Acute drug intoxication in childhood: a 10-year retrospective observational single-centre study and case reports

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Background. Medication poisoning in children is a severe condition that can endanger a child's life. Although drug intoxications are easily preventable, awareness of the proper handling of drugs and their safe storage out of the reach of children is not widespread among the general public. In this work, we investigated the demographic and clinical data of children admitted to the Department of Pediatrics of the University Hospital Olomouc for acute drug-induced intoxication. We also selected several case reports to illustrate the wide range of both presentations and outcomes in individual patients.

Method. Cases of drug-induced intoxications were selected from a group of patients under the age of 19 years admitted to the hospital for poisoning between January 1, 2010, and December 31, 2019. Medical records of these patients were prospectively evaluated, and overview tables and graphs of predefined research objectives were created.

Results. During the given time period, 162 children with suspected drug intoxications were hospitalized at the Department of Pediatrics, University Hospital Olomouc. Of these, 108 cases were reported in girls and 54 in boys (66.7% vs. 33.3%). In 16 cases (9.9%), there was a severe intoxication requiring follow-up intensive care. There was also one case of fatal accidental intoxication. Most poisonings were seen in toddlers (65; 40.1%). Intoxication with suicidal ideation was found in 44 cases (27.2%), with a higher incidence of suicide attempts in girls (40 vs. 4). Repeated intoxication was recorded in nine cases. Analgesics were the most common drug group (61; 37.7%), with paracetamol (28; 17.3%) being the leading drug. In 154 cases (95.1%), the drugs were taken orally, most often in the form of tablets.

Conclusion. Accidental drug intoxications most frequently occurred in the age group from one to three years old. The second highest incidence was among adolescents most of which were suicide attempts. Analgesics and psychoactive agents accounted for the majority of cases. Medications should be kept in places where children cannot reach them.

Key words: medication poisoning, drug intoxication, children, adolescents

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INTRODUCTION

In addition to injuries, poisoning is one of the most common acute conditions which pose a threat to the health and life of children and adolescents. According to the data published by the Toxicological Information Centre (TIC) in Prague, most of the poisonings are caused by drugs (38.8% of all poisonings) in both adults and children. The data available also show that the number of drug intoxications in the Czech Republic is increasing every year. As of December 2019, a total of 11,510 cases of intoxication were recorded in children under 15 years of age. Drug intoxications are most commonly observed in toddlers aged one to three years. Most intoxications at this age are accidental. Particularly at such a young age, drug overdose can cause irreversible damage to the body and acute conditions resulting in the child's death. Intoxications caused by a parent or another family member resulting from administering a wrong dose are typical in children under six months of age[1,2]. The second most numerous age group at risk of intoxication are adolescents from 15 to 19 years of age. This primarily includes intentional intoxication as a method of suicide attempt[3]. Many adolescents deal with problems in relationships, school, or family background. In these long-term uncomfortable situations, they see suicide as a possible way out of their misfortune. Fortunately, these attempts are merely demonstrative, and most of these individuals are deterred by their own actions and seek professional help. Drug intoxications are reversible by medical intervention and usually do not end in death. However, they may result in long-term damage to the body, especially to the liver and kidneys.

In terms of errors and accidents associated with misadministration of prescription drugs, the victim typically is a very young child. This includes situations involving an accidental swap of medications or their inappropriate use and dosage. Misunderstanding of dosage regimen

instructions may be another cause; moreover, it is not uncommon for different family members to give separate doses independently of one another[4].

A toxic dose of a certain active substance is determined individually for the given age of the child. The concentration of the intoxicant is estimated according to the number of tablets or another dosage form. An initial estimate of the intoxicating dose is used in collaboration with the TIC to determine the severity of the condition and to decide on an immediate primary intervention. There are qualitative tests intended to determine the presence (absence) of an ingested intoxicant in the body. Moreover, a quantitative toxicological analysis of plasma is used to more accurately determine the current concentration of the substance in the body. Another possibility for detecting the substance in the body is a toxicological examination of gastric contents and urine.

