PREDICTIVE VALUE OF TRIAGE VITAL SIGNS AND CONSCIOUS LEVEL FOR OUTCOME EVALUATION IN ACUTELY INTOXICATED PATIENTS

BY

Assmaa A. Assaf, Manal A. Abd El Kareem, Hany M. Tawfik*, Marwa A. Hasb Elnabi**

Departments of Forensic Medicine & Clinical Toxicology, Faculty of Medicine,

*Ain Shams University & Sohag University**, Poison Control Center, Ain Shams University Hospitals**

ABSTRACT

Triage in Emergency departments requires emergency doctors to make rapid decisions based on their knowledge and experiences. Triage of patients is critical to patient safety, yet no clear information exists for the utility of initial vital signs in identifying critically ill poisoned patients. The objective of this study is to determine the relationship between triage vital signs and conscious level in predicting the outcome of acutely poisoned patients. The total number of patients was 321 patients admitted to Poison Control Center (PCC) of Ain Shams University Hospitals. Information was collected from the sheets and computerized data base of the patients including vital signs and Glasgow coma scale (GCS) on admission after obtaining the permission of the director of PCC and the regional ethics committee. The results were revised, coded and organized for statistical analysis. The study results revealed 265 (82.6%) survivors with no complications, 30 patients (9.4%) survived but developed complications and 26 (8%) patients died. The study also showed that 32% of patients had hyperthermia, 1.1% had hypothermia, 22.4% had tachycardia, 6.2% had bradycardia, 10.9% had hypotension, 4% had hypertension and 22.8% showed respiratory distress. Additionally, 69.4% of patients had GCS > 8, while 30.6% had GCS≤ 8. The study showed statistically significant difference between uncomplicated, complicated and dead cases as regards heart rate, systolic blood pressure, respiratory rate, skin discoloration (pallor or cyanosis) and GCS. It could be concluded that vital signs can serve as an easily measurable tool for outcome prediction in poisoning cases.

Keywords: *Triage, Vital Signs, Glasgow, Fatality, Complications.*

INTRODUCTlON

Vital signs play an important role in diagnosis of intoxicated patients since they are the key components of toxic syndromes. However, their role in assessing the severity of poisoning has still lack of evidence. Most of the previous researches

focused on the relationship between a single specific poison and its prognostic factors (Lee et al., 2008). Early diagnosis and rapid initiation of appropriate therapy in emergency department (ED) and intensive care unit (ICU) are critical for lowering hospital morbidity and mortality in poisoned patients (Islambulchilar et al., 2009). The identification of those who will require prolonged ICU stay or who may be suitable for intermediate care may help the optimal use of limited resources (Vincent and Moreno, 2010).

AIM OF THE WORK

The aim of this work is to determine the value of triaging the vital signs and conscious level in predicting outcome of acute poisoned patients presented to the PCC of Ain Shams University Hospitals which may help in improving the course of management and deciding the pathway of care.

PATIENTS AND METHODS

This is a retrospective study of 321 acutely intoxicated patients admitted to ICU of PCC of Ain Shams University Hospitals in the period from 1/7/2011 to 31/1/2012. Information was collected from the sheets and computerized data base of the patients. The diagnosis of acute intoxication was based on positive history, clinical picture and initial laboratory tests specific to certain poisons.

The following data was collected from the sheet of each patient:

(A) Demographic Data including age and sex.

(B) Toxicological data demonstrating causative agents.

(C) Physical findings on admission:

a.Vital signs included pulse, blood pressure, temperature, respiratory rate and skin discoloration . The vital signs abnormalities were classified according to Lee et al. (2008) and Reinhart et al. (2008) into:

- Heart rate (tachycardia > 120 beats/min. or bradycardia < 60 beats/min.).

- Systolic blood pressure (hypotension < 90mmHg or hypertension > 140mmHg).

- Temperature (hyperthermia ≥ 37.5°C or hypothermia <36.0°C).

- Respiratory rate (bradypnea <10 or tachypnea >24 breaths per minute).

- Skin discoloration (pallor or cyanosis).

b. Neurological assessment according to Glasgow Coma Scale (GCS).

(D) Outcome of the patients:

The patients were classified according to the outcome into three groups uncom-

plicated, complicated and dead.

