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Assessment of drug toxicity and chemical poisoning among
presented cases in poison center in Basrah city, Iraq.



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Abstract

Background: Poisoning is considered a major public health issue and it's a preventable one. At the same time, it's an important contributing factor to morbidity and mortality worldwide. Acute poisoning represents a frequent cause of admission to emergency units, especially in developing countries.

Aim of the study: This study aimed to assess the prevalence of poisoning with drugs, chemical and house hold products and to review the determinants, circumstances and outcome of intoxicated patients within a period of 3 years using data obtained from Poison Control Center in Basrah city, Iraq.

Methods: this is a retrospective study conducted on acute poisoned patients admitted to different hospitals in Basra city over a period of 3 years (2020,2021,2022).

Results: The total number of poisoning cases in this study was (244). Children were the most vulnerable age group representing 50% of total cases. Males (125) predominated over females (119). Drugs were the most common agent causing the poisoning (171). Centrally acting sedative/hypnotics (Benzodiazepines) Was the first common drug represent (18%, 29.5%, 23%) in 2020, 2021, and 2022, respectively. paracetamol analgesic, the second common drug, represent 15%, 18%, 18.5% consecutively. Pesticides (insecticides and rodenticides) were the most common non-pharmaceutical poisons during 2020 and 2021 with 48% and 66%, respectively. While sulfur dioxide gas was the most chemical represented during 2022 with 30%.

Conclusion: Children were the most susceptible group to poisoning comprising about half of the total poisoning cases. Most poisoning incidents were due to pharmaceutical agents. Sedative/hypnotics (benzodiazepines) represented the highest percentage of them. While pesticides topped the list of non-pharmaceutical poisoning agents.

Recommendations: Certain laws should be implemented to ban certain drugs from being purchased without prescriptions. Improving clinical management of poisoning cases by ensuring available antidotes, training health care staff and establishing treatment guidelines.

Introduction

Poison can be defined as any substance that causes a harmful effect when administered, either by accident or intentionally, to a living organism. Poison is a quantitative concept, almost any substance can be harmful at some doses but without harmful effects at lower doses.

Acute poisoning is the exposure to a poison on one occasion or during a short period of time. Symptoms progress in close relation to the exposure. Acute poisoning represents a frequent cause of admission to emergency units, especially in developing countries.¹ The outcomes of acute poisoning are affected by many factors including the poison's nature, its consumed dose, the time between the exposure and the medical care, and the medical facilities' quality.²

Poisoning is considered a major public health issue and it's a preventable one. At the same time, it's an important contributing factor to morbidity and mortality worldwide.³ It was estimated by the World Health Organization (WHO) that poisons result in one million illnesses worldwide and 0.3 million deaths every year.⁴ Also, during the year 2000, poisoning was the ninth most common cause of death in young adults worldwide.⁵ In general, it is difficult to determine the exact number of poisoning cases that appear annually because most of them are actually not reported.⁶

Several poison types of medicinal and non-medicinal substances have been identified as common agents in poisoning. Medicinal substances include analgesics, anti-inflammatory agents, psychotropic drugs like antidepressants, and benzodiazepines related agents.⁷ The rational use of medicines means that the patients receive their medications suitable with their clinical needs, in the required doses, for a specific period of time, and at the lowest cost to them and their community. Anything contradicts that is considered irrational use and it's one of the main causes of acute drug poisoning worldwide.⁸ On the other hand, non-medicinal substances include chemicals like organophosphates, pesticides, insecticides, organic solvents, and household cleaning products such as bleach and caustics and were also found to be common causes of poisoning among children.⁷

Lifestyle and social behavioral changes resulted in the increase of the number of poisoning cases.⁹ For instance, the development in agricultural, industrial and pharmacological aspects has led to the increased availability of toxic substances like pesticides, medicinal agents and different

chemicals with much easier accessibility. This has also caused noticeable changes in the trends of poisoning.¹⁰

A differential relationship between poison types and geographic locations where poisoning incidences occur has been recommended. Certain types of poisoning substances are potentially more common and easier to access in specific geographic locations than others. For example, people of different ages in rural areas would have more chance of exposure to agricultural chemicals, whereas “over-the-counter” drugs intoxication such as paracetamol is more associated with urban areas.⁷ Therefore, morbidity and mortality vary with the variation of the place of poisoning and it changes over time.⁹

Accidental exposure to toxic agents is more likely in children whereas deliberate poisoning is more common in young adults.¹¹ Common causes of intentional poisoning include business failure, emotional disturbances, distress associated with examinations or chronic diseases.¹⁴ It's important to note that poisoning due to psychotropic medicine was most common among adolescents.⁷ Nevertheless, younger children are very susceptible due to their small size and not fully developed physiology. While older people tend to have chronic diseases with concomitant polypharmacy, so they may misidentify their medications and result in their incorrect use of them.⁸ Gender could be considered as another risk factor. Some studies showed that males primarily presented with drug abuse-related poisoning cases while females represent a higher rate of suicidal poisoning.¹⁰

Poisoning-related epidemiological surveillance is extremely important for evaluating the magnitude of the problem and assessing the risk factors.⁵ This includes the measurement of the nature, severity and outcomes of poisoning cases specific for each country in order to take proper preventive and management actions.¹² Acute poisoning represents a common cause for admission to the emergency departments with severe cases require staying in the intensive care units since they need constant monitoring and technical support.¹³

Aim of the study

The aim of this study is to assess the prevalence of poisoning with drugs, chemicals and household products and to review the determinants, circumstances and outcomes of intoxicated patients within a period of 3 years using data obtained from Poison Control Center in Basrah city, Iraq.

Methods

The present study is a retrospective hospital-based study conducted on acute poisoned patients admitted to different hospitals in Basra city over a period of 3 years. Case records of poisoning cases from January 2020 till December 2022. The data obtained from the electronic database and medical records of Basra Poison Control Center. The study variables included demographics (name, age, sex and residence); type (drug or chemical) and amount of the poison taken; place and time of admission; management of poisoning and outcome. The research protocol was approved by the Ministry of Health, approval from College of Pharmacy University of Basra and approval of the head of the Poison Control Center was taken. Patient consent was waived because this is a retrospective study based on medical records.

Statistical analysis:

This study was statistically evaluated using graph pad prism software (Version8) for analysis. Fraction of total used to calculate the percents and the Chi-square method for analysis and comparison. $P < 0.05$ considered significantly difference in contingency evaluation.