Virtually all drug groups can cause harm if overdosed. Cardiovascular medications, particularly calcium channel blockers, beta blockers, and digoxin, pose a significant risk. Other dangerous, commonly available drugs include opiates, antipsychotics, and anticonvulsants. However, drug intoxications are most often caused by analgesics, especially paracetamol and ibuprofen. In the case of suspected and confirmed intoxication, it is necessary to consider a possible intervention, which is governed by the time from the introduction of the substance into the body, the type of substance, pharmaceutical form, route of administration, and clinical presentation of the patient. The intervention is based on elimination of the substance from the organism. For immediate elimination from the body, the substance is removed from the stomach by inducing vomiting, aspirating the stomach contents or rinsing the stomach and administering activated charcoal, or a combination of administering activated charcoal and a laxative, also known as gastric lavage. These procedures are most effective within an hour after ingestion, in the case of fluids within 15 min. Exceptions are the ingestion of sustained-release dosage forms, drugs with anticholinergic effects, and severe poisoning associated with gastric and intestinal atony. Secondary elimination is indicated after absorption of a drug into the circulation and tissues. These methods include forced diuresis, peritoneal dialysis, extracorporeal methods such as haemodialysis, and haemoperfusion. Forced diuresis has a questionable effect and a relatively high risk of water and ion imbalance. Substances suitable for dialysis have a small molecular weight, small distribution space, and low binding to plasma proteins (e.g. salicylates, methanol, ethylene glycol, lithium, isopropanol). Haemoperfusion is suitable for substances with low water solubility and high affinity for absorbents and low affinity for plasma proteins (carbamazepine, barbiturates, theophylline). Haemofiltration removes substances with a higher molecular weight. Administration of lipid emulsions (Intralipid®) is indicated in acute poisoning by cardiotoxic drugs when severe cardiac symptoms cannot be managed in any other way. Their fat solubility is a prerequisite. It is used in the treatment of poisoning by certain beta blockers, calcium channel blockers as well as some cardiotoxic antidepressants, antiepileptics, and antipsychotics. If an antidote for a given drug class is known and available, in addition to using elimination methods, it is necessary to administer this specific antidote[5].

Few studies are available on drug intoxications exclusively. Moreover, most are based on a larger sample of the pediatric population and include all types of poisoning without detailed specification of the substances, circumstances, and motives for use. Other studies, on the other hand, deal with intoxications only caused by a selected drug group, such as opioids[6]. Specific case reports of intoxications could not be found in the available literature. Therefore, we decided to analyze cases of pediatric drug intoxications admitted to the Department of Pediatrics of the University Hospital Olomouc in the last 10 years, and to compare our results with studies available in the literature. In addition, several case reports are presented which are of interest for their circumstances of poisoning, symptomatology, and clinical course. Another goal of this paper is to draw attention to the risks of improper storage of medicines in households. Most cases of poisoning in children can be easily prevented by sensible parent behaviour. Damage to a child's health, the need for hospitalization, and medical interventions are thus obviated[7].

AIM OF THE STUDY

The study aimed at evaluating medication poisonings which resulted in an admission of pediatric patients to Olomouc University Hospital from 2010 to 2019. Accidental intoxications were distinguished from suicide attempts, and the most commonly represented drugs and drug groups which children have access to were identified. Furthermore, demographic indicators of the studied pediatric population were evaluated.

METHODS

We conducted a retrospective observational study. All admissions were screened in the electronic Hospital Information System. A cohort of patients under the age of 19 years admitted to the DP for suspected drug intoxication in the period from January 1, 2010 to December 31, 2019 was selected from this system. Patients who were admitted because of intoxication by alcohol, "street" drugs, chemical compounds, poisonous plants, food or other noxious agents were excluded from the study. Cases of adverse drug reactions arising from appropriate treatment were also excluded from the final cohort. Medical records were studied in detail, and toxicological analysis was evaluated in each case. The study was conducted following the guidelines of the latest Declaration of Helsinki. All data were processed anonymously.

The collected data included: age of the patient at intoxication, sex, the substance and its formulation, administration route, source of the agent, cause of poisoning, unintentional or intentional intoxication, repeated intoxication, presenting complaints and clinical signs and

Table 1. Distribution of patients admitted for acute drug intoxication according to their age and sex.

Age group	Age	Number of patients (%)	Female (%)	Male (%)
Newborns	0–28 d	0 (0)	0 (0)	0 (0)
Infants	29–364 d	10 (6.2)	7 (6.5)	3 (5.6)
Toddlers	1–3 y	65 (40.1)	34 (31.5)	31 (57.4)
Preschoolers	3–6 y	19 (11.7)	9 (8.3)	10 (18.5)
Early school-age children	6–11 y	7 (4.3)	5 (4.6)	2 (3.7)
Schoolchildren	11–15 y	28 (17.3)	23 (21.3)	5 (9.2)
Adolescents	15–9 y	33 (20.4)	30 (27.8)	3 (5.6)
Total	0–9 y	162 (100)	108 (66.7)	54 (33.3)

symptoms on admission, the severity of the condition, treatment for the individual condition, the length of hospital stay, the need for longer hospitalization in the ICU, and information on the patient's condition at discharge.

