

# Poisoning-related emergency department visits: the experience of a Saudi high-volume toxicology center

Mohammad Ali Alghafees,<sup>a</sup> Abdullah Abdulmomen,<sup>bc</sup> Mahmoud Eid,<sup>bc</sup> Ghadah Ibrahim Alhussin,<sup>a</sup> Mohammed Qasem Alosaimi,<sup>a</sup> Ghadah Saad Alduhaimi,<sup>a</sup> Mohammed Talal Albogami,<sup>a</sup> Mohammed Alhelail<sup>bc</sup>

From the <sup>a</sup>College of Medicine, King Saud bin Abdulaziz University for Health Sciences, <sup>b</sup>Department of Emergency Medicine, King Abdulaziz Medical City, and <sup>c</sup>Department of Medicine, King Abdullah International Medical Research Center, Riyadh, Saudi Arabia

**Correspondence:** Mohammad Ali Alghafees · College of Medicine, King Saud bin Abdulaziz University of Health Sciences, Prince Mutib Ibn Abdullah Ibn Abdulaziz Rd, Ar Rimayah, Riyadh 14611, Saudi Arabia · Alghafees687@gmail.com · ORCID: <https://orcid.org/0000-0003-1136-9578>

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**BACKGROUND:** Acute poisoning is a major contributing factor to mortality and morbidity. There is a lack of research on the epidemiology of acute poisoning risk factors in Saudi Arabia.

**OBJECTIVES:** Descriptive overview of poisoning cases at a tertiary care center.

**DESIGN:** Descriptive, medical record review.

**SETTINGS:** Tertiary care center in Riyadh.

**PATIENTS AND METHODS:** From the electronic medical record system, we collected demographic information, medical history, and the poisoning history on all emergency department visits diagnosed as acute poisoning from January 2016 to January 2021. Patients were classed as children (<18 years old) or adults, and further classified by body mass index.

**MAIN OUTCOME MEASURE:** Intensive care unit (ICU) admission, organ transplantation, and mortality were classified as poor outcomes.

**SAMPLE SIZE:** 492 adults and 1013 children (<18 years old) were identified.

**RESULTS:** The most frequent agent in poisoning for both groups was acetaminophen (n=52, 10.57% and n=100, 9.87%, respectively). The ICU admission rate was 6.7% and 4.8%, and the mortality rate 0.8% and 0.3%, respectively. The accidental poisoning rate was 57.7% among adults (n=284) and 67.6% among children (n=658). The suicide intention rate was 11.2% (n=55) and 7.4% (n=75) among adults and children, respectively. The management for both populations was nonspecific, involving observation, supportive measures, and symptomatic treatment.

**CONCLUSION:** Although the ICU admission rates were consistent with reported data, the mortality rate was marginally lower. The pediatric predominance in the population implies a lack of caregiver education in the region regarding the safe storage of drugs and household products, as well as the use of child-resistant packaging. The high rate of accidental poisoning in both age groups should prompt further investment to promote public health education on the rational use and safe storage of toxic agents and self-protection. The high suicide intention rate needs to be investigated to develop multidisciplinary risk prevention strategies.

**LIMITATIONS:** Single center, retrospective, small population size.

**CONFLICT OF INTEREST:** None.

Acute poisoning is defined as the development of adverse effects due to acute exposure to a toxic substance, including chemicals, medication, biological agents, environmental and occupational toxins, or secondary to drug abuse.<sup>1</sup> Acute poisoning is a major contributing factor to mortality and morbidity worldwide, with the incidence of mortality varying by the cultural characteristics of different societies.<sup>2,3</sup> Although easily preventable, poisoning represents a significant public health issue.<sup>1</sup>