Results

The present work is a retrospective study where data and information collected for three years starting from January 2020 till December 2022 in the poison center in Basrah city, Iraq. A total number of 244 patients seeking for treatment are presented to different hospitals emergency rooms with chemical and/ or drug poisoning. All those were reported in Poison Control Center in Basrah city, Iraq. The total number of poisoning cases with drugs and chemicals during 2020 was equal to 81. This value decreased during 2021 and was equal to 67, and the largest number 96 poisoning cases during 2022. As shown in figure (1).

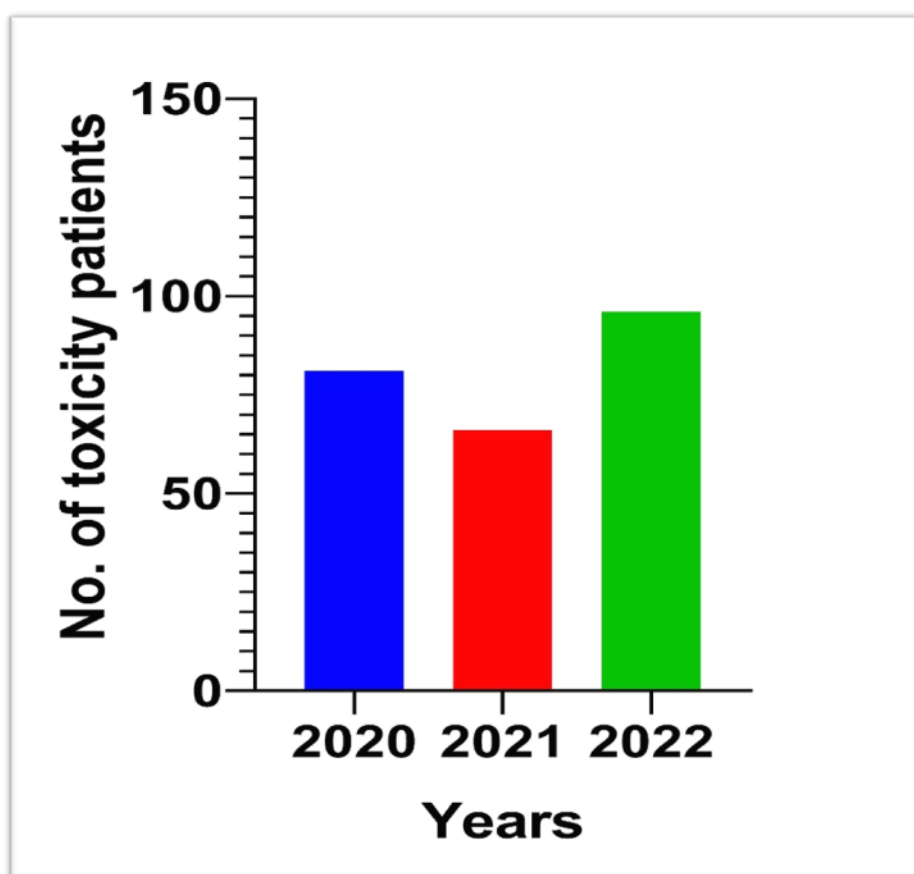


Figure (1): Number of toxicity cases per years

Drugs were responsible for 171 of poisoning incidents while chemical poisoning represented 73 of cases. The year 2022 remarkably revealed the highest number of drug poisoning cases with 70 cases, followed by the years 2020 and 2021 with 60 and 41 cases, respectively. Regarding chemicals poisoning, the year 2020 showed the lowest number of chemical poisonings with 21 cases. This value increased during 2021 and 2022 and was equal to 26 cases each. As in figure (2).

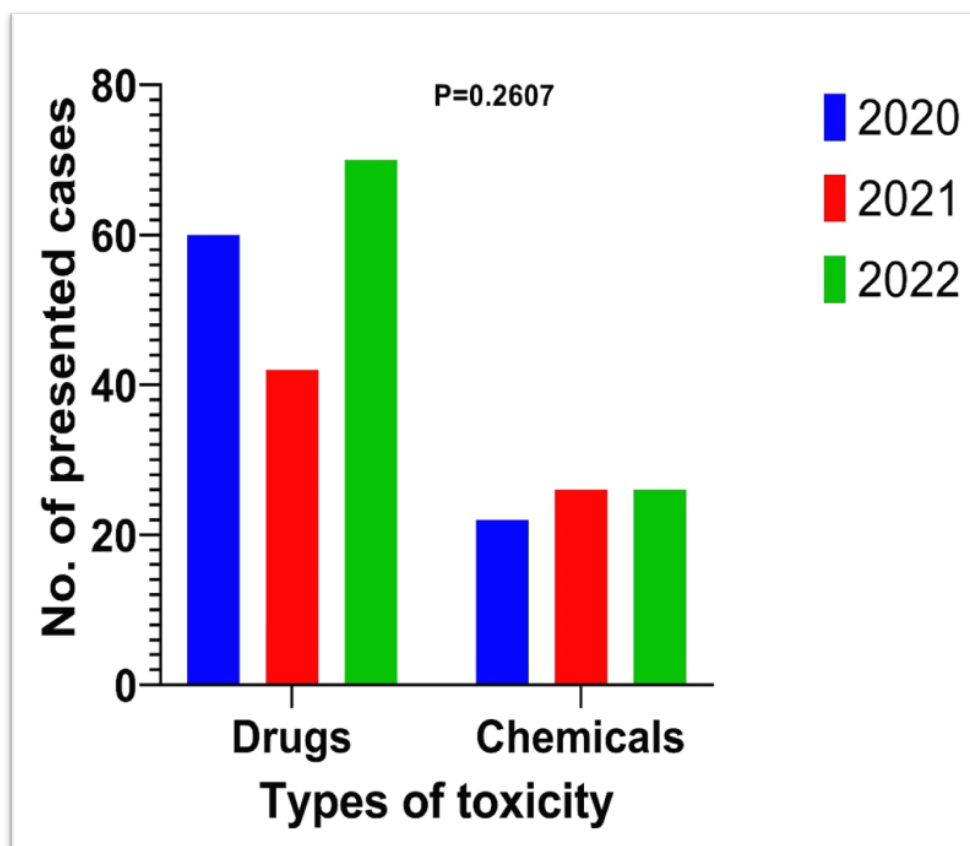


Figure (2): Types of compounds inducing toxicity

The study population during 2020 consisted of 46 males and 35 females. Children represent the most vulnerable group, involved in 52 of the cases, followed by adults (18) cases and adolescents (11) cases. As shown in figure (3). Age and sex distribution is not much different during 2021 from 2020, incidence of toxic exposure was more common in males compared to females (38 versus 29), Also children represented the higher number of poisoning cases 35, followed by adults 27 case and adolescents were the lowest age group involve 5 cases only. Figure (4). There was significant difference in age and sex distribution during the year 2022. Amongst the all-poisoning cases in different age groups, females (55) predominated over males (41). It was also observed that the majority of incidences were seen in adult age group (47), unlike the previous two years, followed by children 34 case and adolescents 15 case. Figure (5).