The results of the toxicological analysis, including detection of toxic agents in the gastric content, blood, and/or urine, and measurements of plasma levels of the substances were evaluated. The following methods were used at the Department of Forensic Medicine and Medical Law for toxicological analysis: thin layer chromatography (TLC); fluorescence polarization immunoassay (FPIA); gas chromatography-mass spectrometry (GC-MS); gas chromatography with electron capture detector (GC-ECD); and high-performance liquid chromatography (HPLC). Continuous data were expressed as mean ± standard deviation, while categorical variables as frequency and percentage.

RESULTS

Demographic data and clinical presentations

During the given ten-year period, 162 cases of suspected drug intoxication were analyzed in our study.

Of these, 108 cases were reported in girls and 54 in boys (66.7% vs. 33.3%). Most poisonings were observed in toddlers aged one to three years old (65; 40%). The adolescent age group had the second greatest representation (33; 20.4%), followed by older school children (28; 17.3%) and preschoolers (19; 11.7%). For more details, see Table 1. The mean age of the patients was 7.2 years (Table 2). Most cases (118; 72.8%) were accidental intoxication, 110 cases were intentional and eight being treatment mistakes of the parents or another family member. Repeated intoxication was recorded in nine cases; however, only six of them were included in this patient cohort. Other cases occurred outside the observed period, or their admission took place in another medical facility. In one case, there was a repeated overdose associated with benzodiazepine abuse.

On admission, 48.1% of patients reported no symptoms or showed no clinical signs. The most common manifestations of intoxication were neurological symptoms, particularly of an inhibitory nature (25.9%), such as malaise, drowsiness, somnolence, bradypsychia, and confusion. The second largest group of symptoms were gastrointestinal problems such as nausea, vomiting, abdominal pain, and diarrhoea which were seen in 18.5%

Table 2. The mean ages of children with drug intoxication.

Mean age	Years
Total	7.17
Female	8.62
Male	4.28
Accidental intoxication	4.43
Suicide attempts	14.36

Table 3. Classification of drugs causing intoxication according to the pharmaceutical groups.

Pharmaceutical groups causing intoxication	Frequency of cases
Analgesics	61
Analgesics-antipyretics	28
NSAIDs	27
Psychotropic drugs	54
Benzodiazepines	18
Antidepressants	18
Cardiotropic drugs and antihypertensives	30
Beta blockers	10
ACE inhibitors	6
Calcium channel blockers	6
Neurologic system agents	18
Antiepileptics	12
Centrally acting muscle relaxants	3
Antihistamines	12
Dermatological drugs	7
Respiratory drugs	5
Vitamins	5
Thyrotropic drugs	4
Proton pump inhibitors	3
Minerals	3
Others	18
Antiuratics	2
Antiemetics/antivertigo drugs	2
Anticoagulants	2
Unknown	2
Antibiotics	1
Prokinetics	1
Gallstone drugs	1
Venotonics	1
Alpha-1 adrenergic receptor antagonists	1
Decongestants	1
Parasympatholytics	1
Antidiabetic drugs	1
Capillary stabilizing agents	1