The negative impact of poisoning on a societies' economic and health-related welfare is vast. Therefore, identifying risk factors is crucial to reduce the incidence of poisoning and ensure the necessary measures are implemented to enhance patient outcomes, including prevention programs.<sup>2</sup> A recent Spanish study suggested that poisoning in patients aged over 65 years required enhanced treatment interventions.<sup>4</sup> However, children under the age of 6 years account for most poisoning cases in the emergency department (ED).<sup>5</sup> Gender has also been substantiated as a risk factor, with males primarily presenting in drug abuse-related poisoning cases while females account for a higher proportion of suicidal poisoning.<sup>6</sup> Investigators have proposed that changes in behavior and lifestyle are a prominent risk factor for acute poisoning. The increase in acute poisoning cases might be attributed to advanced technology and societal development that has increased accessibility to most drugs and chemical substances.<sup>7,8</sup> There is a lack of research on the epidemiology of acute poisoning risk factors in Saudi Arabia. Hence, this study aimed to assess the trends and the clinical outcomes of poisoning cases in King Abdulaziz Medical City (KAMC), a tertiary care facility in Riyadh.

## PATIENTS AND METHODS

This study is a retrospective analysis of admissions to the ED at KAMC. The study targeted all patients presenting with an acute poisoning diagnosis from January 2016 to January 2021. Patients who received acute management at a different hospital and were subsequently admitted to KAMC or were just followed-up at the hospital, were excluded. The study included all patients recorded as but not limited to acute poisoning, overdose, acetaminophen overdose, opioid overdose, amphetamine overdose, organophosphate overdose, accidental ingestion, prescribed drug toxicity, suicide attempt, child abuse, or drug abuse. History was obtained by reviewing triage notes, emergency department notes, intensive care unit (ICU) notes, and inpatient ward notes of patients involved. Demographic information, medical history, poisoning agents, length

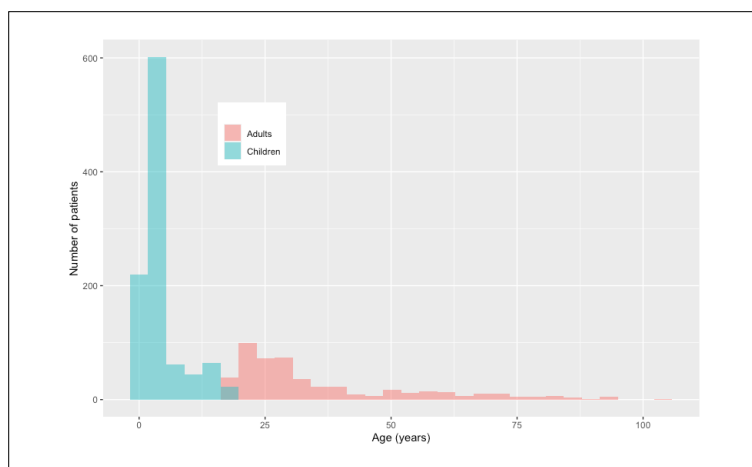
of stay, discharge type, presenting complaints, type of intervention provided, and outcome were retrieved by searching for the records of patients who were registered under one or more of the aforementioned terms in the BESTCare system (ezCareTech, South Korea), electronic medical record system that contains medical history from birth. The system was launched in January 2016 at KAMC.<sup>9</sup> The body mass index (BMI) for adults was categorized in six groups: <18.5 kg/m<sup>2</sup> as underweight, 18.5-24.9 kg/m<sup>2</sup> as normal, 25.0-29.9 kg/m<sup>2</sup> as overweight, 30-34.9 kg/m<sup>2</sup> as class I obesity, 35-39.9 kg/m<sup>2</sup> as class II obesity, and ≥40 kg/m<sup>2</sup> as class III obesity, based on the World Health Organization general population classification while the BMI for children was categorized in four groups: Less than the 5th percentile as underweight, 5th percentile to less than the 85th percentile as normal weight, 85th to less than the 95th percentile as overweight, and 95th percentile or greater as obese according to the Centers for Disease Control and Prevention's childhood weight status classification.<sup>10,11</sup> Intensive care unit (ICU) admission, organ transplantation, and mortality were classified as poor outcomes. Full recovery without any permanent organ damage, and without a need for ICU admission, or organ transplantation, or mortality was classified as an uneventful outcome. Ethical approval with the number RC20/676/R was obtained from the Institutional Review Board of King Abdullah International Medical Research Center. Patient confidentiality was ensured, and the patient data collected and used by only the research team. Due to the retrospective nature of the study and the use of anonymized patient data, the requirement for informed consent was waived.