Statistical analysis

The obtained results were revised, coded and organized for statistical analysis using SPSS (Statistical Package for Social Science) version 17 software. Mean, standard deviation (±SD) was done for numerical data. Frequency and percentage were obtained for non-numerical data.

Comparison between outcome groups was tested using Kruskal Wallis Test. Linear regression analysis was used to identify significant predictors of outcomes. P-value less than 0.05 was considered statistically significant.

RESULTS

Table (1) demonstrated the age and sex of the studied patients. 36.7% of patients were in the age group between 15 to less than 25 years. More than half of the patients (52.6%) were females and 47.4% were males.

Table (2) illustrated that most of poisoning cases were due to pharmaceutical agents (36.5%), followed by organophosphorus compounds (15.3%), tramadol (14.3%), snake bites (5.7%), carbon monoxide (4.9%), corrosives (4%) and other toxic agents (19.3 %) including (kerosene, scorpion, alcohol, hydrogen sulphide, ciguatera, PPD "Paraphenylenediamine").

The outcome of the patients was shown in table (3). 265 patients were survivors with no complications representing about (82.6%), 30 patients were survivors with complications representing about (9.4%) and 26 patients (8%) died.

As shown in table (4), the most frequently encountered complications were dysphagia, bleeding and anemia in 26.6%, followed by intermediate syndrome in 23.3%, cognitive dysfunction in 16.6% and rhabdomyolysis in 10%.

Table (5) demonstrated physical signs and GCS in the studied patients. 32% of cases presented with hyperthermia, respiratory rate abnormality was observed in 22.8% of patients, 22.4% presented with tachycardia and 10.9% had hypotension. Moreover, 69.4% of patients had GCS > 8.

Table (6) showed that there was significant difference between uncomplicated, complicated and dead cases as regards heart rate, systolic blood pressure, respiratory rate, skin discoloration and GCS.

Table (7) showed that predictors of outcome were heart rate, systolic blood pressure and respiratory rate.

Table (1) : Number and percentage of the studied patients (n=321) as regards socio-demographic data (age and sex).

Item		Number	Percentage (%)
Age group (years)	<5	68	21.2%
	5-	22	6.9%
	15-	118	36.7%
	25-	58	18%
	35-	24	7.5%
	≥45	31	9.7%
Sex	Male	152	47.4%
	Female	169	52.6%

Table (2) : Number and percentage of the studied patients (n=321) regarding causative agents of poisoning.

The causative agents	Number	Percentage (%)
Pharmaceutical agents	117	36.5%
Organophosphates	49	15.3%
Tramadol	46	14.3%
Snake bite	18	5.7%
Carbon monoxide	16	4.9%
Corrosives	13	4%
Other toxic agents (kerosene, scorpion, alcohol, hydrogen sulphide, ciguatera, PPD {Parap-henylenediamine})	62	19.3%
Total	321	100%

Table (3) : Number and percentage of the outcome of the studied patients (n=321).

Outcome	Frequency	Percentage (%)
Survived (with no complications)	265	82.6%
Survived (with complications)	30	9.4%
Died	26	8%
Total	321	100%

Table (4) : Number and percentage of the studied patients as regards complications.

Complications	Number	Percentage (%)
Dysphagia, bleeding and anemia	8	26.6%
Intermediate syndrome	7	23.3%
Cognitive dysfunction	5	16.6%
Rhabdomyolysis	3	10%
Rhabdomyolysis, renal failure and dysphagia	2	6.6%
Hepatotoxicity	1	3.3%
Disseminated intravascular coagulation (DIC)	1	3.3%
Myopathy and anemia	1	3.3%
Pneumonia	1	3.3%
Pneumothorax	1	3.3%
Total	30	100%

Table (5) : Number and percentage of the studied patients as regards (n=321) vital signs, skin discolouration and conscious level.