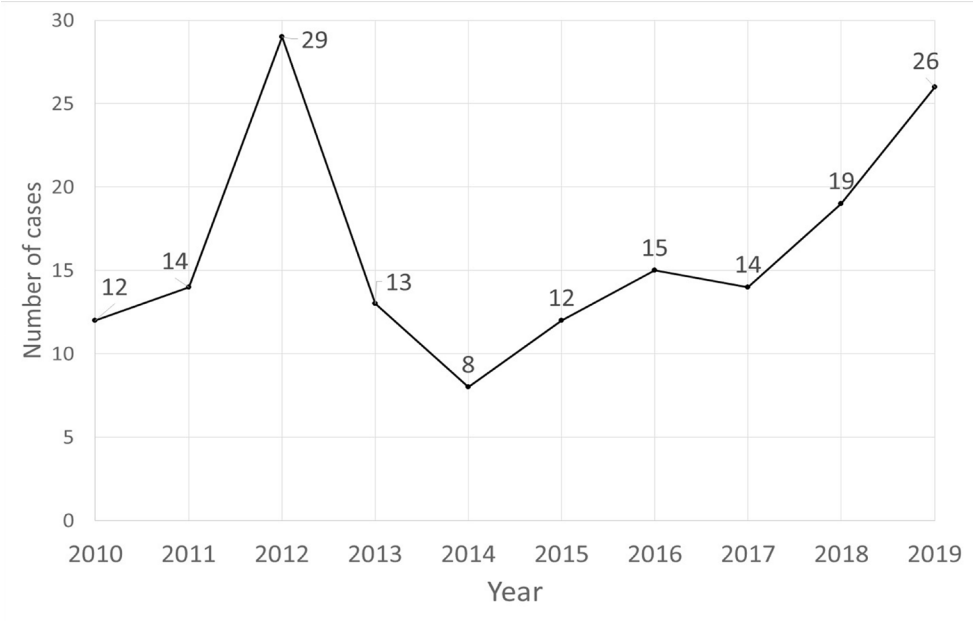

Fig. 1. Pediatric intoxication rates in individual years.

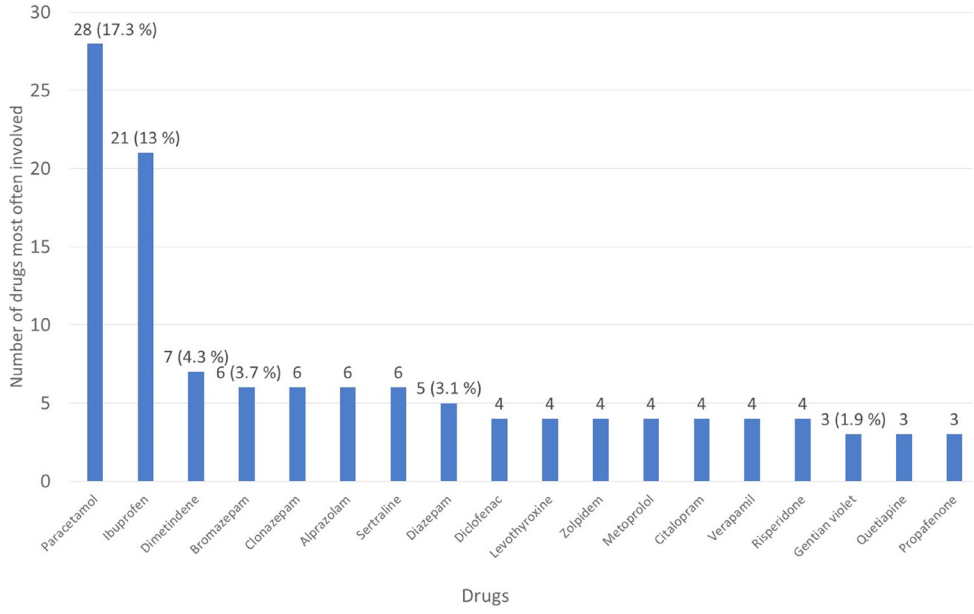

Fig. 2. The drugs most commonly involved in pediatric intoxications in the study period and frequency of their use (with percentages of cases).

of cases. Other uncommon symptoms included excitatory neurological manifestations, tachycardia, headache, vertigo, convulsions, unconsciousness, dyslalia, collapse, and hallucinations.

In the majority of patients (84.6%), the condition improved within three days of hospitalization. The average length of hospital stay was 2.47 days. The longest hospitalization lasted 17 days, the shortest one half a day. In 16 cases (9.9%), there was a severe intoxication requiring longer follow-up intensive care. During the study period, there was only one case of fatal accidental intoxication. The main therapeutic strategy was to eliminate the substance from the body by gastric lavage and/or by administering an adsorbent in the form of activated charcoal. The next step was the administration of a possible antidote, correction of fluid and mineral management, and treatment of symptomatic problems. Most patients were discharged home in a good clinical condition. Sixteen patients were transferred to a psychiatric ward or their catchment hospital.

In the last 10 years, the average number of drug intoxications was 16 cases a year. A steady trend of an increasing number of drug intoxications in children could be observed during this time period, with a maximum deviation in 2012 (29 cases) due to an unusual increase in suicide attempts. A detailed graph is shown in Fig. 1.

