Incidence and profile of acute intoxication among adult population in Najran, Saudi Arabia: A retrospective study

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Abstract

Acute poisoning is considered one of the most important medical emergencies, resulting in severe morbidity and mortality, and is an economic burden on governments. This study aimed to determine the extent of acute adult intoxication among the population located in the Najran area, Saudi Arabia, over the last 3 years (from January 2017 to December 2019). The study is a hospital-based retrospective observational study. The data of all acutely intoxicated adult patients were collected from patients’ files of King Khalid Hospital, the main hospital in the Najran area. In this study, the total number of intoxicated patients was 852. Patients were divided into three groups according to their age: 15–25 years, 26–35 years and >35 years. Accidental intoxication was predominant (64.6%), especially with therapeutic drugs (60.2%), predominantly acetaminophen and amphetamine, which intoxicated 24.5% and 23.4% of the patients, respectively. Moreover, this study showed that 10.6% of patients were intoxicated with overdoses of alcohol, mostly among patients aged over 35 years. Furthermore, the present study revealed that 23.9% of patients were intoxicated with household chemicals, especially Clorox bleach or Flash. Patients presented with a wide range of symptoms; some were even asymptomatic. Overall, patients’ outcomes were good; mortalities were few (1.2%), and most fatalities were found in patients aged over 35 years (60%). The present study showed that pharmaceutical drugs constituted the most common causative agents

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in acute intoxication. Household chemicals, especially Clorox bleach, Flash and pesticides, are highly implicated in the acute toxicity problem. Drug abuse, especially amphetamine and alcohol, still represents a great threat facing people from the Najran region. It is crucial to deliver effective public health education programmes to increase community awareness about the predisposing risk factors of acute toxicity, whether as overdoses or suicide attempts.

**Keywords**
Acute toxicity, intoxication, drug abuse, household chemicals abuse

**Introduction**

Acute toxicity is a worldwide problem. It constitutes one of the most common medical emergencies and is responsible for high morbidity and mortality rates throughout the population.\(^1\)\(^2\) The World Health Organisation (WHO) has estimated that acute poisoning is responsible for about 45,000 deaths annually.\(^3\) Annual rates of acute poisoning referrals to emergency departments vary substantially from one country to another throughout the world, and they range from 0.076\% to 0.7\%.\(^4\)\(^5\) Moreover, the reported annual incidence of acute poisoning may differ even among poisoning centres in the same country. Acute toxicity can be intentional or unintentional, where unintentional or accidental poisoning is more common among children and intentional poisoning is more common among adults.\(^6\) Many drugs are often used for suicide attempts due to their availability, especially sedatives, antidepressants and analgesics, particularly paracetamol.\(^7\) In addition, many chemicals are used with suicidal intent, especially pesticides, which account for 14\%–20\% of suicides worldwide.\(^8\)\(^9\) Annual deaths due to acute poisoning and suicide attempts total about one million worldwide.\(^10\) It was observed that the highest prevalence of acute poisoning was in persons under the age of 30 years, especially females.\(^11\)\(^12\)\(^13\) The highest death rates were reported in low-income and middle-income countries (0.6\% and 11.6\%) rather than in high-income countries (0.33\%–7.6\%).\(^3\)\(^14\)\(^15\) This difference in patterns and rates of acute poisoning could be attributed to religious, geographical, economic and cultural contexts and the availability of xenobiotics.\(^16\)\(^17\)

The management of acute intoxication cases has a unique approach because of the challenge in diagnosis and because of the tremendous number of xenobiotics that can cause toxicity. Signs and symptoms of acute poisoning differ greatly and may include dysrhythmias, hypotension, miosis, depression of the central nervous system (CNS), delirium, hypothermia and depression of the respiratory system, and cases may be severe enough to induce multisystem organ failure.\(^18\)\(^19\) It was reported that if poisoning is recognised and diagnosed early and appropriate diagnostic and supportive care is initiated rapidly, patient outcomes would be good in the majority of cases.\(^20\)

There is a great need for epidemiologic studies in each country and region to clarify the profile of acute poisoning, to help authorities establish a plan for its prevention and control.\(^21\) Currently, there are many studies of acute poisoning in different populations of Saudi Arabia. However, to our knowledge, no study has been
done on accidental poisoning in Najran city since 2003. This is a retrospective observational study that aimed to determine the extent of acute adult intoxication among the population located in the Najran governorate, Saudi Arabia, over a three-year period.

