PATTERN OF PEDIATRIC ILLICIT SUBSTANCE INTOXICATION AT ALEXANDRIA POISON CENTRE: ICU RISK ASSESSMENT

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ABSTRACT

Background: Acute intoxication from illicit substances in children leads to high morbidity rates in many countries. **Aim of the work:** The aim of the study was to evaluate the pattern of acute intoxication by substances of abuse in children (less than 18 years) admitted to Poison Control Center of Alexandria Main University Hospital, Egypt; analyze sociodemographic data of those patients, describe clinical manifestations and management, and to assess the role of Pediatric Early Warning score (PEWS) score in prediction the need of ICU admission. **Patients and Methods**: A prospective observational study was conducted on children admitted to APC in Main University Hospital with a history of acute intoxication with illicit substances in the period from January 2022 to the end of June 2022. Diagnosis of intoxication depended on history, clinical symptoms and laboratory investigations. Clinical and toxicological data were collected. Pediatric early warning score (PEWS) was calculated. **Results:** The study involved 53 children under 18 years old. Males slightly exceeded females; the mean age was 2.51±3.06 years. 81.1% of the children were in age group 1 - < 6 years. The largest percentage of substance intoxication was caused by cannabis (81.1%), followed by opioids (7.5%), Methanol and ethanol constituted 3.8% each, followed by benzodiazepine and methamphetamine constituted 1.9% each. More than half of the cases (52.8 %) were intoxicated by ingestion of illicit substances. 73.6% of cases had a Glasgow coma scale of less than 15. The PEWS score ranged from 0-7, and 45.3% of the cases had a score of 3. A statistically significant relationship was also found between PEWS score and admission of cases to the ICU with $p < 0.001$ and $X^2 = 12.966$. The ROC curve analysis showed that a PEWS score of 4 could reliably predict the necessity for ICU care with high sensitivity and specificity. **Conclusion:** The PEWS score could serve as a reliable tool for predicting the need for ICU admission among acutely intoxicated pediatric patients with illicit substances. It can aid in the early identification of patients who will require ICU admission, particularly in low-income countries with limited resources.

Keywords: *Illicit Substance, Drug Abuse, Cannabis, Pediatric Early Warning Score, Acute Intoxication.*

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INTRODUCTION

Substance abuse (SA) in children is recognized as a major problem for law enforcement, policymakers, and health authorities. It has life-threatening effects since it causes serious physical, social, psychological, and intellectual developmental consequences in children and increases their vulnerability ***(Aly et al., 2020b)***.

Substance intoxication is defined as "a transient condition following the administration of alcohol or other psychoactive substance, resulting in disturbances in level of consciousness, cognition, perception, affect or behavior, or other psychophysiological functions and responses" according to the International Statistical Classification of Diseases and Related Health Problems, revision 11 (ICD-11) ***(Harrison et al., 2021)***. The most abused drugs vary from one country to another according to social and economic conditions ***(Baptiste-Roberts and Hossain, 2018)***. Except for tobacco and alcohol, Cannabis is considered one of the most often abused narcotics in Egypt, according to data from the Fund for Drug Control and Treatment of Addiction. Increased availability for children

results from widespread cannabis use ***(Aly et al., 2020a, Mohammed et al., 2021)***.

In addition, the World Drug Report (2022) emphasized the significant challenges associated with the tramadol crisis in various nations in Africa and other regions ***(UNODC, 2022)***. In addition, Ethanol is one of the most often abused substances in the world, and its use in young people is a matter of concern due to its harmful consequences on brain development and escalated risk of alcohol use disorders ***(Hon et al., 2018)***.

Regarding methanol, exposure to methanol-based formulations by ingestion, inhalation, or cutaneous route can result in hazardous effects. Most methanol toxicities are linked to the consumption of cologne and perfumes due to contamination by methanol. Herbal water may include some alcohol impurities ***(Nekoukar et al., 2021)***.

Patients may exhibit symptoms like other medical or surgical emergencies, such as vomiting, seizures, or diminished awareness. Cannabis poisoning in young children can cause seizure, dangerous behavioral changes, depression of respiration, encephalopathy and coma. Acute encephalopathy exhibits minimal systemic clinical symptoms, such as hyporeflexia, hypotonia, and dilated pupils. Acute cannabis toxicity in children can range from moderate to life-threatening, requiring ICU admission ***(Sarkar et al., 2023, Varin et al., 2023)***. Pure methanol toxicity can cause gastrointestinal disturbance (e.g., nausea, vomiting, and abdominal pain) and CNS suppression (e.g., disorientation and sleepiness) within 0.5-4 hours of intake. After a latent period of 6-24 hours, decompensated metabolic acidosis can cause hazy vision, photophobia, diplopia, and early or late blindness ***(Nekoukar et al., 2021)***.

Toxicologists who treat patients in the emergency room should have a thorough understanding of how to recognize, evaluate, and treat patients who are intoxicated, so detailed history taking is a must as some relatives may conceal the real cause of intoxication for legal issues. Therefore, the emergency care provider should be able to manage the medicolegal aspects of intoxication, delivering the best possible medical care while simultaneously protecting the legal process ***(Sarkar et al., 2023)***.

Nowadays, literature points to an escalating trend of intoxication with drugs of abuse in children ***(Mohammed et al., 2021, Mahmoud and Sarhan, 2022)***. Most studies discuss the prediction of the outcome of intoxication with drug abuse in adults ***(El Sehly et al., 2025)***.

However, a few studies were conducted in pediatric patients to predict the outcome and need of ICU admission by using a reliable score. The Pediatric Early Warning Systems (PEWS) score is a clinical score used for estimating the severity of the medical condition in children. The score calculation involves the evaluation and ranking of many systems, with a strong emphasis on the cardiovascular, respiratory, and behavioral domains. It helps the clinicians to determine deterioration of the patient's medical condition and the need for the ICU ***(Gillipelli et al., 2023)***. To date, the PEWS score has not been used in evaluating acutely intoxicated patients with substance abuse. Therefore, this study assessed the performance of PEWS as a predictive tool for the need for ICU admission among children acutely intoxicated with substance abuse.