Intoxication agents

The most common drug group was analgesics which were used in 37.7% of cases. Psychotropic drugs were the second most abundant group of drugs (33.3%). Paracetamol was the most common drug causing intoxication in 17.3%, followed by ibuprofen in 12.9% of cases. Dimethindene, bromazepam, clonazepam, alprazolam, sertraline, and diazepam were used repeatedly in at least five cases. Less frequent drugs included diclofenac, levothyroxine, zolpidem, metoprolol, citalopram, verapamil, risperidone, gentian violet, quetiapine, and propafenone. In individual cases, the source of intoxication was the following: salicylic acid, levocetirizine, meloxicam, folic acid, moxastine teoclate, buprenorphine, dosulepin, atropine, bisulepin, tizanidine, melperon, betaxolol, codeine, tiapride, sertraline, tramadol, zolpidem, oxazepam, escitalopram, fluoxetine, aripiprazole, carvedilol, cholecalciferol, ferric oxide, phenoxymethylpenicillin, warfarin, perindopril, indapamid, trandolapril, propafenone, thiethylperazine, dextromethorphan, clenbuterol, zinc oxide, dutasteride, oxymetazoline, telmisartan, valproate, cholecalciferol, piroxicam, pyridostigmin, venlafaxin, losartan, furosemide, amlodipine, oxycodone, spironolactone, pregabalin, omeprazol, enalapril, atenolol, fluvoxamin, ramipril, mephenoxalone, baclofen, tizanidine, guaifenesin, theophylline, nebivolol, isotretinoin, pantoprazole, dropropizine, allopurinol, ursodeoxycholic acid, trazodone, olanzapine, clozapine, and sorbiferol. A detailed overview of the most frequently used drugs is shown in Fig. 2. Also, see Table 3 for drug classification according to pharmaceutical groups.

The route of administration was almost exclusively oral (in 95.1%). Solid dosage forms (tablets and capsules) accounted for 83.3%. The second most frequently ingested dosage form were liquids which included oral solutions, solutions and oils for external use, eye drops, and nasal drops. A transdermal therapeutic system, suppositories, and ointments were reported infrequently (2.5%).

Toxicological tests were indicated in almost all patients. Gastric content, and serum and urine samples were taken as a standard to determine the concentration of the drug or its metabolite in the body. When no gastric lavage was performed, only serum and urine samples were evaluated. Qualitative confirmation by TLC or GC-MS was performed in urine and gastric content. Plasma concentrations of the substance were measured. In 28.4% of cases, the presence of a substance in the body was not shown.

Intentional intoxication

Intoxication with suicidal intention was observed in 44 cases (27.2%). In five of these children, it was a repeated action. Suicide attempts were most often demonstrative as a result of a bleak situation in the family, school, or relationship. These intentional intoxications were meant to draw attention, and there was no real intention to harm. In several cases, it was a culmination of a depressive episode. Few children made serious suicide attempts when, even in a subsequent psychological-psychiatric examination, they indicated a desire to die.

The highest incidence of suicide attempts was in girls (91.1% of all suicide attempts). The mean age at suicidal intoxication was 14.3 years. Two peaks in the frequency of these suicide attempts were recorded, with 11 and 10 attempts in 2012 and 2019, respectively. None of them resulted in death. The only dosage form chosen was tablets. In four cases, over 50 tablets were ingested. A mixture of at least two drugs was used in half of the intentional intoxications, and a single drug in the other half (47.7% vs. 52.3%). The most commonly chosen drugs were paracetamol, used in 14 cases, and ibuprofen, used in 11 cases. Other frequent drug classes were antidepressants, with sertraline as the leading agent (four cases), and anxiolytics, of which alprazolam was chosen most often. Antihistamines, cardiovascular and antipsychotic medications were also involved repeatedly. In several cases, the toxic effect was intentionally potentiated by alcohol.

DISCUSSION

The prevalence of intoxication by drugs in the pediatric population has an increasing trend. Burghardt et al. found a correlation between adult drug prescriptions and rising pediatric exposures and poisonings[8]. Children have increasing access to drugs. There have been many cases of children playing with drugs which they found at home. In our study, of the 118 cases of accidental intoxication, 110 were found to be caused by children's self-exposure. The most vulnerable group were children under three years of age. At this age, children begin to be more active, more mobile and start to discover the world around them by putting things in their mouths. A Northeast Romanian study described the highest incidence of intoxication by drugs in children aged 2–3 years[9]. In other published studies, data can be found on cases of medication poisonings in children where 72% were younger than five years of age[10] or in those younger than six years[11]. Data from Israel showed that 82.7% of reported pediatric poison exposures were in children under five years old, with most exposures occurring at home[3].