Parameter		Number	Percentage (%)
Body temperature	Normal	215	66.9%
	Hyperthermia	103	32%
	Hypothermia	3	1.1%
Heart rate	Normal	229	71.4%
	Tachycardia	72	22.4%
	Bradycardia	20	6.2%
Systolic blood pressure	Normal	273	85.1%
	Hypotension	35	10.9%
	Hypertension	13	4%
Respiratory rate	Normal	248	77.2%
	Abnormal (<10 or >24)	73	22.8%
Skin discoloration	Pallor	17	5.3%
	Cyanosis	14	4.4%
	None	290	90.3%
Conscious level	GCS ≤ 8	98	30.6%
	GCS > 8	223	69.4%

Table (6) : Statistical analysis of vital signs, skin discoloration and GCS in relation to outcome of the studied patients.

Parameter		Uncomplicated n.= 265		complicated n. = 30		Dead n. = 26		P- value
		N	%	N	%	N	%	
Body temperature	Normal	173	65.3%	25	83.4%	17	65.4%	0.136
	Abnormal	92	34.7%	5	16.6%	9	34.6%	
Heart rate	Normal	193	72.9%	23	76.7%	13	50%	0.039*
	Abnormal	72	27.1%	7	23.3%	13	50%	
Systolic B.P	Normal	239	90.2%	22	73.4%	12	46.2%	0.000*
	Abnormal	26	9.8%	8	26.6%	14	53.8%	
Respiratory rate	Normal	223	84.2%	19	63.4%	6	23.1%	0.000*
	Abnormal (<10 or >24)	42	15.8%	11	36.6%	20	76.9%	
Skin discoloration	Pallor or cyanosis	16	6%	3	10%	12	46.2%	0.000*
	None	249	94%	27	90%	14	53.8%	
Conscious level	GCS ≤ 8	69	26%	8	26.7%	21	80.7%	0.000*
	GCS > 8	196	74%	22	73.3%	5	19.3%	

*P is considered statistically significant if ≤ 0.05.

Table (7) : Linear regression analysis of vital signs and coma in relation to outcome of the studied patients.

Item	Unstandardized Coefficients		Standardized Coefficients	T test	P- value
	Beta	Std. Error	Beta		
Heart rate	.116	.056	.089	2.077	0.039*
Systolic blood pressure	-.208	.074	-.125	-2.824	0.005*
Respiratory rate	-.146	.063	-.103	-2.298	0.022*
GCS	.004	.011	.027	.334	0.739

*P is considered statistically significant if ≤ 0.05.

DISCUSSION

Acute poisoning is a frequent cause of admission to emergency departments (ED) and often requires treatment in the intensive care unit (ICU). This study aimed at determining the value of triage vital signs and conscious level in predicting the outcome of patients with acute poisoning.

In this study, 265 patients (82.6%) improved and were discharged without complications, 30 patients (9.4%) survived but with complications and 26 patients (8%) died during treatment in the ICU. These results differ from those reported by Hassanian et al. (2007) where ICU mortality in poisoned patients was 18.6%. On the other hand, two studies from Germany and Hong Kong reported that ICU mortality in poisoning cases were 0.7 and 3%, respectively (Schwake et al., 2009). Lam et al. (2010) attributed these different results to the extreme variation in reported mortality and criteria for ICU admission of patients across hospitals and countries.

As regards the vital signs, 32% of patients included in this study presented with hyperthermia, while 22.4% presented with tachycardia. Concerning the systolic blood pressure, 10.9% of patients had hypotension, 4% had hypertension, while respiratory rate abnormalities were observed in 22.8% of cases. These results coincide with those of Lamantial et al. (2013) who found that the following vital sign abnormalities were associated with an increased risk of ED death or ICU admission: systolic blood pressure <100 mm Hg, heart rate >100 beats/minute, respiratory rate <8 breaths/minute or >20 breaths/minute, and oxygen saturation <90%. Also, Lee et al. (2008) reported that 24.6% of acutely intoxicated patients presented with abnormal body temperature, 12.8% had abnormal heart rate and hypotension was found in 3% of cases and 6% presented with respiratory distress. Moreover, Subbe et al. (2003) reported that relative changes in respiratory rate were much greater than changes in heart rate or systolic blood pressure, and thus the respiratory rate was likely to be a better mean of discrimination between stable patients and patients at risk. Also, Tintinalli (2010) reported that shock causes hypoxia resulting in accumulation of pyruvate which is converted to lactate causing lactic acidosis.