THE AIM OF THE WORK

This study aimed to evaluate the pattern of acute intoxication by substances of abuse in children (less than 18 years) admitted to Poison Control Center of Alexandria Main University Hospital, Egypt, analyze sociodemographic data of those patients, describing clinical manifestations and management and to assess the role of Pediatric Early Warning score (PEWS) score in prediction the need of ICU admission.

PATIENTS AND METHODS

Study hypothesis

The PEWS estimates the severity of intoxication with drugs of abuse and predicts the need for ICU admission.

Study design and setting

This prospective observational study included all patients under 18 years old with acute intoxication from illicit drugs who were admitted to the Poison Control Center of Alexandria Main University Hospital over a six-month period, from January 2022 to the end of June 2022.

Eligibility criteria

The current study included all children with confirmed diagnosis of acute poisoning due to substance abuse who presented to the Poison Control Center of Alexandria Main University Hospital during the study period. We excluded children with mental disorders and those with chronic cardiac, liver, or kidney diseases. Additionally, children with an unconfirmed diagnosis and those who were discharged against medical advice were not included in the study. The recruitment process for patients enrolled in this study was illustrated in **figure (1)**.

The diagnosis of intoxication depended on the history, clinical symptoms and signs, laboratory investigations, and positive urine screening tests using immunoassay. Gas chromatography-mass spectrometry (GC-MS) was used whenever needed.

Data Collection

Clinical data collected from each patient included sociodemographic information (age, sex, education, residence), intoxication data (type of substance, route of exposure, circumstances of poisoning, timing of admission, and whether the child was intoxicated by one substance or more), clinical examination (Glasgow Coma Scale, pupil examination, vital signs, oxygen saturation, and temperature), and management (treatment, endotracheal intubation, mechanical ventilation, CPR, and ICU admission).

The severity of symptoms was evaluated using PEWS, which assesses behaviors along with respiratory and cardiac parameters. A score of 0 is assigned to parameters within the normal range, while 3 is given for the most severe manifestations of each parameter **(Table 1)**. This score ranges from 0 to 13 based on the severity of symptoms ***(Özel et al., 2024)***.

The urine immunoassay (Multi-Drug Rapid Test Panel) was utilized for diagnosing patients with acute substance intoxication. The Multi-Drug Rapid Test Panel is a rapid immunoassay designed for the qualitative detection of multiple drugs and drug metabolites in urine ***(Raouf et al., 2018)***.

Chromatographic analysis using GC-MS was utilized to confirm the diagnosis in cases with unclear histories, ambiguous results from screening tests, and non-specific clinical findings. A Thermo Scientific ISQ QD 7000 GC-MS with single quadrupole mass spectrometry, instant Connect Split/Spitless Injector and maximum temperature: 350°C. The GC (TRACE 1310) was equipped with a phenylmethyl polysiloxane capillary column (Name 5MS column) with 30 m × 0.25 mm ID × 0.25 µm film thickness. The carrier gas was helium at a flow rate of 1 mL/min ***(Chromatography, 2023a , Chromatography, 2023b)***.

Ethical considerations: The present research received ethical approval from the Research Ethical Committee at the Faculty of Medicine, Alexandria University *(IRB NO: 00012098, FWA NO: 00018699, Serial protocol 0106984).* Before the patients participated in the study, their guardians gave informed consent, and the data were kept confidential.

Statistical Analysis:

The collected data were recorded, tabulated, and graphically represented using IBM SPSS software version 23.0. Qualitative data were described using numbers and percentages. Quantitative data were summarized using range (minimum and maximum), mean, standard deviation, and median. Comparisons between groups for categorical variables were assessed using the Chi-square test. Alternatively, the Monte Carlo correction test was applied when more than 20% of the cells had an expected count of less than 5. Student's t-test was performed for normally distributed quantitative variables. A receiver operating characteristic (ROC) curve analysis was utilized, and the area under the ROC curve (AUC) indicates the diagnostic performance of the test. The significance of the results was evaluated at the 5% level ***(Hajian-Tilaki, 2013, Kirkpatrick and Feeney, 2015)***.

RESULTS

The study involved fifty-three children under 18 years old. Males constituted 50.9% of the cases. The patients' ages ranged from 10 months to 17 years, with a mean age of 2.51±3.06 years. The majority of admitted cases (81.1%) were in the age group of less than 6 years. About three-quarters of the cases (73.6%) were from urban areas **(Table 1)**.

Table (2) shows that the largest percentage of substance intoxication was caused by cannabis (81.1%), followed by opioids (7.5%). Only one case was intoxicated by benzodiazepine and methamphetamine in each of them (1.9% for each of them). Ingestion was the most common manner of intoxication (52.8 %) among admitted patients. Most of the cases (94.3%) were due to accidental intoxication. No suicidal attempts occur by illicit substances in the admitted cases. About three-quarters of patients (75.5%) were admitted during the night shift. About 7.5% of the admitted cases were by more than one illicit drug.

Table (3) reveals that the Glasgow coma scale was less than 8 in 5.7 % of the patients. About half of the cases (49.1%) had constricted pupils. Hypotension was observed in 7.5% of the admitted cases, and tachycardia was recorded in 20.8% of them. 9.4% of the cases had tachypnea. 7.6 % of the admitted patients required endotracheal intubation and mechanical ventilation. Only one patient required cardiopulmonary resuscitation.

Most of the admitted children (71.1%) had normal ABGs. Metabolic acidosis and respiratory acidosis were observed in 11.3% and 9.4%, respectively. Hypercapnia was present in 17% of the cases. The serum bicarbonate level was low (less than 22) in more than half of the cases (54.7%). Oxygen saturation was low in 2 cases (3.8%). A multidrug screening test was applied to all cases. GC-MS analysis was used to confirm some cases. **Figures (2), (3),** and **(4)** illustrate examples of cases with acute morphine poisoning confirmed by GC-MS. Meanwhile, **figures (5), (6),** and **(7)** represent examples of cases of acute tetrahydro cannabinoid poisoning confirmed through the same method.