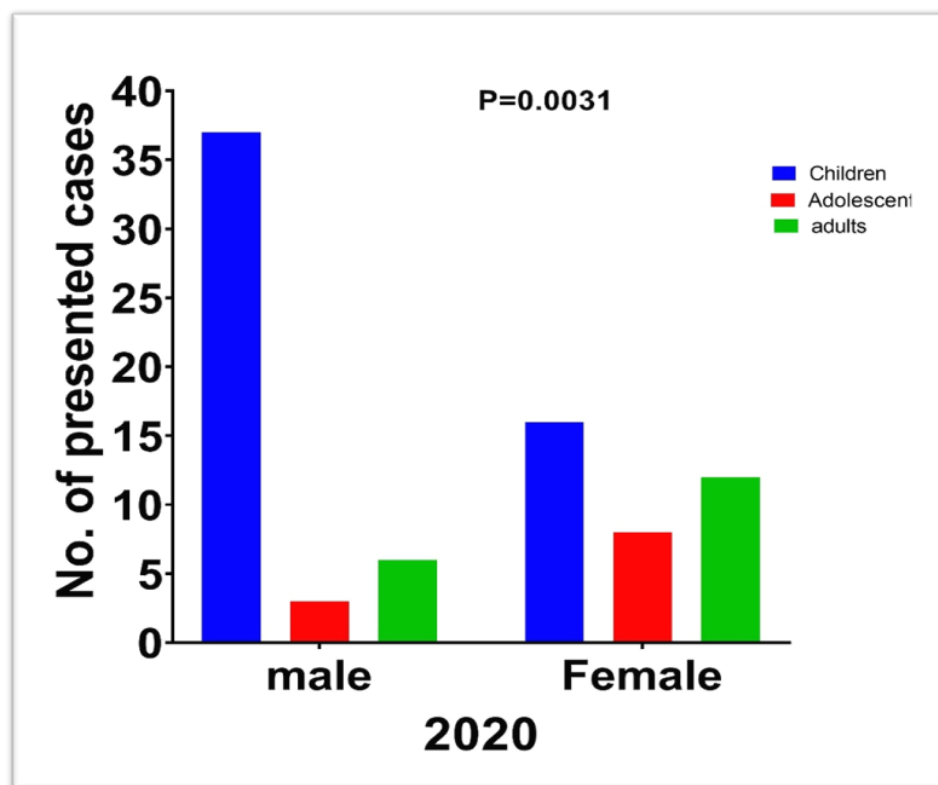


Figure (3): Age and sex distribution during 2020

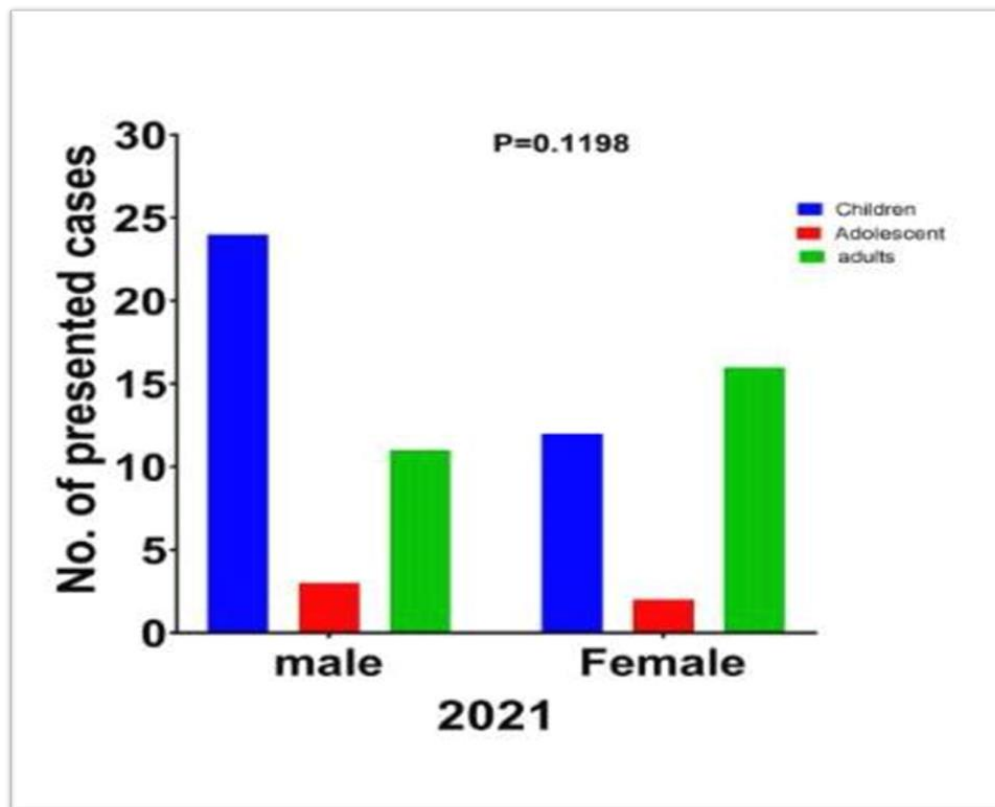


Figure (4): Age and sex distribution during 2021

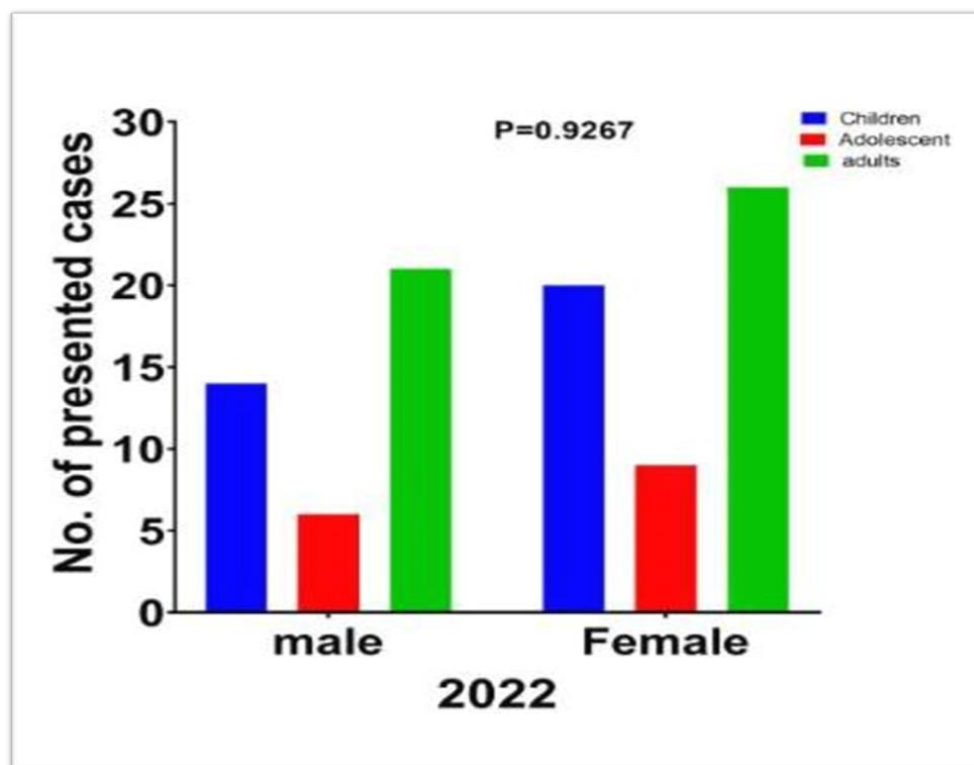


Figure (5): Age and sex distribution during 2022

During 2020 year, 60 drug poisoning cases were found. Benzodiazepines were the leading cause of poisoning (18%), followed by paracetamol (15%) and contraceptives (10%). Much less incidents include narcotics, aspirin, warfarin, multivitamins, iron supplements, cyproheptadine and each of them account for 5%. Each of quetiapine, pregabalin, chloramphenicol, dexamethasone, leflunomide, mefenamic acid, dextromethorphan, metformin, domperidone, vit D3 represent about 2.5% of the cases. Chemicals poisoning in 2020 involved a total of 21 poisoning cases, organophosphorus insecticides were the leading cause of chemicals poisoning (32%). Followed by zinc phosphide rodenticides (16%). Each of potassium permanganate, carbamate insecticides and zinc phosphate account for 8%. And 4% is the percentage of poisoning with each of imidacloprid insecticides, pyrethroid insecticides, collagen cream, kerosine, permethrin solution, silica gel, BAYSAN QAC. As shown in figure (6) and figure (7).