The present study showed that there was statistically significant difference between the three groups as regards heart rate, systolic blood pressure, respiratory rate and skin discoloration. This was similar to the results observed by Yu et al. (2012) who mentioned that there were significant differences in heart rate, systolic blood pressure, and respiratory rate between survivors and non-survivors. They denoted that the patients with extremely

abnormal vital signs had the greatest risk of in-hospital mortality.

In addition, Baumann and Strout (2007) found that the Emergency Severity Index triage score, which incorporates vital signs into its algorithm, accurately assesses the risk of patients for hospitalization and mortality. It is reported that the heart does not pump enough blood during bradycardia and can be life-threatening with resultant heart failure, sudden cardiac arrest or sudden death, whereas tachycardia vary in severity depending on the rate and duration. Possible complications included blood clots that can cause a stroke or heart attack. Inability of the heart to pump enough blood (heart failure) and sudden death, usually associated with ventricular tachycardia or ventricular fibrillation (Lam et al., 2010).

On the other hand, Edmonds et al. (2002) found that in the ED, considerable interobserver variability exists in the measurement of vital signs, with that by sequential observers differing as little as 10 to 15% for heart rate and as much as 35% for respiratory rate. So, we must be very careful in evaluation of the poisoned cases severity by using vital signs only.

Regarding body temperature, no statistically significant difference was found between the three groups. This is similar to Lamantial et al. (2013) who stated that low temperatures were associated with slightly increased odds of suffering a serious outcome; however, temperature abnormalities in general were not strongly predictive of serious injury or illness.

On the other hand, Yu et al. (2012) reported that there was significant difference between survivors and fatalities as regards body temperature and most of dead cases showed lower body temperature. John (2010) reported that hypothermia lead to the Osborn J wave and other dysrhythmias, decreased heart rate, respiratory rate and blood pressure in addition to non-cardiogenic pulmonary edema. Cellular metabolic processes shut down and the exposed skin becomes blue and puffy. Major organs failure and clinical death occurs (Polderman, 2009).

Hildebrandt et al. (2002) reported that hyperthermia lead to tachycardia and tachypnea as blood pressure drops and the heart attempts to maintain adequate circulation. The decrease in blood pressure can then cause blood vessels to contract resulting in a pale or bluish skin color and seizures in advanced cases with organ failure, unconsciousness and death.

In the current study, 69.4% of patients had GCS more than 8, while 30.6% of patients with GCS less than or equal to 8 and there was statistically significant difference between uncomplicated, complicated

and dead cases concerning GCS. 80.7% of dead cases and 26.7% of complicated cases had GCS less than or equal to 8.

This was similar to results observed by Basar et al. (2011) where they studied acutely organophosphrous (OP)-poisoned patients admitted within 24 hours after exposure and found that the mean GCS values were 4 for patients who died and 13 for discharged patients and there was a statistical correlation between GCS values and mortality. Low values of GCS indicated the potential for development of respiratory insufficiency and bad prognosis.

Moreover, Budhathoki et al. (2009) mentioned that GCS less than 8 had been associated with mortality in children presenting with poisoning more frequently. In addition, Russell and Shobhan (2009) found that a GCS of 8 or less is a useful guide for the requirement of endotracheal intubation where the cause of coma is poisoning. Also, Kennon and Vikhyat (2004) had studied 39 poisoned patients and found that GCS is a reliable tool for the evaluation of mental status of poisoning patients in the emergency department. Additionally, Hamad et al. (2000) illustrated that the patients with drugs overdose and a GCS score of less than 10 needed admission to an ICU.

In the current study, linear regression analysis identified that the heart rate, systolic blood pressure and respiratory rate are significant predictors of outcome while coma scale failed to be a predictor. This result coincides with findings of Hsin et al. (2008) who reported that abnormal vital signs were significant predictors of poisoning-related fatalities. Similarly, Jayashree and Singhi (2011) mentioned that hypotension at admission was the most significant predictor of death in children admitted to the ICU with acute poisoning. Finally, Hu et al. (2010) mentioned that factors such as hypotension and respiratory failure upon presentation can predict overall poisoning related fatality in emergency department poisoned patients.

CONCLUSION

Vital signs are easily measurable and useful parameters for predicting poisoning-related fatality. Such objective information is routinely collected in the emergency department and can help the emergency physicians to quickly detect the severity of poisoning and predict the poor outcomes of those who need intensive care admission.