Table (4) shows the PEWS scores for assessing children's intoxication. The score ranges from 0 to 7, with a mean of 2.77±1.56. In this study, 24.5% of cases scored between 0 and 1, while 11.3% had a score of 2. Conversely, 45.3% of cases scored 3, 7.5% scored 4, and 11.3% scored between 5 and 13.

Table (5) illustrates the relation between PEWS Score and place of first admission. Upon admission to the resuscitation room, the PEWS score ranged from 3 to 7, with a mean of 5.0±1.67. When children were first admitted to the ward, the PEWS score ranged from a minimum of 0 to a maximum of 7, with a mean of 2.49±1.32. A statistically significant relationship was found between the place of first admission and the PEWS score in children, with $t=4.272$ and $p<0.001$.

Four patients required admission to the ICU in this study. Two of them were admitted due to respiratory depression from either cannabis or opioid intoxication. The other two patients were admitted for tramadol intoxication, one due to intracranial hemorrhage and the other from serotonin syndrome and this patient died. A statistically significant relationship was found between the PEWS score and the admission of cases to the ICU, with $P<0.001$ and $X^2=12.966$. Seventy-five percent of the cases that entered the ICU had a PEWS score of 5-13. Of these cases, 96.2% recovered without complications, while one case experienced complications (1.9%), and that patient subsequently died **(Table 6**).

The performance PEWS was used to assess the patient's need for ICU admission using ROC analysis, as shown in **table (7)** and **figure (8)**. The cutoff value for the PEWS score was 4, indicating that the patient urgently required admission to the ICU (AUC 0.951, sensitivity 75.0% confidence interval (19.4 – 99.4), specificity 95.83% confidence interval (85.7 – 99.5).

Table (1): Demographic characteristics and the circumstance of intoxication by substances of abuse among patients admitted to APC (n = 53)

Demographic data	No. (n = 53)	%
Sex		
Male	27	50.9
Female	26	49.1
Age (years)		
<1	4	7.5
1 - <6	43	81.1
6 - <12	4	7.5
12 - <18	2	3.8
Mean ± SD.	**2.51 ± 3.06**	
Median (Min. – Max.)	**1.50 (0.83 17)**	
Education		
Illiterate	47	88.7
School	6	11.3
Residence		
Rural	14	26.4
Urban	39	73.6
Type of substance		
Cannabis	43	81.1
Opioids	4	7.5
Methanol	2	3.8
Ethanol	2	3.8
Methamphetamine	1	1.9
Benzodiazepines	1	1.9
Route of exposure		
Inhalation	13	24.6
Ingestion	28	52.8
Injection	12	22.6
Circumstance of poisoning		
Accidental	50	94.3
Homicidal	2	3.8
Overdose	1	1.9
Time of admission		
Morning	4	7.5
Evening	9	17
Night	40	75.5

Table (2): Pediatric early warning score (PEWS) criteria.

	0	1	2	3
Behavior	Playing/appropriate	Sleeping	Irritable	Lethargic/confused **OR** *Reduced response to pain
Cardiovascular	Pink **OR** capillary refill 1-2 seconds	Pale or dusky **OR** capillary refill 3 seconds	*Grey or cyanotic **OR** *Capillary refill 4 seconds **OR** *Tachycardia of 20 above normal rate.	*Grey or cyanotic **AND** mottled **OR** *Capillary refill 5 seconds or above **OR** *Tachycardia of 30 above normal rate **OR** *Bradycardia
Respiratory	Within normal parameters, no retractions	*>10 above normal parameters **OR** *Using accessory muscles of respiration **OR** *30+%FiO2 or 3+ liters/minute	*>20 above normal parameters **OR** *Retractions **OR** *40+%FiO2 or 6+liters/min	*≥5 below normal parameters with retractions or grunting **OR** *50+%FiO2 or 8 +liters/min

***Score with starting by the most severe parameters first.*
**Score 2 extra for every 15-minute nebulizers (include continuous nebs) or persistent post-op vomiting.*
**Use "liters/minute" to score regular nasal cannula.*
**Use "FiO2" to score a high flow nasal cannula.*

Table (3): Clinical examination and management for acutely intoxicated patients by substance of abuse (n =53)

Clinical examination	children (n = 53)	
	No.	%
Level of consciousness by GCS		
<8	3	5.7
9 – 14	36	67.9
15	14	26.4
Median (Min. – Max.)	**11(7-15)**	
Mean ± SD.	**11.91 ± 2.33**	
Size of pupil		
Normal (2-4mm)	14	26.4
Constricted (<2mm)	26	49.1
Dilated (>4mm)	13	24.5
Systolic blood pressure (mmHg)		
Hypotension (<90/60)	4	7.5%
Normal	41	77.4%
Hypertension (>140/90)	8	15%
Min. – Max.	**70.0 – 130.0**	
Mean ± SD.	**93.77±16.20**	
Pulse (beats/min)		
Bradycardia (<60)	2	3.8%
Normal (60 – 100)	40	75.5%
Tachycardia (>100)	11	20.8%
Min. – Max.	**70.00–190.0**	
Mean ± SD.	**127.57±26.26**	
Respiratory Rate		
Bradypnea	2	3.8%
Normal	46	86.8%
Tachypnea	5	9.4%
O_2 saturation		
Less 92	2	3.8%
>92	51	96.2%
Temperature		
Normal	48	90.6%
Fever (> 37.5)	5	9.4%
Min. – Max.	**36.0- 37.9**	
Mean ± SD.	**37.03 ±0.30**	
ETT and mechanical ventilation		
No	49	92.4
Yes	4	7.6
Decontaminations		
activated charcoal	50	94.3
CPR		
No	52	98.1
Yes	1	1.9

Table (4): Distribution of patients admitted to APC with acute intoxication by substances of abuse (n=53) according to PEWS scores.

PEWS scores	children (n = 53)	
	No.	%
0-1	13	24.5
2	6	11.3
3	24	45.3
4	4	7.5
5-13	6	11.3
Median (Min. – Max.)	**3(0-7)**	
Mean ± SD.	**2.77 ± 1.56**	

Table (5): Distribution of patients admitted to APC with acute intoxication by substances of abuse (n=53) according to PEWS Scores and the place of first admission.