The severity of intoxication often depends on the household where the child grows up. In the household of young and healthy parents, children usually do not have an opportunity to find drugs. The risk is higher in households where chronically ill or older people with chronic diseases live. In the National Poison Data System of the American Association of Poison Control Centers, child self-exposure to prescription products predominated (55%) (ref.[12]). Lin et al. showed that neurologic system agents and analgesics were the most common causes of poisoning. Anxiolytic/hypnotic drugs (lorazepam) and acetaminophen were the most frequently used drugs from the former and latter groups, respectively[13]. In our cohort, intoxication by analgesics and antipyretics occurred most commonly, followed by psychotropic drugs. Paracetamol and ibuprofen were the most widely represented drugs. These analgesics are very popular among people for their great effectiveness, minimal side effects, low price, and availability on an over-the-counter basis. As a result,

these analgesics are usually available in most households. Parents underestimate the toxic effects of paracetamol and ibuprofen, ignore their safe storage, and leave them in easily accessible places[14]. All this determines the primacy of analgesics in pediatric intoxications. Increasingly used slow-release drug formulations which usually contain larger amounts of the active compound can lead to an unpredictable clinical course of intoxication[4]. Similar data can be found in a study from Qatar where analgesic and antipyretic medicines, specifically paracetamol, were the most common agents ingested by children as well[15]. Koh et al. cite analgesics/antipyretics and antihistamines as the most common product involved in poisoning[16]. The drugs involved in intoxication in a study from Northwest Romania were: anticonvulsants, non-steroidal anti-inflammatory drugs (NSAIDs), and paracetamol[9].

Children at young ages discover the world by their mouths, as mentioned above. Therefore, it is no surprise that the most frequent route of administration is by mouth. In our study, it accounted for 95% of the cases. The common occurrence of oral intoxication is evidenced in a study by Lin et al. in which all children were exposed by oral route[13]. In a study from Singapore, it was 98% (ref.[16]).

In our 10-year data collection, there was a clear predominance of intoxication in girls over boys. The exact ratio was 108 girls versus 54 boys. These results might be quite misleading since other studies show similar numbers for both sexes. For example, in a study from Taiwan, there were 39 boys (44.8%) and 48 girls (55.2%) (ref.[13]). The significant difference between girls and boys in our study was caused by having included 40 cases of suicidal poisoning in all the 108 cases of intoxication in girls.

Girls made up the majority of suicide attempts. In our hospital, there were 44 cases of suicide attempts by ingestion of drugs. Of these 44 cases, there were 40 girls and four boys. Similar data can be found in the TIC database. The TIC database suggests that girls have a higher incidence of suicide attempts by drug intoxication than boys. A study by Duramaz et al. showed that suicide attempts were significantly more frequent in girls. Among 12 suicide cases, there were 11 girls and only one boy[17]. This predominance of girls in suicidal intoxication could be due to the fact that girls generally use "more aesthetic" ways. By contrast, boys tend to seek more drastic ways of suicide. In general, it is not hard for adolescents to get drugs for their suicide attempts.

Paracetamol and ibuprofen were used most frequently, which is in agreement with a study by Zakharov et al.[18]. The reason why these two medications were the most common is probably that they can be found in almost every household. Adolescents can buy them without prescription, too, because in the European Union paracetamol is a non-prescription drug in pharmacies and non-pharmacy stores[14]. In another study, antidepressants or combinations of drugs were common in suicide attempts[10]. According to the TIC, the most commonly abused drugs were those affecting the nervous system and NSAIDs (ref.[18]). In our study, some patients only took a single drug, while others combined two or more drugs. The mean age of adolescents attempting suicide was 14.26 years for girls and 14.44 years for boys. These findings are consistent with a study by Duramaz et al. in which the mean age for girls was 14.2 years[17].