The data were entered in Microsoft Excel 2019 (Microsoft Corporation, WA, USA) and were analyzed with IBM SPSS version 23.0 (IBM Corporation, NY, USA). Frequency and percentage are used to display categorical variables and a minimum, maximum, mean and standard deviation or median (interquartile range) for continuous variables.

## RESULTS

The study included 492 adult patients (≥18 years of age) (32.7%) and 1013 children (67.3%). The median ages were 28 years for the adults and 2.8 years for the children (**Figure 1**). The majority (n=272, 55.3%) of the adults and children were male (n=531, 52.4%). Most adults and children were nonsmokers (n=439, 89.2%; n=954, 94.2%, respectively). Most adults and children were underweight or of normal weight (**Table 1**).

The majority of adults and children had no comorbidities (**Table 2**). The most frequent comorbidities in adults



**Figure 1.** Age distribution of the study sample (n=1505).

**Table 1.** Body weight profile of the study population (n=1505).

	Adults (n=492)	Children (n=1013)
Underweight	260 (52.8)	629 (62.1)
Normal weight	114 (23.2)	189 (18.7)
Overweight	63 (12.8)	117 (11.5)
Obesity class 1	30 (6.1)	
Obesity class 2	20 (4.1)	78 (7.7) <sup>a</sup>
Obesity class 3	5 (1.0)	

Data are number (%). Underweight: <18.5 kg/m<sup>2</sup>, Normal weight: 18.5-24.9 kg/m<sup>2</sup>, Overweight: 25.0-29.9 kg/m<sup>2</sup>, Obesity class 1: 30-34.9 kg/m<sup>2</sup>, Obesity class 2: 35-39.9 kg/m<sup>2</sup>, Obesity class 3: ≥40 kg/m<sup>2</sup>. <sup>a</sup>Children not classified by obesity class.

and children were neuropsychiatric disorders, cardiovascular diseases, diabetes mellitus, and bronchial asthma. Both adults and children usually consumed only one agent (**Table 3**). Only 81 adults (16.46%) ingested multiple drugs. For both adults (**Figure 2**) and children (**Figure 3**), the most frequently consumed single agent was acetaminophen alone, or in combination with another agent for adults. Other common agents were anticonvulsants, carbon monoxide, non-steroidal anti-inflammatory drugs, anticoagulants, antipsychotics, pesticides, and amphetamines. Cannabis and ethanol were occasionally used in combination with other agents.

Premature discharges were uncommon (<3%). More than 90% of adults and children had uneventful outcomes. In adults, 33 (6.7%) were admitted to the ICU, and 4 (0.8%) died. Forty-nine children (4.8%) were admitted to ICU, 3 (0.3%) died, and 1 (0.1%) had an organ transplantation. The median length of stay was 1 day in

**Table 2.** Medical history of the study population.

Medical history	Adults (n=496)	Children (n=1013)
No comorbidities	360 (73.2)	774 (76.4)
Neuropsychiatric disorder	51 (10.4)	76 (7.5)
Cardiovascular disease	33 (6.7)	54 (5.3)
Diabetes mellitus	27 (5.5)	43 (4.2)
Bronchial asthma	20 (4.1)	36 (3.6)
Metabolic disorder	13 (2.6)	23 (2.3)
Attention deficit hyperactivity disorder	7 (1.4)	13 (1.3)
Cerebrovascular disease	6 (1.2)	6 (0.6)
Renal disease	6 (1.2)	17 (1.7)
Autism spectrum disorder	5 (1.0)	7 (0.7)
Hematologic disease	5 (1.0)	5 (0.5)
Endocrine disorder	4 (0.8)	11 (1.1)
Congenital heart disease	3 (0.6)	13 (1.3)
Developmental delay	3 (0.6)	15 (1.5)
Down syndrome	3 (0.6)	7 (0.7)
Pulmonary disease	3 (0.6)	4 (0.4)
Congenital neurological defects	2 (0.4)	10 (1.0)
Cancers	2 (0.4)	7 (0.7)
Autoimmune diseases	2 (0.4)	5 (0.5)
Liver disease	2 (0.4)	8 (0.8)
Ophthalmic disease	2 (0.4)	4 (0.4)
Benign prostatic hyperplasia	1 (0.2)	2 (0.2)
Gastroenterological disease	1 (0.2)	6 (0.6)
Musculoskeletal disorder	2 (0.4)	6 (0.6)

Data are number (%).