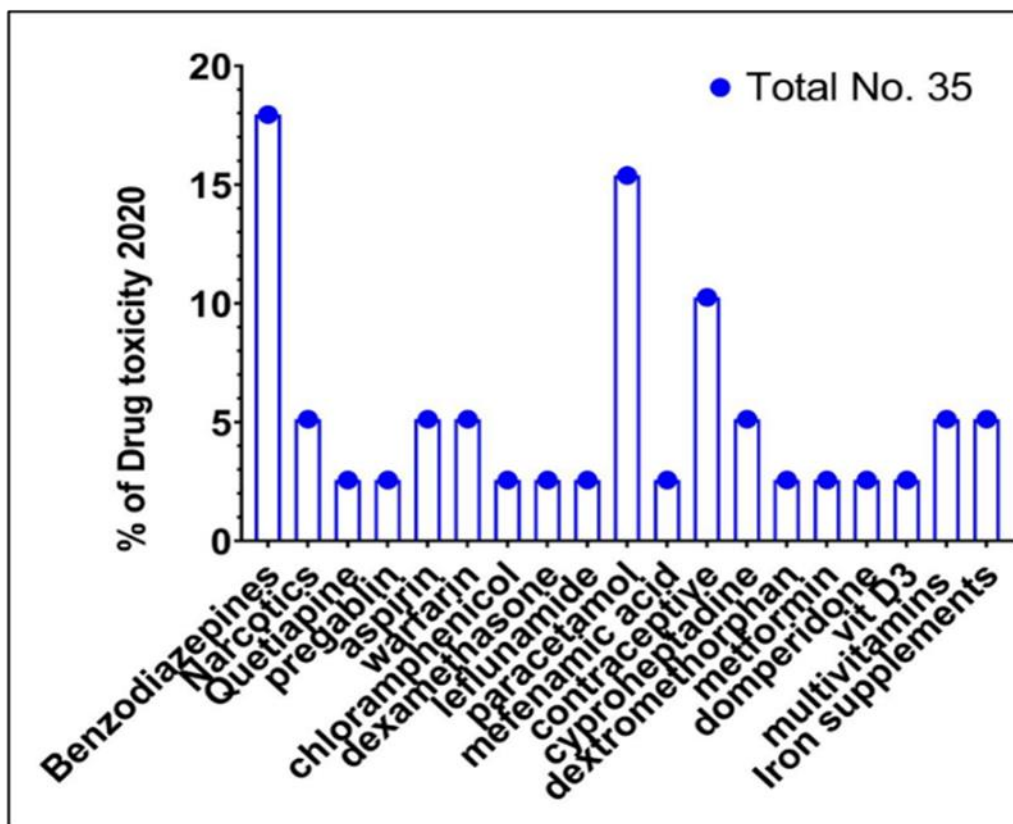


Figure (6): Drugs involved in drug poisoning cases during 2020

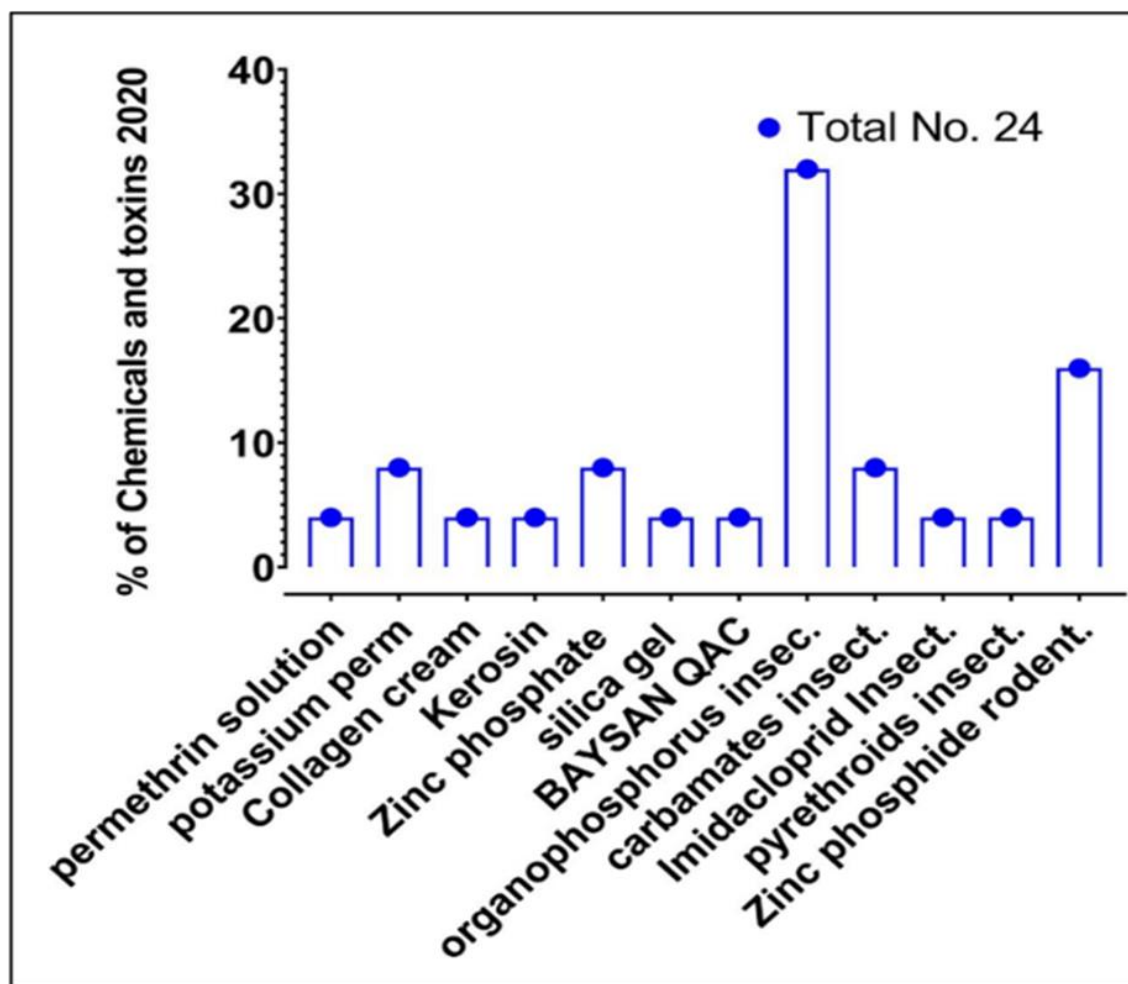


Figure (7): Chemicals involved in chemicals poisoning cases during 2020.

In 2021 year, for 41 drug poisoned cases, benzodiazepines stand for the highest percentage of drug poisoning as 29.5%. Followed by paracetamol (18%) and contraceptives (15%). Each of ondansetron and multivitamins represent about 7%. Also, each of candesartan, methyldopa, sunitinib, thyroxine, omeprazole and folic acid account for 3.5%. A total of 26 chemicals poisoning cases were found in 2021. Zinc phosphide rodenticides represent the highest percentage of chemicals poisoning (48%). Followed by organophosphorus insecticides (18%), chlorine (16%). For each of arsenic, ethanol, potassium permanganate, snake bite and scorpion sting, the percentage of poisoning is 4%. This is showed in figure (8) and figure (9).

