PSS and APACHE II score were the prognostic factors in elderly cases. Additionally, Assaf et al., (2019) reported that mechanical ventilation was significant predictor of outcome of acutely poisoned patients admitted to ICU in all ages. Also, Hu et al., (2010) reported that respiratory failure on presentation could predict intoxication related mortality in emergency department intoxicated individuals.

On the other hand, Nejad et al (2012) revealed that there was negative relation between mechanical ventilation requirement and outcome in aluminum phosphide poisoning. In addition, Zanaty and Elagamy, (2016) found that pH and hypoxia where the predictors affecting the outcome of intoxicated elderly patients.

In this study, ROC curve analysis showed that APACHE II score at cut off value more than 19 had corresponding sensitivity 100%, specificity 100% and accuracy rate 100%. These results go with those of Moussa et al., (2018) where APACHE II score at cut off value more than 10 had sensitivity 100%, specificity 90.56% and accuracy rate 98.6% as predictor of outcome of acute organophosphate poisoning. According to Hilal et al., (2020) the accuracy rate between 80% and 90% was described as excellent discrimination.

Conclusion

The current study concluded that the most commonly affected age group was young elderly group. Accidental intoxication and suicidal attempts were equally represented. The majority of the acutely intoxicated elderly patients had one or more underlying chronic comorbidities and the oral route was more common. CVS drugs, CNS drugs and pesticides were the major causes of poisoning in elderly patients. CVS complications were the commonest cause of ICU admission in elderly. High APACHE II score was correlated with long hospitalization. Presence of respiratory manifestations, the need for mechanical ventilation, PSS, and APACHE II score were the prognostic factors in elderly patients with acute poisoning.

Recommendations

- Precautions against poisoning in the elderly should be carried out, particularly those who are at a high risk of suicide.
- Prognostic factors outlined in this study (respiratory manifestations, need for mechanical ventilation, PSS score and APACHE II score) should be evaluated regularly and as soon as possible to determine the severity and enhance the management strategy.
- Further studies are needed to provide a more comprehensive picture of risk factors influencing acute poisoning in the elderly, including larger sample size for more extended period than one year.

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تقييم عوامل الخطورة المؤثرة في التنبؤ بحالات التسمم الحاد لكبار السن التى ادخلت مركزعلاج التسمم بمستشفيات جامعة عين شمس خلال عام 2022

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الملخص العربي

المقدمة: غالبًا ما يكون التسمم لدى كبار السن أكثر خطورة، والمضاعفات أكثر حدوثا والنتيجة المميتة أكثر شيوعًا.

الهدف من الدراسة: تقييم عوامل الخطورة التي تؤثرعلى التنبؤ بحالات التسمم الحاد لكبار السن.

طريقة البحث: دراسة مستقبلية شملت حالات التسمم الحاد لكل الاشخاص بعمر 60 سنه او اكثر و التى ادخلت الى مركز علاج التسمم بمستشفيات جامعة عين شمس خلال عام 2022 .

النتائج: من بين 72 مريضًا بالتسمم الحاد من كبار السن كان هناك 56 مريضاً من الناجين (77.78 %) و 16 مريضا من المتوفيين (22.22%). تراوحت أعمار غالبية المرضى (83.33%) بين 60 و74 عامًا. وكانت حالات التسمم العرضي ومحاولات الانتحار ممثلة بالتساوي. كان لدى معظم كبار السن المصابين بالتسمم الحاد واحد أو أكثر من الأمراض المزمنة وكان الطريق الفموي أكثر شيوعًا. كانت أدوية القلب والأوعية الدموية وأدوية الجهاز العصبي المركزي والمبيدات الحشرية هي الأسباب الرئيسية للتسمم الحاد لدى كبار السن. كانت مضاعفات جهازالقلب والأوعية الدموية هي السبب الأكثر شيوعًا للحجز بوحدة العناية المركزة لدى كبار السن. كان مقياس شدة التسمم ومقياس اباتش الثانى فى مجموعة المتوفيين3 ± 0.00 و 29.25± 3.55 ،0.60 ± 1.52

و1.81± 7.92 في مجموعة الناجين. ارتبط مقياس اباتش الثانى المرتفع بالاستشفاء لفترة طويلة. كان وجود الاعراض التنفسية والحاجة إلى التنفس الصناعى و مقياس شدة التسمم ومقياس اباتش الثانى هي عوامل الخطر المستقلة للتوقع السيء.

الاستنتاج: ان وجود الاعراض التنفسية، والحاجة إلى التنفس الصناعى ، و مقياس شدة التسمم ومقياس اباتش الثانى من عوامل التوقع لحالات التسمم الحاد لكبار السن. وتوصى هذه الدراسة بضرورة اتباع استراتيجيات لمنع التسمم لدى كبار السن، وخاصة أولئك الذين هم في خطر كبير للانتحار

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