**Materials and methods**

*Study design and setting*

The present work was a hospital-based retrospective observational study that was performed in the Najran governorate, Saudi Arabia, over the last 3 years (from January 2017 to December 2019). The data of all acutely intoxicated adult patients were collected from patients’ files from the medical records department of King Khalid Hospital, Najran (the main hospital in the Najran governorate, Saudi Arabia). The diagnosis of acute poisoning was based on the following criteria: a history of exposure to poison(s), characteristic clinical signs and symptoms of the suspected poison involved, and clinical examination and laboratory investigations.

Regarding the sample size, it was not justified to select or exclude any patients from the records. One of this study’s aims is to draw a real picture of acute toxicity among adult inhabitants in Najran regarding its incidence and aetiology. Thus, all acutely intoxicated adult patient cases saved in King Khalid Hospital records were included in this study.

*Patients*

Patients were divided into three groups (group I: patients aged 15–25 years, group II: patients aged 26–35 years and group III: patients aged >35 years). Collected data were included on the following: patient demographics (age, gender, residence) and toxicological data, including toxic agent; manner of toxicity; the time elapsed between exposure and reaching the hospital, outpatient or admission; and date of the poisoning occurrence. In addition, data of clinical examination were collected: vital signs (pulse, blood pressure and temperature); the level of consciousness; and neurological, abdominal and chest examinations. Also, data of results of routine laboratory and toxicological investigations were collected when available, including serum electrolytes, liver enzymes, kidney function test and toxicological analysis, as well as electrocardiograph (ECG) and radiological findings. Moreover, we collected available data related to patient outcomes, including admission, recovery, death and discharge.

*Exclusion criteria*

Cases of food poisoning and chronic poisoning were excluded from the study.
Statistical analysis

Data were processed and analysed using GraphPad InStat 3 (GraphPad Software Inc., 2236 Avenida de la Playa, La Jolla, CA 92037 USA). Qualitative data were described using numbers and percentages, and quantitative data were described using minimum, maximum and mean ±SD. A value of $p < 0.05$ was considered statistically significant.

Results

The data of all acutely intoxicated adult patients were collected from patients’ files held in the medical records department, King Khalid Hospital, Najran (the main hospital in the Najran area; it receives only patients older than 15 years and patients referred from other hospitals). The patients ($n = 852$) were divided into three groups: group I ($n = 459$) included patients aged 15–25 years, group II ($n = 217$) included patients aged 26–35 years and group III ($n = 176$) included patients aged >35 years.

Table 1 demonstrates the patient characteristics and demographic data for cases of acute poisoning among adults in the Najran region from January 2017 to December 2019. The total number of intoxicated patients was 852. Most patients in the study were females (456, 53.5%), while the total number of males was 396 (46.5%). This was also the case for groups I and II individually; however, in group III males were predominant, comprising 119 (67.6%) of the patients in the group ($p < 0.0001$).

Concerning the residences of the intoxicated patients, most of them were from rural areas, constituting 436 (51.2%) of the total patients. Meanwhile, patients living in urban areas constituted 416 (48.8%) of the total patients ($p = 0.0005$). At the same time, we found that most patients were intoxicated in the summer season (336, 39.4%), followed by autumn (186, 21.8%), then winter (174, 20.5%) and, lastly, spring (156, 18.3%) ($p = 0.0005$; Table 1).

Regarding the manner of poisoning, it was found that most patients (550, 64.6%) ingested the toxin accidentally, while fewer patients (302, 35.3%) took the toxin intentionally ($p < 0.0001$). Moreover, most patients (706, 82.9%) were directed to the hospital to seek treatment. Among the 852 patients reaching the emergency department in the hospital, a wide range of mixed symptoms were reported, particularly vomiting (586, 68.8%), dizziness (791, 92.8%), difficulty breathing (668, 78.4%), irritability (659, 77.3%), constricted pupils (66, 7.7%) and headache (762, 89.4%), while some were unconscious (143, 16.8%) ($p < 0.0001$). Many patients had more than one symptom.

Table 2 demonstrates the physical state of the poison and the route of poisoning for cases of acute poisoning in adults of the Najran region from January 2017 to December 2019. The total number of intoxicated patients was 852.