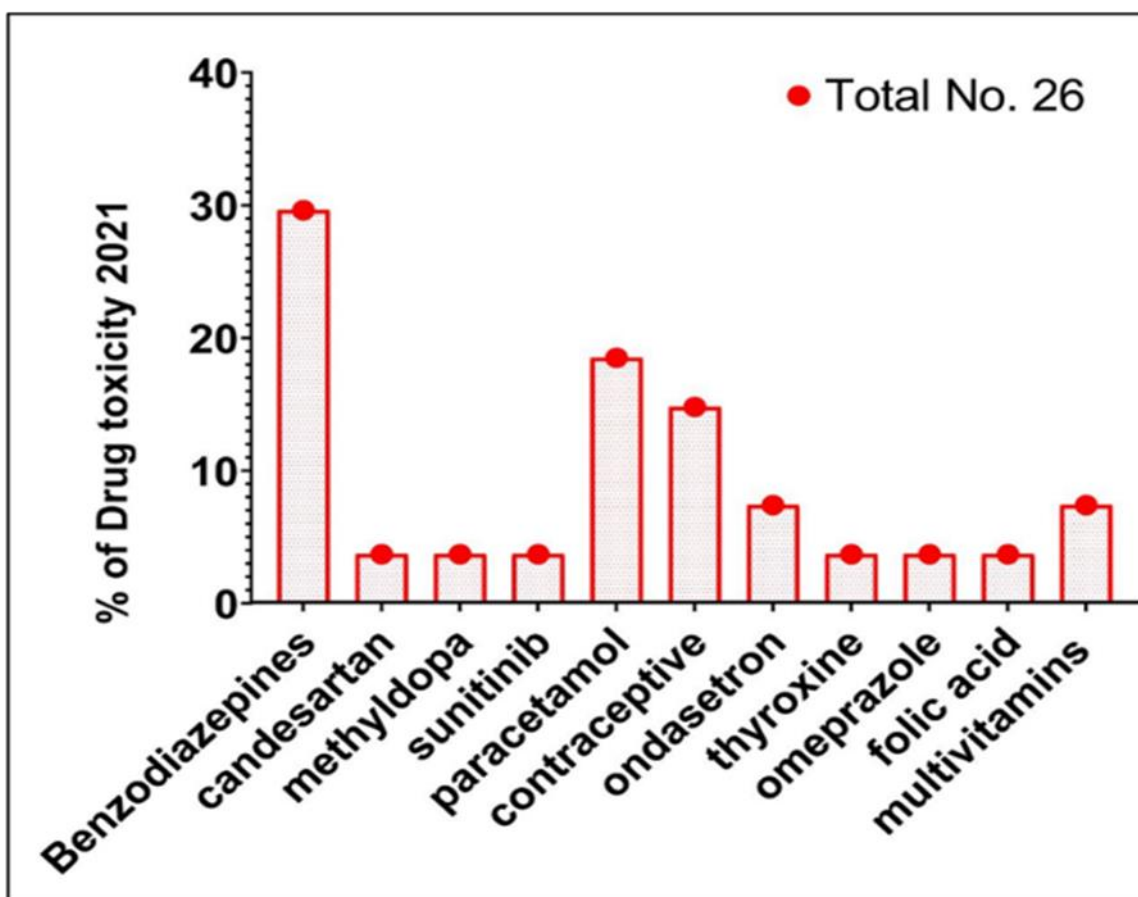


Figure (8): Drugs involved in drug poisoning cases during 2021

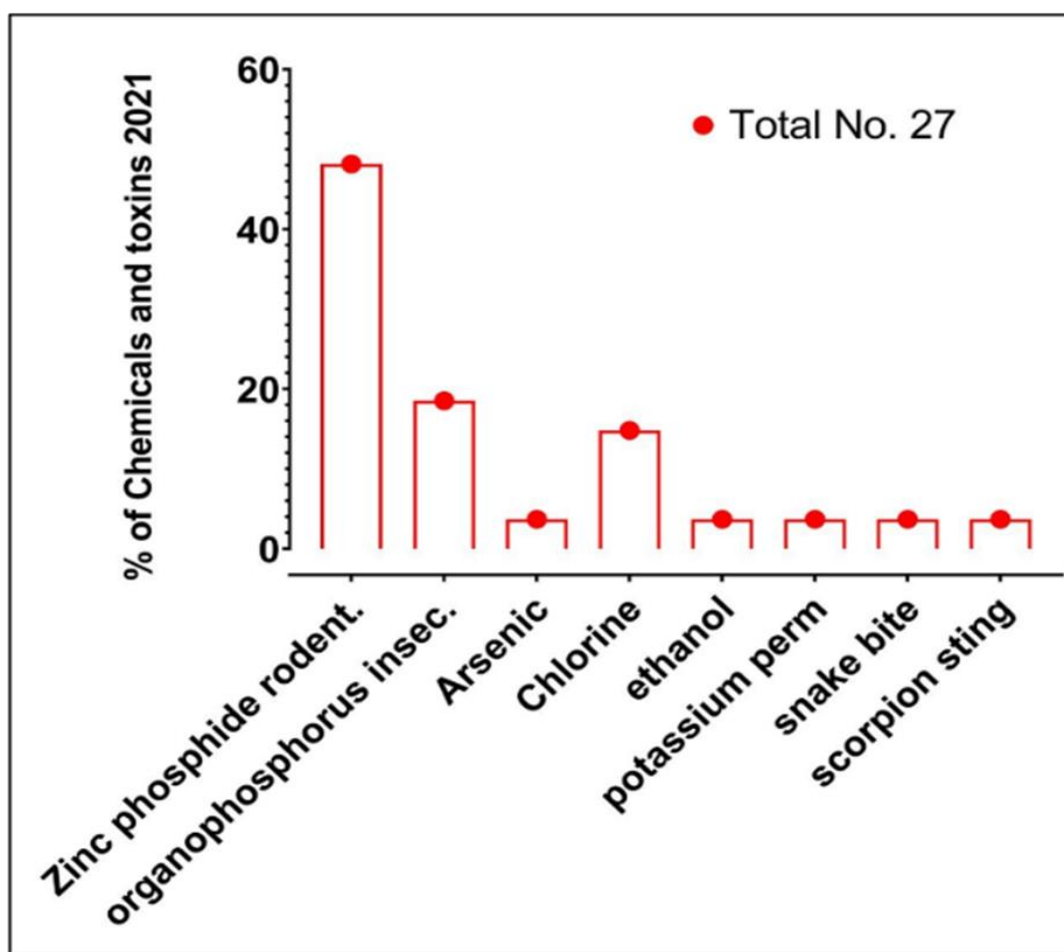


Figure (9): Chemicals involved in chemicals poisoning cases during 2021

During 2022, a total number of 70 drug poisoning cases occurred. Benzodiazepines comprise 23% of all of these cases. Paracetamol is second in order (18.5%). Followed by multivitamins (9%), tramadol (7%). Each of nifedipine, doxycycline, mefenamic acid, cyproheptadine, melatonin represents about 4.5%. The lowest percentage of 2% was found in each of amphetamine, pregabalin, bisoprolol, carbamazepine, montelukast, diphenhydramine, dextromethorphan and iron supplements. Also, during 2022, for 26 chemicals poisoning cases, the highest percentage of chemicals poisoning (30%) is sulfur dioxide gas poisoning. Second is rodenticides (20%). Each of organophosphorus insecticides and zinc phosphate represent 10% of those cases. While carbamate, cypermethrin, detergent (phenol), dettol, ethanol and cosmetic cream comprise the lowest percentage of 5% each. As in figure (10) and figure (11).