**Table 3.** Poisoning history of the adults and children.

	Adults (n=492)	Children (n=1013)
Number of poison agents consumed		
1	411 (83.5)	854 (84.3)
2	49 (10.)	107 (10.6)
3	22 (4.5)	28 (2.8)
4	4 (0.8)	14 (1.4)
5	3 (0.6)	5 (0.5)
6	2 (0.4)	3 (0.3)
7	1 (0.2)	1 (0.1)
Discharge status		1 (0.1)
Mature	478 (97.2)	990 (97.7)
Premature	14 (2.8)	23 (2.3)
Outcome status		
Uneventful	455 (92.5)	957 (94.5)
Intensive care unit admission	33 (6.7)	49 (4.8)
Organ transplantation		1 (0.1)
Death	4 (0.8)	3 (0.3)
Not documented		3 (0.3)

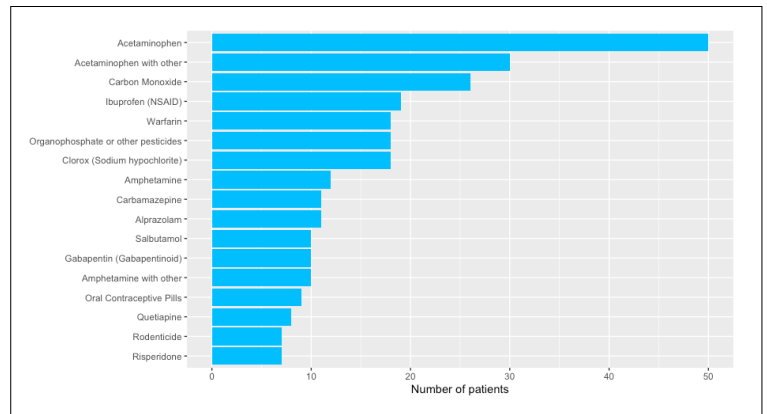
Data are number (%).

both adults and children (Figure 4). Only 32 patients stayed more than 7 days up to a maximum of 41 days in adults and 35 days in children.

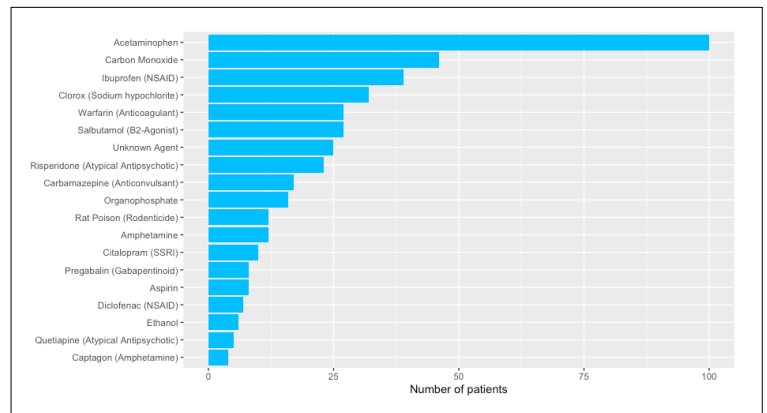
In adults and children about half were asymptomatic (Table 4, Table 5). The most frequently observed clinical presentations were an altered level of consciousness, vomiting, abdominal pain, dizziness, diaphoresis in adults, palpitation (tachycardia) in adults.

In adults, the intention of drug ingestion was accidental in more in more than half (n=284, 57.7%), attempted intentional suicide in 55 (11.2%), substance abuse in 39 (7.9%), prescribed drug toxicity in 32 (6.5%), 3 (0.6%) occupational exposure, and 79 (16.1%) had no documented intention. (Figure 5). The pattern differed somewhat in children with more accidental (n=658, 7.6%) accidental than suicidal (n=75, 7.4%).