PEWS score	Resuscitation	Ward	t	P
	(n = 6)	(n = 47)		
Min. – Max	3.0 – 7.0	0.0 – 7.0	4.272*	<0.001*
Mean ± SD	5.0 ± 1.67	2.49 ± 1.32		
Median	5.50	1.32		

t: Student t-test
**: Statistically significant at p ≤ 0.05*

Table (6): Distribution of patients admitted to APC with acute intoxication by substances of abuse (n=53) according to PEWS score and the ICU.

(PEWS) (n = 53)	ICU				χ^2	MCp
	No (n = 49)		Yes (n = 4)			
	No.	%	No.	%		
0 – 1	13	26.5%	0	0.0%		
2	6	12.2%	0	0.0%		
3	24	49.0%	0	0.0%	12.966*	0.001*
4	3	6.1%	1	25.0%		
5 – 13	3	6.1%	3	75.0%		

*χ^2: **Chi square test** **MC: Monte Carlo***
**: Statistically significant at p ≤ 0.05*

Table (7): Sensitivity, specificity, positive and negative predicted value and accuracy for PEWS with ICU admission.

	AUC	p	95% C.I	Cut off	Sensitivity (95%C.I)	Specificity (95%C.I)	PPV	NPV	Accuracy
PEWS Score	0.951	0.003*	0.890 – 1.011	>4	75.0 (19.4 – 99.4)	95.83 (85.7 – 99.5)	60.0	97.9	94.23

AUC: Area Under a Curve *p value: Probability value* *CI: Confidence Intervals*
NPV: Negative predictive value *PPV: Positive predictive value*
**: Statistically significant at p ≤ 0.05*

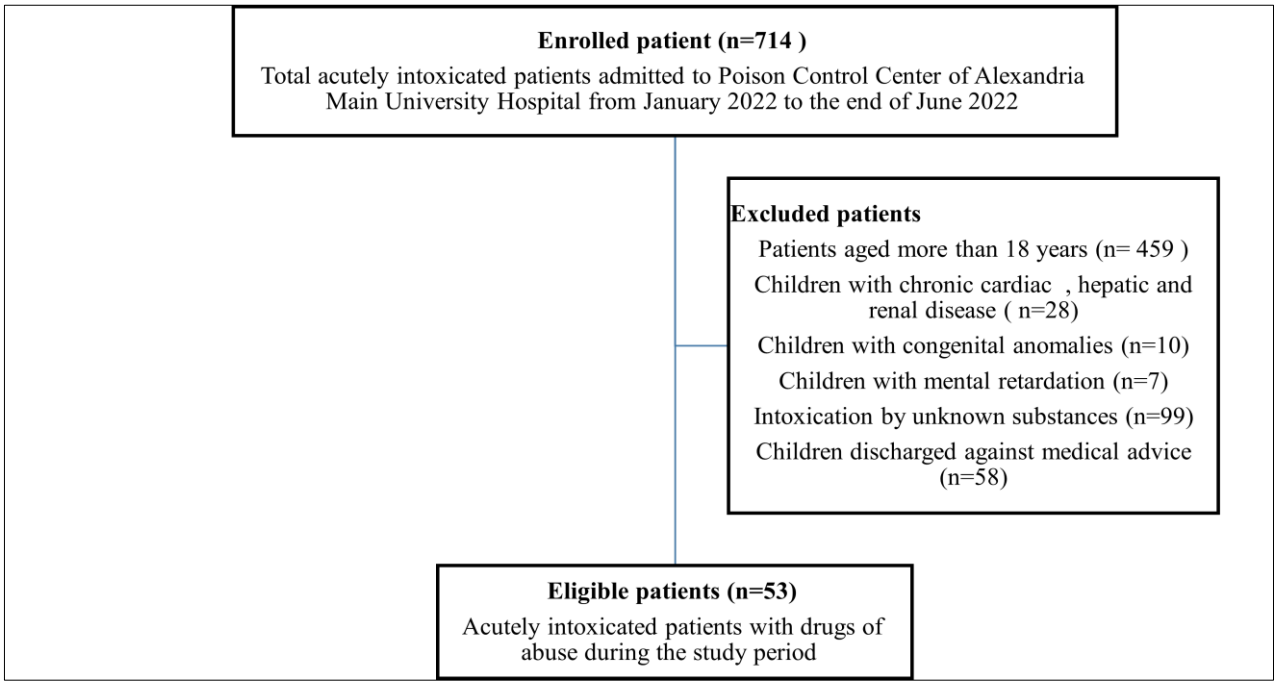

Figure (1): Flow chart illustrates the recruitment process for patients enrolled in the present study.

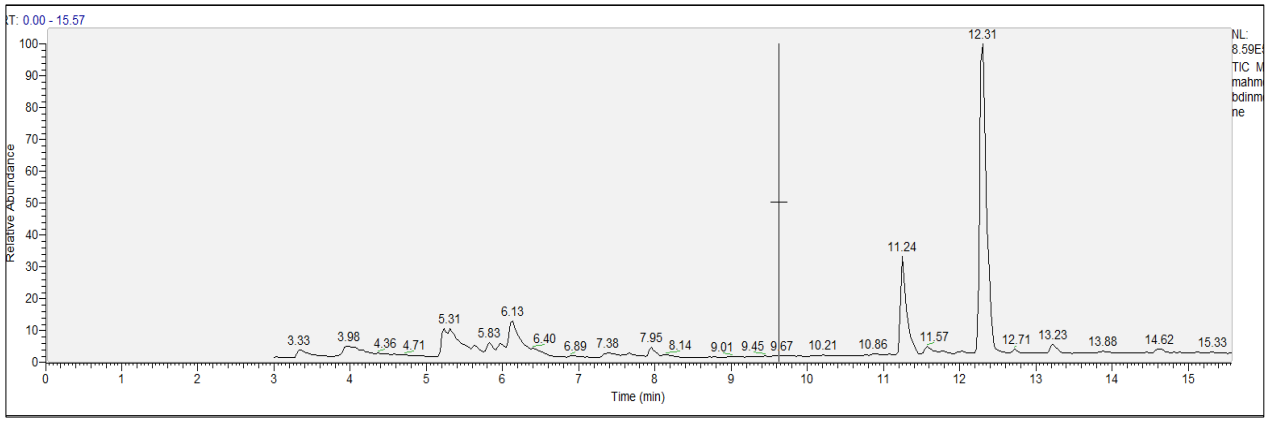

Figure (2): Gas chromatogram of morphine metabolite in urine (N-methyl-3, 6-di (trimeythylsiloxyl)-4, 5epoxymorphin-1-ene), Retention time =12.31 minutes, R match 68%.