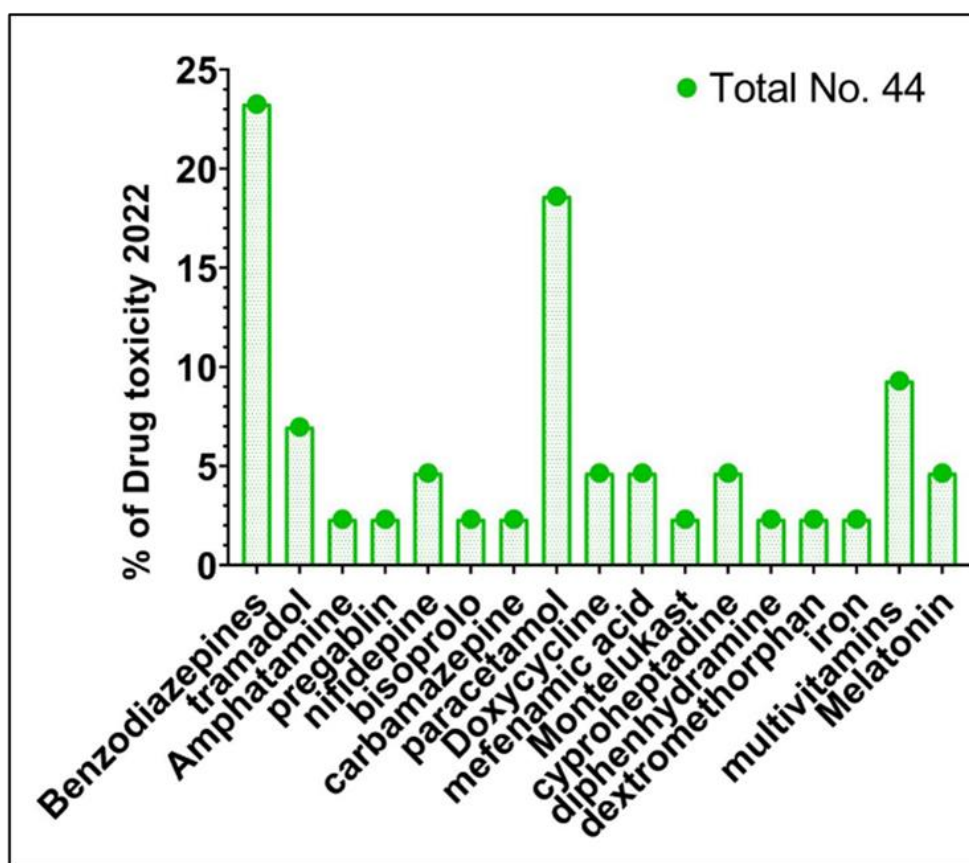


Figure (10): Drugs involved in drug poisoning cases during 2022

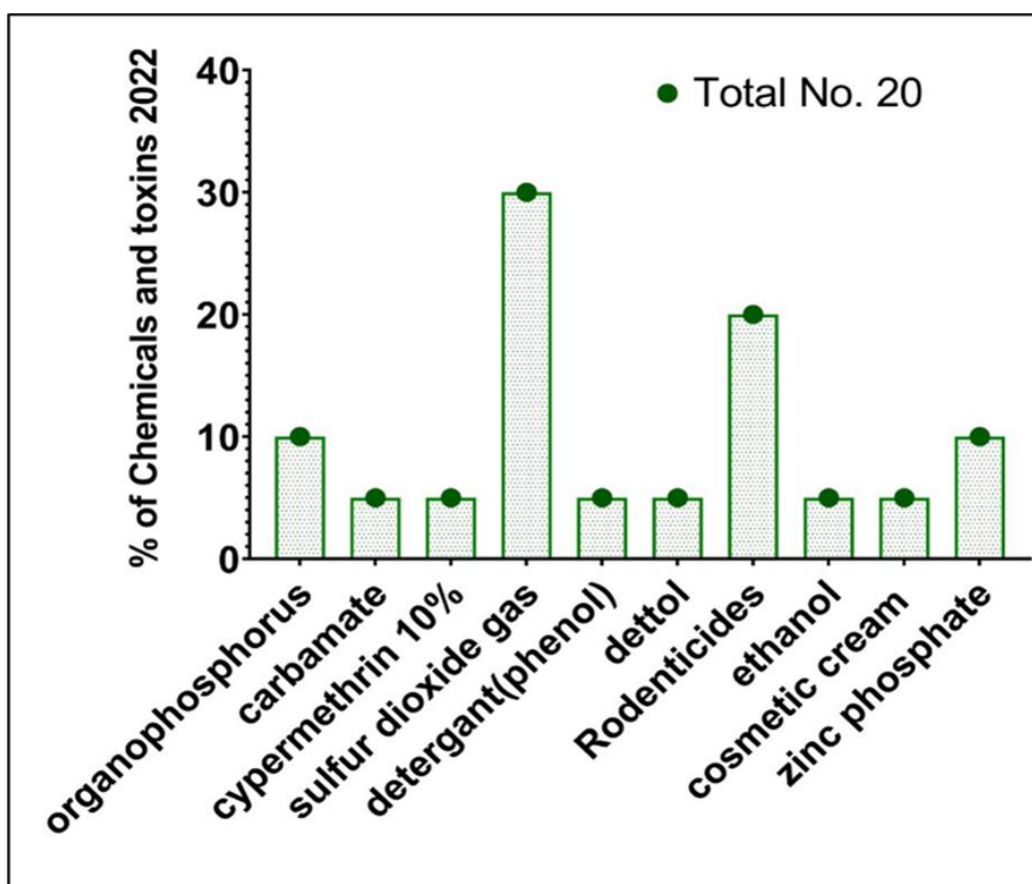


Figure (11): Chemicals involved in chemicals poisoning cases during 2022.

Discussion:

Poisoning is considered a major threat to public health. Until now, as far as we know, there is no epidemiological study about poisoning patterns in Basra city that has been published in international journals. Data obtained from the current study can be very helpful to assess risk factors, try to adapt preventive measures in this city specifically and to enlighten physicians regarding providing precise instructions related to the treatment.⁵ This study includes 244 poisoning cases reported to Poison Control Center from different hospitals emergency departments. It includes data from the years 2020, 2021 and 2022 with 81, 67 and 96 cases, respectively. Accurate data are difficult to obtain since many poisoned patients may not seek medical help and will be unreported. This could lead to misleading statistical information about the actual number of poisoning cases.¹⁰

In this retrospective study, males outnumbered females during both 2020 and 2021. This result is similar to the one obtained during a study in Karnataka and another one in Saudi.^{11,3} While during the year 2022, females numbers were higher than the males. Another study with females ratio higher than males is the one conducted in Egypt during 2019.⁶ This variation in the male to female ratios can be attributed to the different cultural trends and lifestyles.³

Our results revealed that about half of the total number of patients were children under seven years old. This was similar to a study in Egypt during 2012 which reported 58.2% of accidental poisoning occur in the age group between 1-10 years.¹ It is also similar to another study in Iran in which half of poisoning occur in children less than four years old.¹⁵ This is due to the fact that children in this age are more curious and have exploratory tendencies hence they try to put everything around them in their mouths. A greater number of these poisonings occur in small houses where the chemicals and household products are easily accessible by children, so parents should be fully aware of making their children's environment safer and more protected.