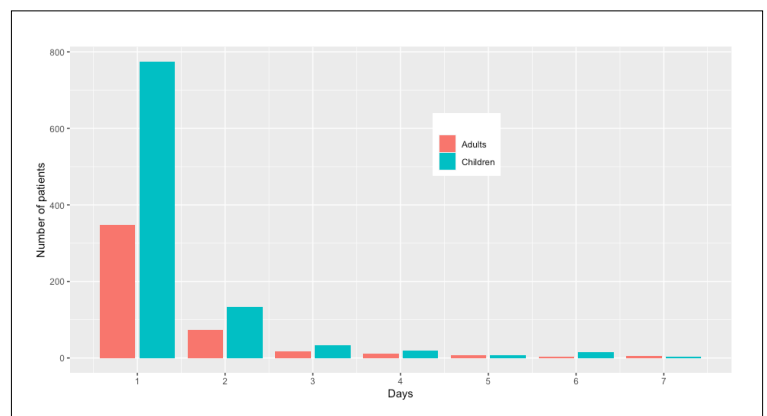
The majority of adults and children were observed with supportive management (Table 6). Only 50 (10.16%) adults and 94 children (9.3%) received decontamination and elimination therapy, with ac-



**Figure 2.** Common agents used in poisoning in adults (n=492).



**Figure 3.** Common agents used in poisoning in children (n=1013).



**Figure 4.** Length of stay in adults and children.

tivated charcoal the most frequently used method. Benzodiazepine and N-acetylcysteine were the two most frequently used methods for antidotal and targeted therapy. Only four adults received blood or blood products. Five children received fresh frozen plasma. A

**Table 4.** Clinical presentation of poisoning in the adults (n=492).

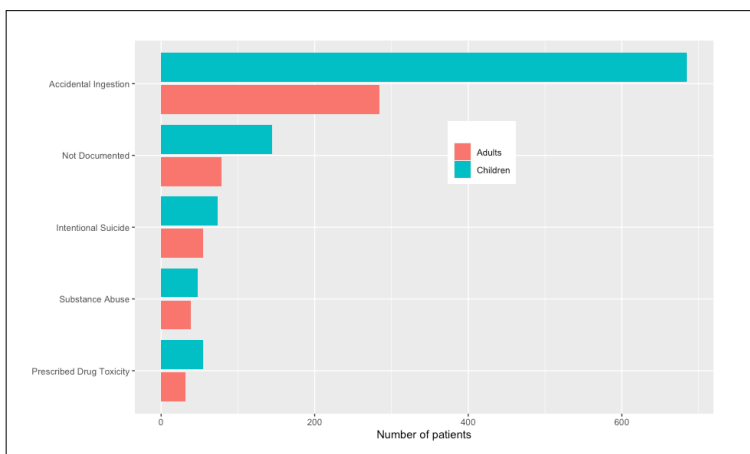
Asymptomatic	214 (43.5)
Altered level of consciousness	95 (19.3)
Vomiting	67 (13.6)
Abdominal pain	43 (8.7)
Dizziness	39 (8.0)
Diaphoresis	32 (6.5)
Palpitation, tachycardia	30 (6.1)
Headache	25 (5.1)
Agitation	23 (4.7)
Chest pain	15 (3.0)
Partial seizure	14 (2.9)
Generalized weakness, lethargy	13 (2.6)
Nausea	12 (2.4)
Bleeding	9 (1.8)
Salivation	8 (1.6)
Cough	7 (1.4)
Tremor	6 (1.2)
Ataxia (unsteady gait)	6 (1.2)
Body ache, generalized pain	4 (0.8)
Diarrhea	4 (0.8)
Dystonic reaction, Dyskinesia	4 (0.8)
Hypertension	4 (0.8)

Data are number (%). Other less frequent presentations included constipation, diplopia (visual disturbance), dysarthria (slurred speech), fever, hallucinations.