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القيمة التنبؤية لفحص العلامات الحيوية و مستوى الوعى لتقييم النتائج في مرضى التسمم الحاد

المشتركون فى البحث

د. أسمـــاء عســـــاف د. منـــال عـبد الكـريـم
د. هانى محمد توفيق* د. مروه أحمد حسب النبى**

من قسمى الطب الشرعى والسموم الإكلينيكية – كلية الطب – جامعة عين شمس وجامعة سوهاج**

ومركز علاج التسمم بمستشفيات جامعة عين شمس*

الفحص في أقسام الطوارئ يتطلب من طبيب الطوارئ إتخاذ قرارات سريعة بناء على معرفتة وخبراته. فحص المرضى أمر بالغ الأهمية لسلامة المرضى، ولكن لا توجد معلومات واضحة فيما يتعلق بجدوى العلامات الحيوية الأولية في تحديد الحالات المتدهورة من مرضى التسمم الحاد. في الدراسات الحديثة لعلم السموم الاكلينيكية، العلامات الحيوية تلعب دورا هاما في التشخيص لأنها من المكونات الرئيسية لمتلازمات السمية. وبالرغم من ذلك يعد دورها في تقييم شدة المرض فى حالات التسمم ما يزال غير كافى. التشخيص المبكر وبدء العلاج المناسب السريع في غرفة الطوارئ ضرورى من أجل خفض معدلات الاعتلال والوفيات في مرضى التسمم الحاد. ولذلك تهدف هذة الدراسة الى تحديد العلاقة بين فحص العلامات الحيوية ومستوى الوعى في توقع النتائج للمرضى الذين يعانون من التسمم الحاد. تم عمل هذة الدراسة بأثر رجعي لمرضى حالات التسمم التى تم إدخالها وحدة العناية المركزة فى مركز علاج التسمم بمستشفيات جامعة عين شمس في الفترة من ٢٠١١/٧/١ إلى ٢٠١٢/١٢/٣١ وكان إجمالي عدد المرضى ٣٢١ مريض. وتم تقسيم المرضى الى ثلاث مجموعات (الوفيات، أحياء بدون مضاعفات، وأحياء بمضاعفات). وقد جمعت البيانات من ملفات المرضى وقاعدة البيانات الالكترونية بالمركز والتى تشمل: العمر، الجنس، نوع التسمم ، النبض، وضغط الدم، ودرجة الحرارة ومعدل التنفس ولون الجلد وتقييم درجة وعى المريض وفقا الى مقياس جلاسكو. وقد كشفت نتائج البحث أن ٢٦٥ (٨٢,٦٪) مريض عاشوا مع عدم وجود مضاعفات، ٣٠ مريضا (٩,٤٪) كانوا على قيد الحياة ولكن بمضاعفات وتوفي ٢٦ مريض (٨٪) وأظهرت الدراسة أيضا أن ٣٢ ٪ من المرضى لديهم ارتفاع فى درجة الحرارة و ١,١٪ انخفاض فى درجة الحرارة، وكان ٢٢,٤٪ يعانون من سرعة فى دقات القلب، وأظهر ٦,٢ ٪ بطء فى ضربات القلب ، وكان هناك انخفاض فى ضغط الدم فى ١٠,٩٪ من الحالات، بينما عانى ٤٪ من ارتفاع ضغط الدم، وأظهر ٢٢,٨٪ اضطراب فى معدل التنفس. كما تبين أن ٦٩,٤٪ من المرضى كانت درجة وعيهم اقل من ٨ بمقياس جلاسكو، بينما ٣٠,٦٪ ≥ ٨ . وأظهرت الدراسة فروق ذات دلالة إحصائية بين الثلاث مجموعات فيما يتعلق بمعدل ضربات القلب وضغط الدم ، معدل التنفس، ومقياس جلاسكو. وبناء على ذلك نستنتج أنه من الممكن أن تكون العلامات الحيوية بمثابة وسيلة سهلة لقياس التنبؤ بنتائج حالات التسمم الحاد و تحديد درجة خطورته ومدى ضرورة إدخال المريض العناية المركزة.