Concerning the physical state of the poison, solid toxins caused toxicity in 563 patients (66.1%), liquid toxins caused toxicity in 247 patients (29%) and gaseous toxins caused toxicity in 42 patients (4.9%) ($p < 0.0001$).
Regarding the route of poisoning for cases of acute poisoning, most patients (762, 89.4%) administered the toxin orally, and this was observed in all groups. The dermal route was reported in 36 patients (4.2%), constituting 4.6%, 5.1% and 2.3% of patients in groups I, II and III, respectively. The ocular route was uncommon and observed in only 10 patients (1.2%), while the inhalation route was observed in 44 patients (5.2%) ($p = 0.02$; Table 2).

Table 3 demonstrates the type of poison among patients with acute poisoning in the Najran region from January 2017 to December 2019. Most of the patients (513, 64.6%) received unintentional poisoning, while the intentional poisoning rate was 35.4%. The common symptoms included vomiting, dizziness, difficulty breathing, irritability, constricted pupils, headache, and unconsciousness, with vomiting being the most common symptom (432, 94.1%) followed by dizziness (432, 94.1%).
Table 2. The physical state and route of toxins among adult patients admitted with acute poisoning in the Najran region from January 2017 to December 2019.

| Groups       | Group I | Group II | Group III | p-Value |
|--------------|---------|----------|-----------|---------|
|              | 15–25 years | 26–35 years | >35 years |         |
| n            | 459     | 217      | 176       |         |
| No. (%)      |         |          |           |         |

| Characteristic | Physical state of poison       | Group I | Group II | Group III | p-Value |
|----------------|--------------------------------|---------|----------|-----------|---------|
| Solid (n = 563, 66.1%) | 344 (74.9) | 145 (66.8) | 74 (42) | <0.001<sup>b</sup> |
| Liquid (n = 247, 29%)    | 83 (18.1) | 66 (30.4) | 98 (55.7) |         |
| Gaseous (n = 42, 4.9%)   | 32 (7)    | 6 (2.8)   | 4 (2.3)   |         |

| Route of poisoning | Group I | Group II | Group III | p-Value |
|--------------------|---------|----------|-----------|---------|
| Oral (n = 762, 89.4%) | 403 (87.8) | 196 (90.3) | 163 (92.6) | 0.02<sup>a</sup> |
| Dermal (n = 36, 4.2%)  | 21 (4.6)    | 11 (5.1)   | 4 (2.3)   |         |
| Ocular (n = 10, 1.2%)  | 3 (0.65)    | 2 (0.9)    | 5 (2.8)   |         |
| Inhalation (n = 44, 5.2%) | 32 (6.95)  | 8 (3.7)    | 4 (2.3)   |         |

<sup>a</sup>Significant association.
<sup>b</sup>Highly significant association.

Table 3. List of toxins among adult patients admitted with acute poisoning in the Najran region from January 2017 to December 2019.

| Groups       | Group I | Group II | Group III | p-Value |
|--------------|---------|----------|-----------|---------|
|              | 15–25 years | 26–35 years | >35 years |         |
| n            | 459     | 217      | 176       |         |
| No. (%)      |         |          |           |         |