**Table 5.** Clinical presentation of poisoning in the children (n=1013).

Asymptomatic	554 (54.7)
Altered level of consciousness	134 (13.2)
Vomiting	113 (11.2)
Abdominal pain	66 (6.5)
Dizziness	59 (5.8)
Shortness of breath	44 (4.3)
Agitation	43 (4.2)
Headache	41 (4.0)
Palpitation, tachycardia	39 (3.9)
Nausea	32 (3.2)
Chest pain	20 (2.0)
Ataxia (unsteady gait)	17 (1.7)
Generalized weakness, lethargy	17 (1.7)
Dystonic reaction, Dyskinesia	15 (1.5)
Seizure	15 (1.5)
Diarrhea	14 (91.4)
Bleeding	12 (1.2)
Cough	12 (1.2)
Tremor	10 (1.0)
Diplopia (visual disturbance)	9 (0.9)
Paresthesia	7 (0.7)
Rash	7 (0.7)

Data are number (%). Other less frequent presentations included rash, diaphoresis, hallucinations, fever, salivation, throat pain, cyanosis, and others



**Figure 5.** Intention of drug ingestion in adults and children.

small proportion of adults and children received miscellaneous interventions including intubation and cardiopulmonary resuscitation.

## DISCUSSION

Globally, poisoning is a major public health issue. The substances used vary geographically, indicating the influence that environment, race, and culture have on choice and availability. In Saudi Arabia, information related to poisoning trends is limited, though clinicians experience a shift in the most widely used poisons over time. This retrospective study aimed to determine the patterns of poisoning in adults and children in a high-volume toxicology center.

In the current study, males marginally outnumbered females in both the adult and pediatric samples. Literature varies in this regard. A study conducted in West Bengal, India reported a similar demographic profile.<sup>12</sup> Other studies also reported a male majority. A retrospective case series from Oslo, Norway, reported that over 75% of adult patients treated for acute recreational drug toxicity were male,<sup>13</sup> while Lee et al noted similar trends in pediatric poisoning patients.<sup>14</sup> However, the current literature also substantiates that females are more likely to be involved in incidents of poisoning. A

time-series analysis conducted in Sri Lanka during the COVID-19 pandemic aimed to determine the impact of the pandemic on hospital presentations for self-poisoning. The findings of this study suggest that more than half of patients (54.3%) presenting to the hospital with self-poisoning were female.<sup>15</sup> An additional study corroborated these results, with the occurrence of poisoning being more common in female patients (67.7%) than males.<sup>16</sup> Male and female incidence rate discrepancies might be attributable to differing cultural trends and lifestyles.

**Table 6.** Interventions provided for the adult and child sample (n=1505).

Intervention	Adults (n=492)	Children (n=1013)
Observation and supportive management (total)	419 (85.1)	901 (88.92)
Observation and reassurance	298 (60.7)	677 (66.81)
Supportive and symptomatic management	84 (17.0)	168 (16.58)
Admission	37 (7.4)	56 (5.53)
Decontamination and elimination (total)	50 (10.2)	94 (9.28)
Activated charcoal	38 (7.7)	85 (8.39)
Multi-dose activated charcoal	1 (0.2)	
Decontamination	5 (1.0)	4 (0.39)
Gastric lavage	3 (0.6)	1 (0.10)
Dialysis	2 (0.4)	3 (0.30)
Lipid emulsion	1 (0.2)	
Urine alkalinization		1 (0.10)
Antidotal and targeted therapy (total)	78 (15.6)	95 (9.37)
Benzodiazepine	26 (5.2)	29 (2.86)
N-acetylcysteine	15 (3.1)	22 (2.17)
Vitamin K	6 (1.2)	4 (0.39)
Atropine	5 (1.0)	8 (0.79)
Naloxone	5 (1.0)	7 (0.69)
Pralidoxime	4 (0.8)	1 (0.10)
Benzotropine (anticholinergics)	3 (0.6)	1 (0.10)