Children usually stayed in hospital for two days. In some cases, the actual drug intoxication was not confirmed, and the children were kept in hospital for 48 h for observation. Similar data can be found in a U.S. study in which 96% of patients were hospitalizated for 48 h (ref.[18]). The longest hospitalization took 17 days. It was a 2-year-old boy intoxicated by verapamil and propafenone. This case ended with the child's death. Luckily, it was the only fatal case of drug intoxication during the 10-year period in our hospital.

Pediatric drug poisoning is a common, preventable child injury. Ways to prevent these intoxications include the use of child-resistant packaging and drug take-back programmes[19]. Another important part of prevention is instructing parents on proper storage and usage of medicines for children. The former can be achieved by using lockable first-aid kits or another place outside children's reach since especially young children find medicine quite appealing for its colourful design and tend to play with it. As for the latter, in our study there were six cases of accidental intoxication (out of 117) caused by wrong drug dosage. To avoid these accidents, parents should be properly instructed on the risks of child overdose. In the prevention of drug intoxication, attention should also be paid to adolescents, particularly girls. Wang et al. pointed out the risk of using medication organizers which can increase the number of intoxications in children[20].

CASE PRESENTATIONS

Eight case reports are presented from our group of patients with drug intoxication which are of interest for their circumstances of poisoning, symptomatology, and clinical course. Based on the cause and motive, they are divided into three categories: accidental intoxication, suicide attempts, and intoxication of an experimental nature.

1. ACCIDENTAL INTOXICATION

CASE 1

A nearly 2-year-old boy was admitted for a vague impairment of consciousness caused by severe accidental intoxication. On admission, he was severely hypotensive, with an irregular and fluctuating heart rhythm with numerous extrasystoles. He was pale with a collapsed periphery, an intangible pulse, and mydriatic pupils. He responded with severe bradycardia during handling.

After admission to the pediatric ICU, gastric lavage was performed in which no tablet residues were found. Ten grams of activated carbon were administered. Oxygen therapy was started. For severe bradycardia, atropine, continuous tensamine, norepinephrine, and sequentially isoprenaline were administered. Calcium, lipid emulsion, and an infusion of crystalloids were delivered continuously. Bicarbonate was given for signs of combined acidosis in blood tests.

His circulation remained very unstable; mean blood pressures fluctuated in the range of 19–40 cm H_2O. Diuresis was minimal. Therefore, catecholamine therapy, in combination with dobutamine, norepinephrine and isoprenaline ensued. Atropine was administered for persistent bradycardia. Amoxicillin was used to prevent bacterial infection.

After about two hours, convulsions developed, responding relatively well to diazepam. The boy was ventilated without problems; oxygen saturation was above 94% and blood gas values were satisfactory. After another three hours, glucagon was given for hypoglycaemia. In the following hours, further seizures, blood pressure fluctuations, bradycardia, ventricular tachycardia, severe hypotension, and oligo-anuria occurred. His pupils were unresponsive to light.

Approximately 24 h after intoxication, a toxicological examination of the serum was performed in which verapamil was detected at an already therapeutic level. In the following days, his circulation stabilized, ventricular tachycardia disappeared, and diuresis resumed. However, an imbalance of the internal environment persisted with a tendency to hypernatraemia, hyperglycaemia, and high serum osmolality. Plasma was given for thrombocytopenia with coagulopathy. He was still comatose, unresponsive to painful stimuli.

Seven days after intoxication, brain MRI was supplemented, and post-hypoxic changes in the white matter were recorded. An increase in CRP was noted in a laboratory blood test. Antibiotic therapy was changed to meropenem to detect bacterial infection on BAL examination. The boy began to digest intermittently, diuresis was maintained by the administration of furosemide or desmopressin.

However, his neurological condition remained unchanged. Areflexia above C1 was diagnosed. Clinical examination confirmed presumed brain death. After completing angiography of the brain, brain death was declared. Organ procurement was performed 17 days after intoxication for donation with parental consent.

CASE 2

An 11-month-old girl was admitted for a vague impairment of consciousness. Her parents noticed that she acted drunk during the day. She was put to bed in the afternoon. Twitching of the tongue was observed during sleep. When trying to wake up, she only made a feeble eye contact. Her parents decided to take her to hospital. Even before they left, they observed disordered breathing, namely its irregularity with a growl. Based on these manifestations, they contacted EMS. On EMS arrival, the girl was already atonic, bluish, cyanotic, blood pressure 85/50 mm Hg, pulse 126/min, oxygen saturation 50%. Oxygen saturation reached 98% after using a bag-valve mask. There was persistent bradypnoea. Almost no responses to painful stimuli were recorded, the patient's pupils were unresponsive to light, and her bulbs were divergent. She was immediately transported to the pediatric ICU.