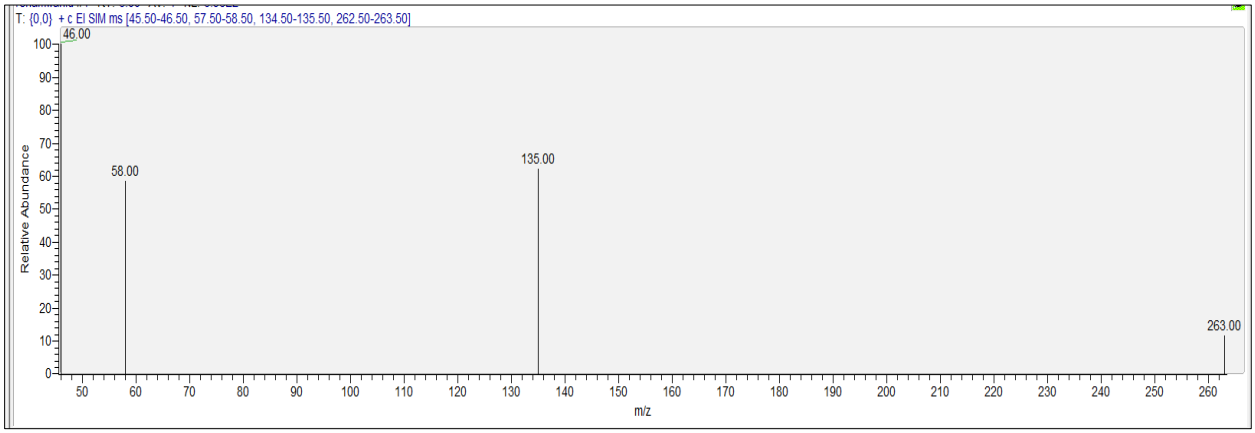

Figure (3): Mass spectrum of morphine metabolite detected in urine.

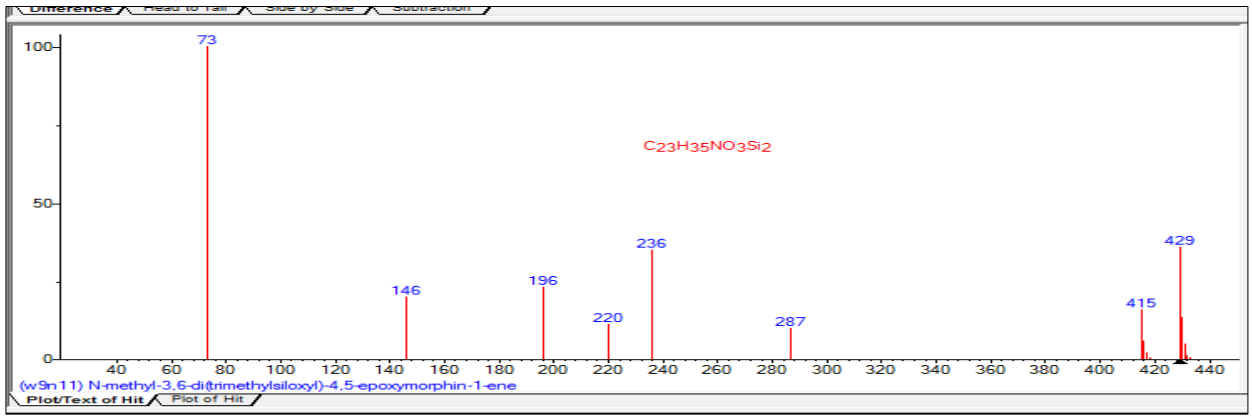

Figure (4): Structure and mass spectrum of morphine metabolite.

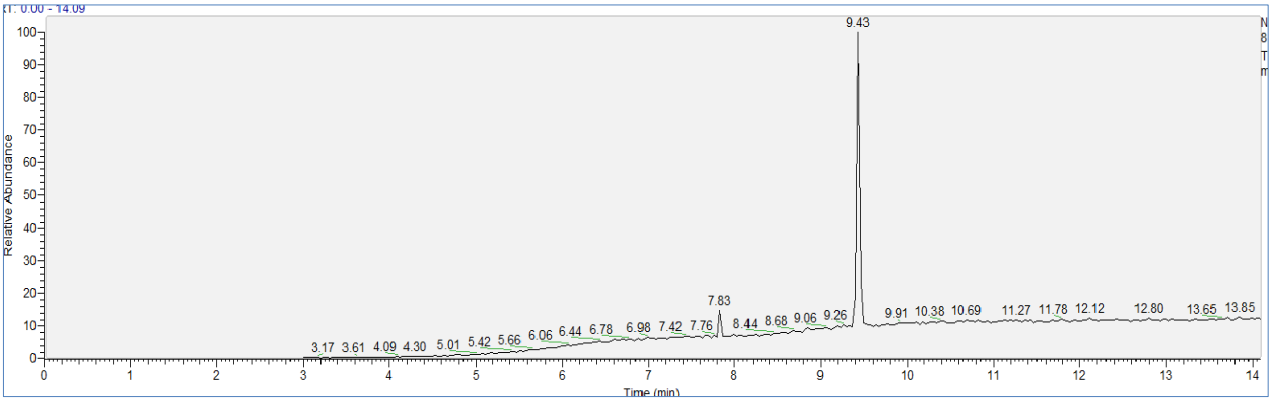

Figure (5): Gas Chromatogram of THC metabolite (TMS-11COOHtetrahydrocannabinol) in urine. Retention time =9.43 minutes. R match 87%.