| Type of poison | Group I | Group II | Group III | p-Value |
|----------------|---------|----------|-----------|---------|
| Therapeutics (n = 513, 60.2%) | 324 (70.6) | 115 (53) | 74 (42) | <0.0001<sup>a</sup> |
| Acetaminophen (n = 126, 24.5%)  | 102 (22.2) | 12 (5.5) | 12 (6.8) |         |
| Amphetamine (n = 120, 23.4%)    | 44 (9.6)   | 53 (24.4) | 23 (13.1) |         |
| Aspirin (n = 36, 7%)            | 18 (3.9)   | 6 (2.8)   | 12 (6.8) |         |
| Brufen (n = 28, 5.6%)           | 16 (3.5)   | 6 (2.8)   | 6 (3.4)  |         |
| Depakine (n = 6, 1.2%)          | 6 (1.3)    | 0 (0)     | 0 (0)    |         |
| Tegretol (n = 6, 1.2%)          | 6 (1.3)    | 0 (0)     | 0 (0)    |         |
| Metronidazole (n = 21, 4.1%)    | 17 (3.7)   | 4 (1.8)   | 0 (0)    |         |
| Multivitamins (n = 5, 1%)       | 5 (1.1)    | 0 (0)     | 0 (0)    |         |
| Omeprazole (n = 15, 2.9%)       | 3 (0.7)    | 6 (2.8)   | 6 (3.4)  |         |
| Multiple drugs (n = 87, 16.9%)  | 76 (16.6)  | 9 (4.1)   | 2 (1.1)  |         |
| Unknown (n = 63, 12.2%)         | 31 (6.7)   | 19 (8.8)  | 13 (7.4) |         |
| Alcohol (n = 90, 10.6%)         | 0 (0)     | 12 (5.5)  | 78 (44.3) |         |
| Pesticide (n = 48, 5.6%)        | 30 (6.5)   | 6 (2.8)   | 12 (6.8) |         |
| Household chemicals (n = 201, 23.9%) | 105 (22.9) | 84 (38.7) | 12 (6.8) |         |
| Clorox (n = 119, 59.2%)         | 81 (17.6)  | 30 (13.8) | 8 (4.5)  |         |
| Flash (n = 68, 33.8%)           | 24 (5.3)   | 42 (19.4) | 2 (1.2)  |         |
| Dettol (n = 14, 7%)             | 0 (0)     | 12 (5.5)  | 2 (1.2)  |         |
| Total (n = 852, 100%)           | 459 (53.9) | 217 (25.5) | 176 (20.6) |         |

<sup>a</sup>Highly significant association.
60.2%) were intoxicated by a wide variety of therapeutic drugs, such as acetaminophen (paracetamol) for 126 patients (24.5%) and amphetamine for 120 patients (23.4%). Acetaminophen toxicity was most common in group I (22.2%), and amphetamine toxicity dominated in group II (24.4%). Also, Aspirin and Brufen (ibuprofen) were found to be responsible for toxicity in 36 (7%) and 28 (5.6%) of all intoxicated patients, respectively. Less commonly, Depakin (valproic acid) and Tegretol (carbamazepine) were found to be responsible for toxicity in six patients each, and Flagyl (metronidazole) was responsible for toxicity in 21 patients (4.1%).

Overdoses of multivitamin drugs were recorded in five cases (1%). Multiple drugs were administered by 87 patients (16.9%). However, 63 patients (12.2%) were recorded as having toxicity by unknown therapeutics.

Although alcohol drinking is prohibited in Saudi Arabia, the present study showed that 90 patients (10.6%) were intoxicated with overdoses of alcohol. Alcohol toxicity was most common in group III (44.3%), patients who were older than 35 years. None of group I was intoxicated with alcohol. The study revealed that 48 patients (5.6%) were exposed to pesticide toxicity, which was most common in group I patients (30, 6.5%). Concerning household chemicals, the study revealed that 201 patients (23.9%) were intoxicated by chemicals used for washing, cleaning floors and disinfecting. Clorox and Flash represented the most common ones. Clorox was responsible for toxicity in 119 patients (59.2% of household toxicity and 14% of all toxicity cases) ($p < 0.0001$; Table 3).

Table 4 demonstrates the management approach for adult patients with acute poisoning in the Najran region from January 2017 to December 2019. Most patients were given more than one treatment option, and 392 patients (46%) received specific medication and antidotes for the causative toxin. Gut
decontamination, activated charcoal and oxygen inhalation therapies were used in 670 (78.6%), 267 (31.3%) and 126 (14.8%) cases, respectively. However, 138 patients (16.2%) showed no symptoms and were clinically stable, so they were kept for a short-term observation period and then discharged home ($p < 0.0001$).