**Table 6 (cont.).** Interventions provided for the adult and child sample (n=1505).

Intervention	Adults (n=492)	Children (n=1013)
Thiamine	3 (0.6)	
Sodium bicarbonate	3 (0.6)	4 (0.39)
Diphenhydramine	2 (0.4)	5 (0.49)
Phenytoin	1 (0.2)	
Haloperidol	1 (0.2)	
Furosemide	1 (0.2)	
Inotropes	1 (0.2)	
Ketamine	1 (0.2)	
Vasopressors		4 (0.39)
Deferoxamine		1 (0.10)
Fomepizole		3 (0.30)
Glucagon		1 (0.10)
Hydroxocobalamin		1 (0.10)
Heparin		1 (0.10)
Flumazenil		2 (0.20)
Ethanol		1 (0.10)
Blood and blood products (total)	4 (0.8)	5 (0.49)
Blood transfusion	1 (0.2)	
Fresh frozen plasma	3 (0.6)	5 (0.49)
Miscellaneous (total)	22 (4.5)	33 (3.26)
Intubation	12 (2.4)	15 (1.48)
Cardio-pulmonary resuscitation	1 (0.2)	
Not documented	9 (1.8)	17 (1.68)

Data are number (%)

The majority of the current sample, both adults and children, were underweight, 260 (52.80%) of the 492 adults and 629 (62.10%) of the 1013 pediatric sample. These findings are inconsistent with the current literature that identifies being overweight or obese as a risk factor for adverse outcomes following poisoning. A retrospective cohort study evaluated the relationship between being overweight and the development of hepatotoxicity and acute liver injury following acute acetaminophen overdose. The results demonstrated that 17% of patients were obese, 12.2% were overweight, and 70% were normal BMI cases. This study concluded that being overweight or obese is an independent risk factor of acute live injury in patients following an acute acetaminophen overdose.<sup>17</sup>

In comparison to a northeast Indian study, which reported an 8.3% overall mortality rate,<sup>18</sup> the current study reported 4 deaths in the adult sample (0.8%) and 3 deaths in the pediatric sample (0.3%). The larger mortality rate in the northeast Indian study is validated by an additional observational study that reported an overall mortality rate of 3.4% among self-discharging patients and 1.7% among patients, not self-discharging.<sup>19</sup> The low mortality rate in the current study may be due to the inclusion of all cases labeled as poisoning complaints in the system, regardless of whether they achieved a toxic dose or not.

The patient's age, gender, number of agents, and intensity of symptoms are all factors that influence the length of stay. In the current study, the average length of stay was marginally lower than reported in the literature. The adult sample had a mean length of stay of 1.95 days and the pediatric sample had a mean length of stay of 1.6 days, compared to another Indian study reporting a mean length of stay of 12.53 days,<sup>18</sup> and a second cohort study reporting a mean length of stay of 18.11 days in a Spanish tertiary hospital.<sup>20</sup>

Most of the cases in this current study were free of any comorbidities. However, multiple reports have linked certain comorbidities to a higher likelihood of poisoning. According to a study conducted in an academically affiliated psychiatric hospital,<sup>21</sup> 60% of the patients admitted due to an opioid overdose, had a co-occurring psychiatric disorder. In the current study, only 51 (10.4%) adults were known to have neuropsychiatric disorders. A meta-analysis stated that children and adolescents diagnosed with attention deficit hyperactivity disorder (ADHD), had a higher risk of poisoning in contrast to children and adolescents without ADHD.<sup>22</sup> In the current study, only 13 (1.3%) children were diagnosed with ADHD.

In this study, in both the adult and pediatric sample,

most ingested a single agent, namely acetaminophen. However, in two studies done in Nepal and Egypt, the most frequent poisoning agent was an organophosphate in both adults and children.<sup>23,24</sup> This could be attributed to the fact that Nepal and Egypt have a significant portion of their workforce in agriculture. In comparison, the population in the current study was urban. However, acetaminophen and organophosphate share a number of key features such as accessibility and availability. In a study conducted at a university hospital in Turkey, the most frequent single agent for adults was acetaminophen (9.7%),<sup>25</sup> supporting the current study reporting 10.57%. Ingesting multiple drugs occurred more frequently in the adult sample of the current study, similar to studies conducted in Turkey, Iran, and Martinique.<sup>1,25,26</sup> The current recommendation to test for co-ingestions of other substances in intentional poisoning cases.