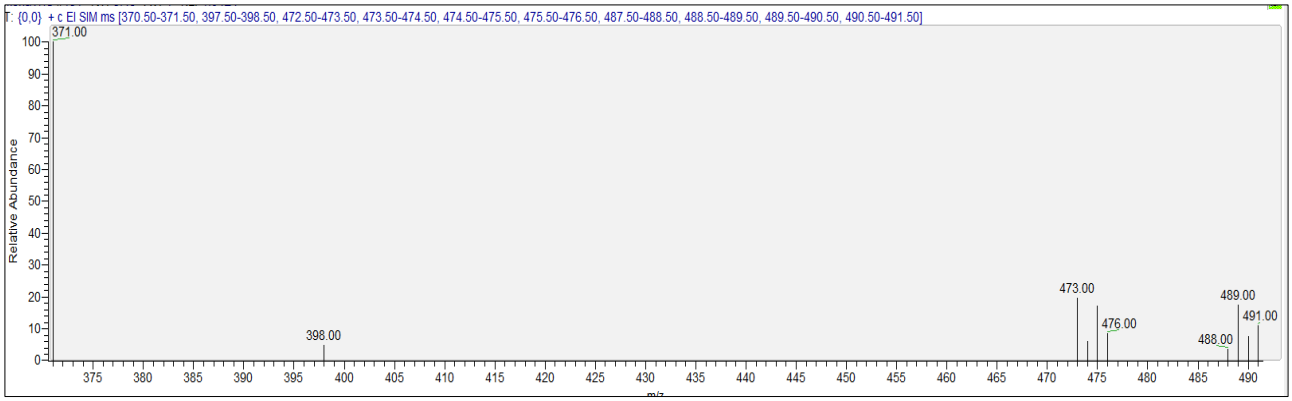

Figure (6): Mass spectrum of THC metabolite detected in urine (TMS-11COOHtetrahydrocannabinol).

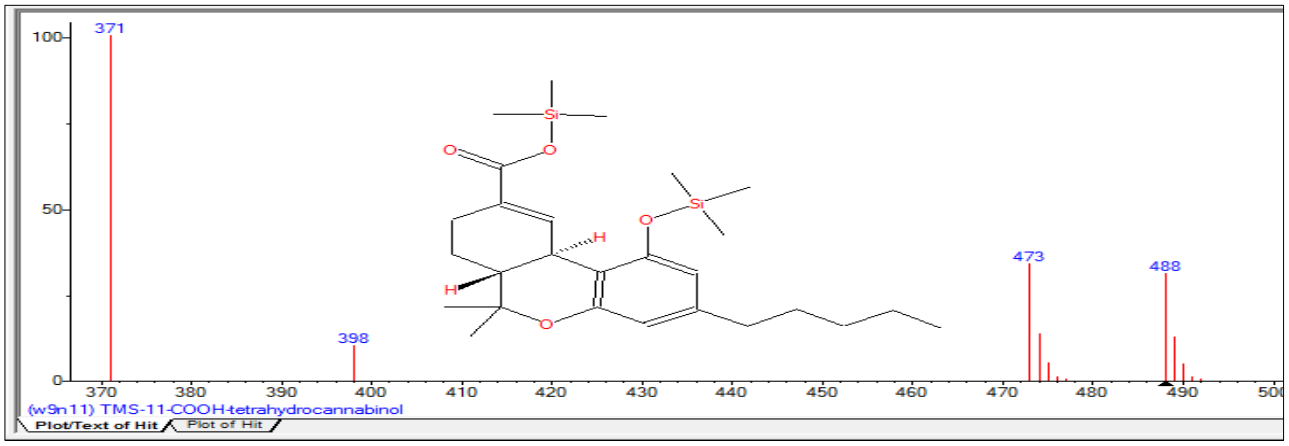

Figure (7): Structure and mass spectrum of TMS-11COOHtetrahydrocannabinol.