Table 5 demonstrates the final patient outcomes for adult patients with acute poisoning in the Najran region from January 2017 to December 2019. The total number of intoxicated patients was 852. The study revealed that ten patients (1.2%) reached the hospital in a critical condition and died after admission. Most fatalities (six patients) were found in group III, representing 60% of all fatalities. A total of 359 patients (42.1%) required hospital admission and were discharged after a complete recovery. In addition, 374 patients (43.9%) received treatment, required no admission and were discharged after a complete recovery, and 109 patients (12.8%) were put under observation (for a period $< 24$ h) before discharge.

| Groups | Group I | Group II | Group III | $p$-Value |
|--------|---------|----------|-----------|-----------|
| 15–25 years | 26–35 years | >35 years | |
| n = 459 | n = 217 | n = 176 | |
| No. (%) | No. (%) | No. (%) | |
| Treatment, recovery and discharge ($n = 374, 43.9\%$) | 237 (51.6) | 94 (43.3) | 43 (24.4) | $< 0.0001^a$ |
| Observation, recovery and discharge ($n = 109, 12.8\%$) | 62 (13.5) | 27 (12.5) | 20 (11.4) | |
| Admission, complete recovery and discharge ($n = 359, 42.1\%$) | 159 (34.7) | 93 (42.8) | 107 (60.8) | |
| Admission and death ($n = 10, 1.2\%$) | 1 (0.2) | 3 (1.4) | 6 (3.4) | |
| Total ($n = 852, 100\%$) | 459 (100) | 217 (100) | 176 (100) | |

$^a$Highly significant association.

Table 5 demonstrates the final patient outcomes for adult patients with acute poisoning in the Najran region from January 2017 to December 2019. The total number of intoxicated patients was 852. The study revealed that ten patients (1.2%) reached the hospital in a critical condition and died after admission. Most fatalities (six patients) were found in group III, representing 60% of all fatalities. A total of 359 patients (42.1%) required hospital admission and were discharged after a complete recovery. In addition, 374 patients (43.9%) received treatment, required no admission and were discharged after a complete recovery, and 109 patients (12.8%) were put under observation (for a period $< 24$ h) before discharge.

Discussion

Acute poisoning is one of the most important worldwide medical emergencies that results in a high morbidity and mortality rate, especially in developing countries. Early diagnosis, treatment and preventative planning are the most suitable measures to solve and control this problem. At the same time, acute poisoning still constitutes a major health threat in Saudi Arabia.

The present study was a hospital-based retrospective observational study that aimed to determine the extent of acute adult intoxication among the population of the Najran area, Saudi Arabia, over the last 3 years (from January 2017 to
December 2019). The results of this study demonstrated that the total number of intoxicated patients was 852. Accidental intoxication was predominant (64.6%), especially with therapeutic drugs (60.2%), where the oral route was the most common (89.4%). Patients were intoxicated with a wide variety of drugs, especially acetaminophen and amphetamine, in 24.5% and 23.4% of patients, respectively. Although alcohol drinking is prohibited in Saudi Arabia, the study showed that 10.6% of patients overdosed with alcohol, predominantly patients aged over 35 years. Moreover, the study revealed that 23.9% of patients were intoxicated with household chemicals, most commonly Clorox or Flash. However, pesticide intoxication affected 6.5% of patients. Patients’ symptoms ranged from asymptomatic to a wide variety of symptoms, and many patients were given more than one treatment option. Patients’ outcomes were good, and mortalities were few (1.2% of total patients). Most fatalities (six patients) were found in the age group above 35 years, representing 60% of all fatalities.

Table 1 demonstrates the patient characteristics, revealing slightly more female (53.5%) than male (46.5%) patients ($p < 0.0001$). Such a result was reported by many authors who attributed the increased number of intoxicated females to the existence of the social repression of females in many societies.12,13,26

Regarding patients’ residences (Table 1), those living in rural areas were slightly predominant (51.2% of the total patients; $p = 0.0005$). Such a result is in agreement with those reported in some other countries, including Sri Lanka.27 The high incidence of poisoning among the rural population could be attributed to high illiteracy, ignorance and superstitions.28,29

Table 1 revealed that most patients were intoxicated in the summer season (39.4%) and the fewest in the spring season (18.3%); ($p = 0.0005$). Seasonal variations in acute poisoning were also seen in different parts of the world. In Iran, it was found that peak acute toxicity was observed in spring (28%) and summer (27.5%), with lower numbers in winter (23.6%) and autumn (20.8%).30 Meanwhile, in some parts of the Gulf area, such as Qatar, most cases of acute toxicity were seen in the summer and autumn seasons.31

Concerning the mode of poisoning, it was found that most patients (64.6%) had taken the toxin accidentally. However, 35.4% of patients had taken the toxin intentionally ($p < 0.0001$).