¹ However, there are strategies to prevent and reduce poisoning in children. For example, avoiding using food or drink containers to store chemicals, drugs and house cleaners. Adults should not take their medication in front of children because they might think it's candy. Storing drugs and chemicals in cabinets that can be locked or keeping them on high shelves will also help.¹⁶

In the current study, drugs were responsible for the majority of poisoning cases while chemicals were with less poisoning incidence. This is similar to other studies in nearby countries like Iran and Egypt where pharmaceutical products were responsible for 77.7% and 59.5% of poisoning, respectively.^{5,6} On the other hand, 90% of patient in Sri Lankan cohort were poisoned with non-pharmaceuticals.¹⁷ This can be clarified by the fact that drugs can be easily purchased from pharmacies without a prescription, which is associated with improper usage of drugs. In addition, the city of Basra is an urban rather than a rural area. In urban areas, therapeutic drugs are more commonly used. This may be due to the higher incidence of chronic diseases or due to higher socio-economic level.¹

Benzodiazepines (centrally acting sedative/hypnotics) and paracetamol analgesic were the most commonly reported drug classes to cause poisoning incidents during the three years of our retrospective study. Benzodiazepines represent 18%, 29.5%, 23% of drug poisoning in 2020, 2021, and 2022, respectively. While paracetamol represents 15%, 18%, 18.5% consecutively. This whole pattern is similar to a study conducted in Cairo in 2015 where CNS depressants represent the highest percentage followed by analgesic poisoning.¹² Our retrospective study was conducted during the years of COVID-19 pandemic, that's why we think there were a lot of poisoning cases with multivitamins as there was a widespread use of them and their availability in about every house, there may be a tendency to increase the dose for the purpose of preventing infection. Poisoning due to multiple drugs was also observed during these years in the percentages (13%,17%,17%). Combination products were also involved in this category.