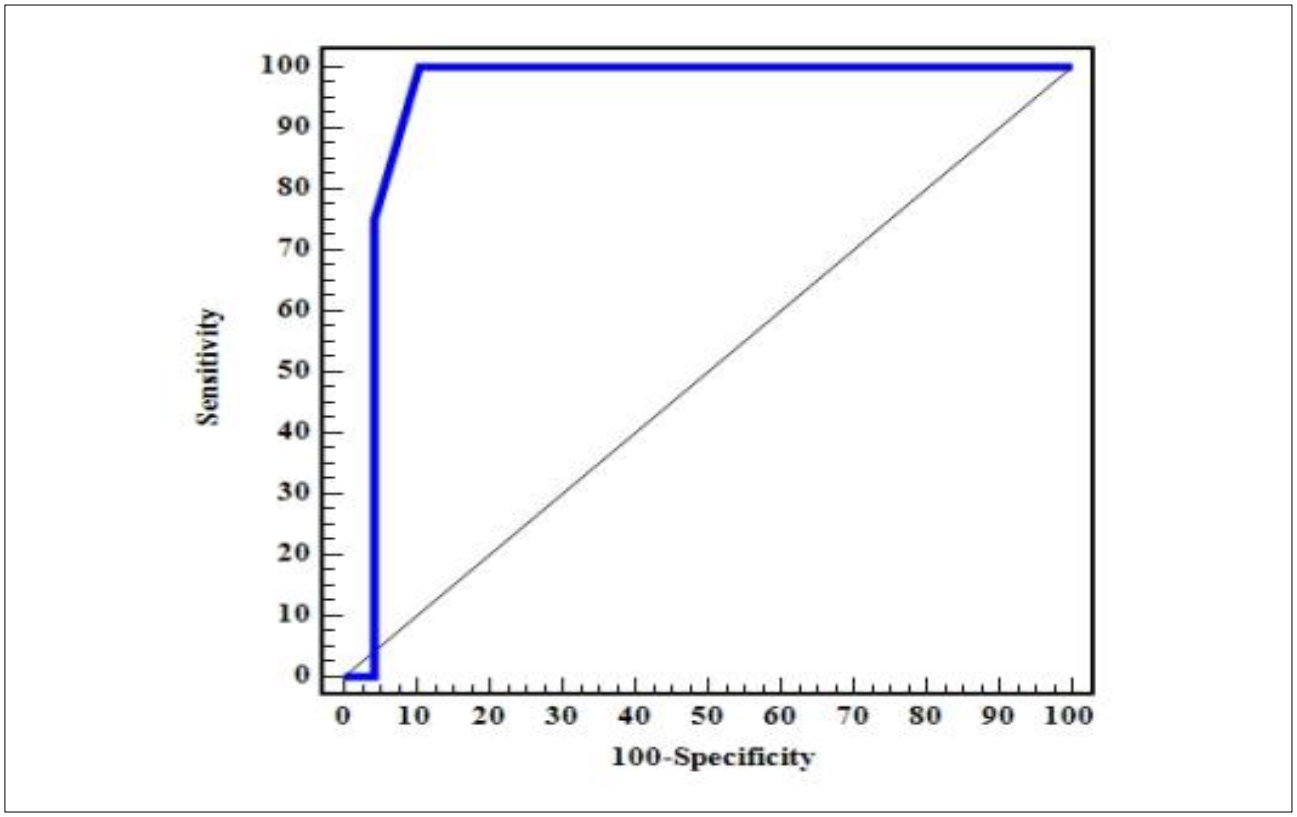

Figure (8): ROC curve for PEWS Score to predict ICU admission (n=4) from non-ICU admission (n=49).

DISCUSSION

Acute intoxication in children is one of the urgent situations confronting toxicologists. This intoxication can be particularly challenging, especially if the causative agent is unknown to both the physician and the caregivers ***(Tiwari et al., 2021)***. Drug abuse in children is still a growing problem in many countries, and it can lead to serious health issues, including physical, mental, or psychological impacts ***(Das et al., 2016)***. Therefore, the current study took an in-depth look at acute intoxication from substance abuse in children admitted to APC.

Most children in this study were aged 1 to 6 years. In the early years of their lives, they take their first steps and seek to explore their environment. They are particularly vulnerable to accidental exposure, especially due to improper storage of substances and a lack of family attention. A study conducted in Egypt found that 89.9% of children with acute cannabis intoxication were under 6 years old (Mohammed et al., 2021). 70% of cannabis-intoxicated patients were children under 2 years old in a study conducted at a pediatric hospital in Rouen, France ***(Mory et al., 2019)***.

Also, the mean age of children in the present study was 2.51±3.06, which was higher than the mean age of previous studies. ***Onders et al. (2016)***, assessed marijuana exposure among children younger than six years in the United States, with a mean age of 1.81 years. ***Mohammed et al. (2021)***, evaluated the prevalence of acute cannabis intoxication in preschool children in Egypt, reporting a mean age of 17.38 months ±8.75.

In the present study, about 3.8% of patients were aged 12 to 18 years. Additionally, ***Mahmoud and Sarhan (2022)*** reported that, 91.6% of cases involving intoxication from abused drugs were in the age group of 10 to 19 years.

Adolescence is a challenging time for everyone. During this stage, numerous biological, psychological, cognitive, and physiological changes occur. Young people strive for independence, work to define themselves, explore new experiences, imitate their peers, and may cope with problems through drug abuse ***(Rabie et al., 2020)***.

Males predominated in the current study. ***Onders et al. (2016)*** also noted the male preponderance among patients intoxicated by cannabis (50.7%). However, females outnumbered males in another study conducted by ***Pélissier et al. (2014)***.

A majority of the cases (73.6%) were from urban regions in this study. This aligns with previous research ***(El Masry and Tawfik, 2013; Mohammed et al., 2021)***. These illicit drugs are more accessible in urban communities than in rural ones, increasing the likelihood that children accidentally ingest these substances due to inadequate supervision from negligent parents.

On the other hand, ***Lambert et al. (2008)*** and ***Rhew et al. (2011)*** found that drug intoxication was more common in rural areas.

The majority of cases (81.1%) involved intoxication from cannabis. Cannabis accounted for 24% of intoxication cases among pre-school children in a study conducted by ***Mohamed et al. (2021a)***. Cannabis is the most commonly used illicit substance worldwide. In the United States and Canada, there was an increase in pediatric cannabis-related poisonings, especially after the legalization of cannabis ***(Varin et al., 2023)***. Cannabinoids were also the most widely used illicit substance among Egyptians in a study conducted by ***Hamdi et al.(2016)***.

Oral ingestion of illicit substances (52.8%) accounted for the highest rate of intoxication in this study, which is consistent with findings from other research ***(Pélissier et al., 2014; Blohm et al., 2019; Boadu et al., 2020)***. Most of the cases (94.3%) were accidentally intoxicated in this study. Most of the previous studies are consistent with the current findings ***(Boadu et al., 2020; Mohammed et al., 2021)***. Drug abuse by parents increases negligence toward their children, raising the risk of poisoning.

Pélissier et al. (2014) explained that, children can accidentally swallow small pieces of cannabis resin, as it resembles chocolate, which attracts children ***(Pélissier et al., 2014)***. ***Blohm et al. (2019)*** clarified that, food products mixed with marijuana, such as candy, cakes, and soft drinks, are available to children. In the present study, two cases involved ingestion of these illicit substances

through homicidal exposure. A literature review by ***Hines et al. (2018)*** described a case of cannabis injection committed by a caregiver.

Regarding the assessment of consciousness level by GCS, about three-quarters of the cases (73.6%) showed a GCS of less than 15. A similar result (78.55%) was documented by ***Kosiorek et al. (2024)***. In the study conducted by ***Mohammed et al. (2021b)***, drowsiness was present in one-third of the patients (31.4%) intoxicated by cannabis. Ataxia and lethargy were the most common symptoms in other studies ***(Wang et al., 2016; Richards et al., 2017)***.