According to the circumstances of poisoning, there are two main modes: unintentional (accidental), constituting almost all reported cases, and intentional (suicidal, homicidal or drug abuse), representing a lower percentage.32 Intentional poisoning occurs when a person takes or is given a substance with the intention of causing harm, while unintentional poisoning occurs if a person takes or is given a substance without intent to cause harm. Unintentional poisoning could be due to negligence, carelessness, an error in judgement or an unexpected situation in the home in the workplace, as in the case of intoxication due to a drug overdose.33,34 It was reported that about two million cases of intentional poisoning and suicide attempts occur annually, resulting in about a million deaths each year, and chemical toxicity accounts for a significant number of these deaths.35 It has been reported
that accidental poisoning is a major problem in Saudi Arabia. Moreover, in another study, it was reported that intentional poisoning constituted about 26.4% of intoxication cases in Jeddah, Saudi Arabia. Most cases of intentional poisoning occur in developing countries and are associated with high morbidity and mortality. The mode of acute poisoning could vary from one region to another in relation to religious, cultural and geographical contexts and the availability of different xenobiotics.

Regarding the responses of the intoxicated patients and their relatives at the time of intoxication, Table 1 shows that most patients (82.9%) went directly to the hospital to seek treatment. However, 17.1% tried to seek first aid services before going to the hospital. No statistical difference was found among these groups \( p = 0.1539; \) Table 1). Pre-hospital first aid for intoxicated patients aims to mitigate the toxin as fast as possible until the patient receives medical assistance. It is vital to increase community awareness about the importance of providing intoxicated patients with first aid to decrease absorption of the toxin and support patients’ vital signs until reaching the hospital.

Patients reached the emergency department in the hospital with a wide range of symptoms, especially dizziness (92.8%), headache (89.4%), difficulty breathing (78.4%), irritability (77.3%) and vomiting (68.8%), while some (16.8%) patients were unconscious \( p < 0.0001; \) Table 1).

Doctors often face a challenge in managing critically-poisoned patients. The symptoms and clinical effects encountered in poisoned patients are dependent on many variables, including the type of toxin, the toxic dose, the length of exposure time to the toxin and the pre-existing health of the patient.

Table 2 demonstrates the physical state of the poison and the route of poisoning for cases of acute poisoning. Regarding the physical state of the poison, solid toxins caused toxicity in 66.1% of patients, liquid toxins in 29% and gaseous toxins in 4.9% \( p < 0.0001 \). This could be explained by the results in Table 3, which show that the majority of patients (60.2%) were intoxicated with therapeutic drugs, mostly in the form of tablets or capsules.

Regarding the route of poisoning for cases of acute poisoning, most patients (762, 89.4%) administered the toxin orally, and this was noticed in all groups. The dermal route was reported in 36 patients (4.2%), constituting 4.6%, 5.1% and 2.3% of patients in groups I, II and III, respectively. The ocular route was uncommon and noticed in only 10 patients (1.2%), while the inhalation route was noticed in 44 patients (5.2%); \( p\)-value = 0.02; Table 2).

These results could be explained by the results in Table 3, which show that the majority of patients (60.2%) were intoxicated with therapeutic drugs, mostly in the form of tablets or capsules taken orally. In addition, alcohol and liquid household chemicals were administered orally. The dermal route was recorded mostly in cases of pesticide toxicity, mostly among agricultural workers. These results are in agreement with some other studies that reported toxicity through the oral route was the most common. The inhalation route was recorded as being accidental due to evaporation of liquid household chemicals, mainly Clorox alone or when mixed
with Flash, especially when cleaning closed areas. The inhalation route was also recorded in Saudi Arabia in relation to solvents, which resulted in an altered level of consciousness. It was reported in a previous study that 1778 (5.3%) male secondary school students from the Saudi eastern province were abusing solvents. Another study conducted in Al-Amal hospital and including 43 participants abusing solvents showed that the majority abused paint, followed by glue.