Pesticides, particularly organophosphorus insecticide, were the commonest agent involved in chemical poisoning during the year 2020 representing 32%, followed by zinc phosphide rodenticide (16%). This was similar to studies in different countries like Iran and India. In each, organophosphorus insecticide was the most reported poison.^{5,14} In contrast, during the year 2021, zinc phosphide rodenticide occupied the highest percentage (48%) followed by organophosphorus (18%). While in 2022, sulfur dioxide gas represented 30% followed by rodenticide. Sulfur dioxide results from the industrial combustion of coal and a common cause of air pollution¹⁸. It is usually involved in occupational poisoning. Our study reported some individuals poisoned with other types of pesticides like carbamate and pyrethroid insecticides.

Additional to pesticides, other chemical agents are connected to poisoning cases during these three years. Such as cleansing products, cosmetics, fuels like kerosene. Most of these household chemicals are caustic and corrosive and they are widely available.

Since this study is a retrospective one, some limitations to it include the difficulty in obtaining accurate information, missing data and the fact that there isn't a very regulated method for data collection.⁵

Conclusion:

This study revealed that children under 7 years old were the most vulnerable age group for poisoning in Basrah city during the period (2020-2022) as they represent about 50% of the total cases. Male children outnumbered the females in this age group while females were the predominant in older age group. The study doesn't reveal increasing of the number of poisoning cases with the years as the total cases during 2021 was less than that during 2020 while during 2022 the total cases are obviously increased. Most poisoning incidents were due to pharmaceutical agents. Benzodiazepines and paracetamol were the leading cause of drug poisoning. While pesticides were the most common agents causing poisoning with non-pharmaceuticals, especially organophosphorus insecticides and zinc phosphide rodenticides.

Suggestions for future work:

Future work should focus on obtaining additional information about records of mortality from poisoning cases, long term complication, hospitalization period, suicidal thoughts and route of administration. Investment in public health education about how to store toxic substances safely. Certain laws should be implemented to ban certain drugs from being purchased without prescriptions. Improving clinical management of poisoning cases by ensuring available antidotes, training health care staff and establishing treatment guidelines by obtaining poisoning information from different regions within the country.

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تقييم السمية الدوائية والتسمم بالمواد الكيميائية بين الحالات المعروضة في مركز السموم في مدينة البصرة في العراق

المقدمة: يعتبر التسمم مشكلة رئيسية على الصحة العامة و يمكن الوقاية منها. في الوقت نفسه، يعتبر التسمم عامل مهم يساهم في معدل المرض والوفيات في جميع أنحاء العالم. يمثل التسمم الحاد سبباً متكرراً للدخول الى وحدات الطوارئ ، خاصة في البلدان النامية.

الهدف: هدفت هذه الدراسة إلى تقييم مدى انتشار التسمم بالأدوية والمواد الكيميائية والمنتجات المنزلية ومراجعة محددات وظروف ونتائج مرضى التسمم خلال فترة ٣ سنوات باستخدام بيانات تم الحصول عليها من مركز مراقبة السموم في مدينة البصرة في العراق.

الطريقة: هذه دراسة استرجاعية أجريت على مرضى التسمم الحاد الذين تم إدخالهم إلى مستشفيات مختلفة في مدينة البصرة على مدى ٣ سنوات (٢٠٢٠، ٢٠٢١، ٢٠٢٢).

النتائج: بلغ العدد الإجمالي لحالات التسمم في هذه الدراسة (٢٤٤) حالة. وكان الأطفال هم الفئة العمرية الأكثر عرضة للتسمم ويمثلون ٥٠٪ من إجمالي الحالات. فاق الذكور (١٢٥) الإناث (١١٩). كانت الأدوية أكثر العوامل المسببة للتسمم (١٧١ حالة) ، كانت الادوية المهدئة التي تعمل على الجهاز العصبي المركزي (البزوديازيبينات) الاولى ترتيباً و تمثل (١٨ ٪ ، ٢٩,٥ ٪ ، ٢٣ ٪) في أعوام ٢٠٢٠ و ٢٠٢١ و ٢٠٢٢ على التوالي. مسكن الباراسيتامول ، في المرتبة الثانية و يمثل ١٥ ٪ ، ١٨ ٪ ، ١٨,٥ ٪ تباعا. كانت المبيدات (المبيدات الحشرية ومبيدات القوارض) هي السموم الأكثر استخداماً خلال عامي ٢٠٢٠ و ٢٠٢١ بنسبة ٤٨ ٪ و ٦٦ ٪ على التوالي ، بينما كان غاز ثاني أكسيد الكبريت أكثر المواد الكيميائية تمثيلاً خلال عام ٢٠٢٢ بنسبة ٣٠ ٪.

الخلاصة: كان الأطفال هم المجموعة الأكثر عرضة للتسمم ، مما أدى إلى ما يقرب من نصف إجمالي حالات التسمم. معظم حالات التسمم كان سببها الأدوية. مثلت الأدوية المهدئة و المنومة (البزوديازيبينات) النسبة الأكبر. بينما تصدرت المبيدات قائمة مسببات التسمم غير الدوائي.

التوصيات: يجب تطبيق قوانين معينة لحظر شراء بعض الأدوية بدون وصفة طبية. تحسين الإدارة السريرية لحالات التسمم من خلال ضمان توافر الترياق وتدريب موظفي الرعاية الصحية ووضع مبادئ توجيهية للعلاج.



جامعة البصرة كلية الصيدلة



تقييم السمية الدوائية والتسمم بالمواد الكيميائية بين الحالات المعروضة في مركز
السموم في مدينة البصرة في العراق



الباحثين:

فاطمة توفيق حميد

ضحى عسل بداي

فاطمة حسن خلاطي

بإشراف :

م.م علي محمد جاسم

ماجستير أدويه

أ.د. اسامه ايوب يعقوب

دكتوراه ادويه وسموم