More than three-quarters of the cases (75.5%) exhibited normal sinus rhythm. Sinus tachycardia was observed in 20% of the cases, and approximately 54.5% of these were diagnosed with cannabis intoxication. ***Pélissier et al. (2014)*** found that, about a quarter of the cases with cannabis intoxication experienced sinus tachycardia. Sinus tachycardia in cannabis intoxication results from anti-cholinergic activity ***(Franz and Frishman, 2016)***.

Most cases presented with normal blood pressure (77.4%). Additionally, ***Richards et al. (2017)*** reported that, 90% of patients had normal blood pressure.

On the other hand, ***Kosiorek et al. (2024)***, recorded hypertension and hypotension in 44.22% and 67.66% of cases, respectively. Temperature was normal in 90% of the cases, and no hypothermia was reported.

However, Kosiorek et al. (2024), observed hypothermia in a quarter of the cases due to alcohol consumption.

The Pediatric Early Warning Score (PEWS) promotes early detection and prevention of deterioration in hospitalized pediatric patients. It emphasizes the status of the cardiopulmonary system, the need for oxygen therapy, and the patients' neurological condition ***(Tosca et al., 2021)***.

The PEWS score was calculated to assess children with drug abuse intoxication. About half of the cases (45.3%) had a score of 3. Additionally, there was a significant relationship between the PEWS score and the place of first admission, with patients who had higher PEWS scores being admitted to the resuscitation room. Furthermore, ICU admission was associated with higher PEWS scores. The cutoff value for predicting ICU admission was 4 for the PEWS score, with an accuracy of 94.23%, a sensitivity of 75.0%, and a specificity of 95.83%.

Several studies demonstrated the effectiveness of the PEWS score in predicting the need for ICU admission and early mortality in emergency situations. However, its applicability in toxicology remains limited. In a study conducted by ***Sharif et al. (2022)*** on pediatric cases involving caustic ingestion, PEWS significantly predicted poor outcomes and the necessity for ICU admission ($p<0.001$).

In another study on cases of corrosive ingestion, the PEWS score was more accurate than endoscopy-based evaluations for the early identification of poor outcome cases ***(Tosca et al., 2021)***.

Additionally, PEWS has been associated with the length of hospital stays ***(Shafi et al. 2020)***. Furthermore, a multicenter study indicates that a PEWS score can predict cardiopulmonary arrest and identify poor outcomes ***(Chong et al., 2022)***.

Regarding the Sequential Organ Failure Assessment score (SOFA), it is used in the ICU to evaluate a patient's organ failure. ***Essam Eldin et al. (2021)*** previously used it to determine the severity in ICU patients intoxicated due to substance abuse. In addition, ***Abd Elghany et al. (2018)*** utilized it as a predictor of outcomes in patients poisoned by aluminum phosphide.

Noteworthy, the Pediatric Risk of Mortality Score (PRISM) is widely used as an effective tool for discriminating among pediatric patients in the ICU and for accurately evaluating mortality risk ***(Anjali and Unnikrishnan, 2023)***.

This score depends on calculating clinical and laboratory parameters, so it has some methodological limitations due to the large amount of data needed to calculate PRISM ***(Taori et al., 2010)***. The application of PRISM in clinical toxicology practice remains limited.

GC-MS analysis was highly important in the current study for confirming some truly positive results and excluding false positive

results from urine immunoassay. GC-MS is the most reliable and accurate method for identifying drug abuse. Proper identification by GC-MS occurs through two steps: retention time and the fragmentation mass spectrum of the compound ***(Bloom et al., 2023)***.

The primary goals of care, beyond symptomatic relief, were airway protection, regulation of breathing, and maintenance of circulation. This aligns with the study by ***Vale and Braberry (2016)***, which reported that treating serious emergency conditions, including airway compromises, breathing difficulties, hemodynamic instability, and significant dysrhythmias, constitutes the initial care.

The current study highlights the PEWS score as a straightforward and dependable tool for predicting the necessity of ICU admission after toxic exposure to substance abuse in pediatrics. Early identification of patients who may need ICU admission could enhance their prognosis. It is worth mentioning that PEWS has varying degrees of specificity and sensitivity. There is inconsistency in the age-defined standard ranges for physiological parameters. It may be influenced by the healthcare provider's assessment, introducing subjectivity ***(Lambert et al., 2008; Bonafide et al., 2014)***.

Strengths and Limitations of the study: The current study illuminates the characteristics of acute poisoning from illicit drugs in children, which could aid healthcare providers involved in managing these cases.

Additionally, the data presented could inform the implementation of future preventive strategies within the Egyptian community. Most importantly, this study highlights, for the first time, the prognostic value of PEWS in managing these cases.

The primary limitation of this study is that it is conducted at a single center and involves a relatively small number of patients, primarily due to the rarity of acute intoxication with illicit substances among pediatric patients. Consequently, future research is needed across multiple healthcare institutions with a larger sample size to allow for more robust statistical validation of the current findings.

CONCLUSION

Children under 6 years old are at risk of intoxication from illicit substances. Cannabis is the most commonly ingested illicit substance. The PEWS score is a simple and effective tool for assessing the severity of acute drug abuse intoxication. It has shown promising results in evaluating physiological parameters in children and predicting the need for ICU admission.

RECOMMENDATIONS

In light of the current study, we recommend the use of the PEWS score as a reliable prognostic tool that effectively predicts ICU admission among children intoxicated with substance abuse. The necessity for multi-center validation of the PEWS score in pediatrics toxicology. Additionally, this study highlighted that most of the enrolled children were accidentally intoxicated with illicit drugs; therefore, increasing public awareness about the dangers of substance abuse, especially cannabis, could help reduce the incidence of such cases. Public education focuses on raising public awareness about the risks associated with substance abuse through comprehensive awareness campaigns and offering specialized training for all members of society.

Acknowledgments:

The authors express their deep gratitude to the directors, medical staff, and nursing staff of APC for their cooperation and support.

Author contributions:

All authors contributed equally to the study, and all were involved in the revision of the manuscript.

Conflict of interest:

The authors declare that they have no conflicts of interest to disclose.

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