Table 3 demonstrates the type of poison and shows that most patients (60.2%) were intoxicated with therapeutic drugs, especially acetaminophen (paracetamol), which intoxicated 24.5% of patients, and amphetamine, which intoxicated 23.4% of patients. Acetaminophen toxicity was most common in group I (22.2%), while amphetamine toxicity was most common in group II (24.4%). Aspirin was responsible for toxicity in 7% of all intoxicated patients. At the same time, Brufen (ibuprofen), Depakine (valproic acid), Tegretol (carbamazepine), Flagyl (metronidazole) and multivitamin drugs were responsible for toxicity in fewer patients. However, 63 patients (12.2%) who represented failed suicide attempts stated that they took a large dose of a drug or several drugs but refused to name the drugs they administered, so they were recorded as having toxicity with unknown therapeutics.

The aetiology of acute intoxication varies from one country to another and even in different regions of the same country. According to WHO, the number of deaths due to drug overdose in 2015 was as high as 168,000. The great advances in the pharmacological industry have led to a tremendous number of drugs available in the pharmaceutical market. Nowadays, a wide variety of drugs can be taken as medication and are liable to cause toxicity, either as overdoses or for suicide purposes. It was documented that overdoses of analgesics, tranquillisers and antidepressants are the most common causes of intentional poisoning in industrialised countries, while pesticides are the most common in Asian countries, particularly in rural areas, with a fatality range of 10%–20%. In Saudi Arabia, it was documented that the 10 most common suspected toxic substances were analgesics (15.2%), vitamins (13.2%), chemicals (8.3%), caustics (8.2%), antihistamines (6.5%), antibiotics (3.5%), pulmonary drugs (3.4%), pesticides (2.9%), antihypertensive medications (2.4%) and food poisoning (1.8%). A large number of studies reported that pharmaceutical toxicity was the most common type of poisoning in Saudi Arabia, especially acetaminophen. Moreover, it was reported that toxicity via paracetamol overdose was frequently seen in Saudi Arabia, especially in young females attempting suicide.

In other countries, the representation of acute toxicity could be different. In the US, it is mainly due to illicit drugs. In Turkey, it was reported that medicinal drugs were the major cause (69.37%) of acute poisoning cases, followed by inhalation of gases (14.44%), alcohol (5.99%), alcohol together with illicit drugs (4.23%), food (3.17%), corrosives (1.76%) and pesticides (1.06%). In another study in Turkey, the most common causes of acute intoxication were drugs, carbon monoxide and alcohol. In India, the most widespread cause of acute poisoning is agrochemical insecticides (49%), followed by pharmaceutical drugs (17%) and alcohol (13%). In Iceland, it was found that 72% of acute intoxicated cases were associated with drugs and/or alcohol.
Regarding amphetamine toxicity, it was found that 23.4% of total patients were intoxicated with amphetamine, mostly in group II (24.4%). In Saudi Arabia, it was documented that amphetamine is the most common illicit drug abused by Saudis (ranging from 4% to 70.7%), and there was an increase in amphetamine abuse over time.53,54

The present study revealed that 5.6% of patients were exposed to pesticide toxicity. It was most common in group I (6.5%). Pesticide toxicity has been reported in many studies in Saudi Arabia,40,55 and most cases of pesticide toxicity were seen in middle- and low-income countries due to increased agricultural activities.44

Although alcohol is prohibited in Saudi Arabia, 90 patients (10.6%) were intoxicated with alcohol (Table 3). Alcohol toxicity was most common in group III (44.3%), comprising patients older than 35 years. None of group I was intoxicated with alcohol.

These results are in agreement with other studies that reported some cases of alcohol addiction among patients in Saudi Arabia. In a study done in Al-Amal Hospital in Jeddah, it was found that 16.1% of patients in clinics were alcohol abusers.54 In another study, in the same hospital in 1995–1996, it was found that 87% of admitted patients were abusing alcohol.56 In addition, in 2013, it was concluded that over the past two decades alcohol was one of the most commonly used substances (9%–70.3%) among Saudi residents in addiction treatment hospitals in Saudi Arabia. Peer pressure and psychosocial stress factors are considered the most common risk factors for initiation and relapse. Depression, anxiety and hepatitis were the most common co-morbidities associated with alcohol consumption among Saudi residents.57 Moreover, a strong correlation between alcohol abuse and car accidents was reported, where 25% of drivers were under the influence of alcohol while driving at the time of car accidents.53

Regarding household chemicals, the present study revealed that 23.9% of patients were intoxicated with chemicals used for washing, cleaning floors and disinfecting. Clorox and Flash constituted the most common chemicals encountered, with Clorox responsible for toxicity in 59.2% of household toxicity and 14% of all toxicity cases.