In contrast to earlier findings by the Nepali study, stating that suicide was the main cause of poisoning in the adult participants, the current result indicated that 284 (57.7%) of the adult sample and 658 (67.6%) of pediatric sample were due to accidental poisoning. Accidental poisoning highlights a concern about the lack of precaution. For instance, child-resistant packaging and storing all medications and household products away from children to prevent accidents.<sup>24</sup>

The current study found that only 6.7% of adult sample were admitted to the ICU, similar to studies done in Sweden (6%) and the Turkey study (4%).<sup>27,28</sup> In the present study, the ICU admission outcomes were uneventful as the patients were discharged, consistent with the two studies. In the current study, 4.8% of the pediatric sample was admitted to the pediatric intensive care unit (PICU), which is higher than reported in a study done in Taiwan (3.8%).<sup>5</sup> The reason may be the current practice of admitting pediatric poisoning cases in the PICU for observation. The use of a prediction model, associated with a high negative predictive value (98.7), could decrease the cost of care by reducing the observational admissions by 34.3%.<sup>29</sup>

The management in both the pediatric and adult samples was nonspecific, involving observation, supportive measures, and symptomatic treatment, in line with a study done in Taiwan.<sup>5</sup> The similarity in the management of both the adult and pediatric poisoning cases is contrasted by a study highlighting the need for more active treatment and more hospital admissions in older patients.<sup>4</sup> Cases of organophosphate poisoning also require more vigorous management, including decontamination, and ventilation, as reported in a study done in the Emirates.<sup>30</sup> Fortunately, or-

ganophosphate poisoning accounted for only 2.24% and 1.68% in the current study's adult and pediatric samples, respectively.

The uneventful outcomes in the pediatric sample are similar to other reports. This outcome may be attributed to the fact that the majority of the poisoning cases were accidental and in relatively small amounts or the ingestion of minimally toxic substances.<sup>6,31</sup> Poorer outcomes in pediatric poisoning are associated with pesticide poisoning. Aside from the high mortality rates due to organophosphate poisoning, it is complicated by neurological deficits.<sup>30</sup> There is a higher likelihood of developing long-term neurodevelopmental and neurobehavioral sequelae in children who have been acutely poisoned by an organophosphate, compared with children who have never been poisoned.<sup>32,33</sup> As most of the instances of pediatric poison ingestion are attributed to their exploratory nature and despite the observed reduction in fatal pediatric poisonings, it can be prevented easily by implementing a number of measures.<sup>34</sup> Caregiver education regarding the proper and safe storage of drug and household products, as well as the use of child-resistant packaging have been proven as effective in preventing pediatric poisoning.<sup>5,35</sup>

In conclusion, the observed ICU admission rates were in line with the other reports. However, the mortality rate was marginally lower. This may be contributed to the fact that all the emergency department cases labeled as a poisoning were included without taking into consideration if the ingested dosage was toxic or not. Vulnerable groups such as toddlers and the elderly deserve special consideration due to their weaker cop-

ing capacity. Thus, future studies are recommended to further dissect the data and provide a deeper insight on high-risk age groups with a focus on the clinical sequelae following discharge. The use of prediction models to improve the triaging system could decrease the costs of observational ICU admissions. The pediatric predominance in the sample implies a lack of caregiver education in the region, regarding the safe storage of drugs and household products, as well as the use of child-resistant packaging. The high rate of accidental poisoning in both age groups requires further investment to promote public health education on the rational use and safe storage of toxic agents as well as self-protection. The rate of suicide intention should be investigated to develop multidiscipline risk prevention strategies. Large nationwide studies are required to assess the trends in poisoning on a regional level, to support healthcare policy planning and to equip healthcare centers in a particular region, for an early accurate diagnosis and an effective treatment plan.

The current study had some limitations. Firstly, due to the retrospective nature of the study, the research team had to rely on accurate safe record keeping. The data in the BESTCare system may not be complete. Secondly, all the ED cases labeled as a poisoning complaint were included without taking into consideration if the ingested dosage was at a toxic level, which may have skewed the outcomes. The clinical implications of the current study should be interpreted with caution. Thirdly, as the data was obtained retrospectively, some important parameters such as occupation and marital status could not be evaluated.



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