These results agree with previous research conducted in Saudi Arabia. Household chemicals are recorded as a significant source of poisoning in Saudi Arabia and account for 45% of acute toxicity cases.45

Table 4 demonstrated the type of management approach for adult patients with acute poisoning. The total number of each sub-group exceeded the total number of each group because most patients were given more than one treatment option. The study revealed that 46% of patients received specific medication and antidotes for the causative toxin. Meanwhile, gut decontamination was used in 78.6% of patients, and activated charcoal was orally administered to 31.3% of patients. However, 16.2% of patients showed no symptoms and were in a healthy condition, so they were kept under observation for a certain period and then discharged from the hospital ($p < 0.0001$).
It is established that all poisonings should be considered serious emergency cases and independent from their clinical presentation at the time of admission.\textsuperscript{39} If a patient is recognised as being intoxicated early and if appropriate testing and supportive care are initiated rapidly, the majority of patients' outcomes will be good. The proper and wise use of antidotes should be practised, and treating doctors should clearly understand the indications, contraindications and proper dosages of antidotes prior to administration.\textsuperscript{20} Most intoxicated persons could be treated with general emergency care and, if necessary, with symptomatic intensive care measures.\textsuperscript{58}

Regarding the final patient outcomes, Table 5 revealed that the majority of patients (56.7\%) did not need hospital admission and were treated in the emergency rooms and returned home after observation for a period, ensuring they were healthy. It was found that 43.9\% of patients received treatment, and they were discharged after complete recovery, while 12.8\% were put under observation and they were discharged upon confirming good health. Moreover, 42.1\% needed hospital admission for a certain period, and they were discharged after a complete recovery. However, 10 patients (1.2\%) died after admission to hospital. Most fatalities were found in group III, six patients of whom died (60\% of all fatalities) due to methanol toxicity. It has been reported that in Saudi Arabia, methanol is found as a solvent in some brands of perfume and cologne. It can be drunk and can cause acute toxicity. In addition, it can be found through the contamination of handmade liquor, smuggled alcohol and so forth with methyl alcohol.\textsuperscript{59,60} The minimal lethal toxic dose of methanol is about 30 ml of 40\% methanol; however, as little as 10 ml of methanol can cause blindness.\textsuperscript{61} Methanol toxicity has been reported in Saudi Arabia. In addition, many cases of permanent blindness due to methanol intoxication have been reported in Saudi ophthalmologic centres.\textsuperscript{60}

This study revealed that the listed treatment approaches of the hospital accorded with those outlined and published by the American Academy of Clinical Toxicologists (ACCT) and the European Association of Poison Centres and Clinical Toxicologists (EAPCCT), as well as with other studies.\textsuperscript{62,63} These results agree with many other studies from across the world.\textsuperscript{64–66} The results of a low mortality rate in the present study agree with those reported in many other studies.\textsuperscript{67,68} Low mortality rates likely reflect the influence of a combined policy of strict legislation against drug trafficking and tight control over prescription drugs.\textsuperscript{67}

Because of the retrospective nature of this study, it had some limitations. Despite the count of all poisoning cases that were recorded in the patients' files of the King Khalid main hospital in the Najran region, there may be a number of cases who received health care in the primary care centre and were discharged without referring to the central hospital. This means that there are likely to be a number of cases that were not included in this study. Moreover, no data were available regarding the outcomes after hospital discharge or mortalities occurring after discharge.
Conclusions
The present study shows that most cases of poisoning occurred in patients younger than 25 years, most cases did not need hospital admission and most could be treated in the emergency room. Pharmaceutical drugs constituted the most common causative agents used in acute intoxication. In addition, household chemicals, especially Clorox, Flash and pesticides, are highly implicated in the acute toxicity problem. Moreover, drug abuse, especially of amphetamine and alcohol, still represents a great threat facing the Saudi people. Thus, it is vital to deliver effective public health education programmes to increase community awareness about the predisposing risk factors of acute toxicity, whether as accidental overdoses or in suicide attempts. Finally, as with the majority of studies, the findings of this study have to be seen in light of a limitation as the sample size was not justified to select or exclude any patients from the records. All acutely intoxicated adult patient cases saved in King Khalid Hospital records were included in this study.

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