Upon EMS arrival, the patient's GCS was 3. She was placed on IMV. Gastric lavage was performed. A sample of gastric contents together with urine and serum was sent for toxicological examination in which metabolites of gabapentin at therapeutic levels and toxic levels of oxycodone were detected. Since her loss of consciousness was caused by acute opioid intoxication, an antidote (naloxone) was given. In addition, a laboratory examination, CT for a history of a blow to the head, and X-ray examination of the heart and lungs were performed. None of the examinations showed signs of pathological processes. In addition to naloxone, activated charcoal was administered, and infusion therapy was initiated.

The next day, a follow-up X-ray revealed aspiration pneumonia on the right. Co-amoxicillin was administered empirically. Symptomatic treatment was continued. While in a stabilized condition, she was extubated uneventfully on the second day of hospitalization. An adequate decrease in oxycodone concentration was detected in the follow-up toxicological examination of the serum.

On day 4, the girl was transferred to a general ward for further care. Here, she remained afebrile with good blood count and inflammatory markers. She was released to home care on the same day in a good clinical condition and without breathing difficulties.

CASE 3

A 15-month-old girl was admitted for ingesting an indeterminate amount of ibuprofen and intertrigo ointment. The mother found her daughter playing with an ointment and eating it. She was dirty all over and her mouth was full of the ointment. The mother found out that the child's older half-sister had mixed an unspecified amount of crushed ibuprofen with the intertrigo ointment. It could not be established whether this mixture was administered intentionally to the child. During EMS transport, the child had no complications; she was not vomiting

Gastric lavage was performed at the Intensive and Resuscitation Care Unit within one hour of ingestion. Residues of ibuprofen tablets were found in the gastric contents. Activated charcoal was administered, and the child was admitted for observation. Her general condition remained unchanged.

The next day, the child was afebrile, slightly dysphonic, and laryngeal. Follow-up biochemical examination was normal. On the same day, she was transferred in a good condition to a general ward. Her behaviour was adequate for age and situation. When crying, she was mildly dysphonic with no other symptoms of respiratory infection. Further blood tests showed slightly elevated AST, monocytosis, and eosinophilia. The child was discharged to home care in a good general condition.

CASE 4

A 2-year-old boy was transferred from the Department of Pediatrics of the Jeseník Hospital to the Intensive and Resuscitation Care Unit due to the development of severe symptoms of atropine intoxication (mydriasis, restlessness, hallucinations, dry mucous membranes). While

walking, the boy found a bottle of 1% atropine eye drops and drank an indefinite amount. According to the carer, 2.9 mL of the solution were missing in the vial, which corresponds to 29 mg of atropine.

On admission, the boy had dilated pupils unresponsive to light, dry mucous membranes, was restless, and had hallucinations, defending something invisible in empty space. Toxicological examination of urine showed high concentrations of atropine and its metabolites. The administration of benzodiazepines was recommended for sedation after consulting the TIC. Physostigmine was not recommended as an antidote due to its significant proarrhythmogenic effect. The restlessness was suppressed by the administration of midazolam and diazepam.

The next day, his restlessness subsided completely. Serious rhinitis appeared after moistening of the mucous membranes. During the day, the boy was fully fed orally. Of the previous symptoms, only mydriatic pupils persisted with no response to light. The boy was transferred back to the catchment hospital in Jeseník in a significantly improved condition.

2. SUICIDE ATTEMPTS

CASE 5

An almost 17-year-old girl was admitted to the DP via emergency department for drug intoxication because of unrequited love. In the morning, the girl probably consumed all the drugs she had found at home: about 10 tbl of metamizole, 20 tbl of drotaverine, 10 tbl of ambroxol, 14 tbl of propiverine, 8 tbl of loperamide, 15 tbl of progesterone, 30 tbl of methylphenidate, 100 tbl of ibuprofen, 100 tbl of metoprolol, and 20 tbl of norfloxacin.

On admission, she was bradycardic, confused, with severe dyslalia and mydriatic pupils. Laboratory blood tests revealed metabolic acidosis. Gastric lavage was performed and a sample was sent for toxicological examination. Activated charcoal and atropine for bradycardia were administered. Parenteral infusion therapy was initiated with the need for catecholamines to support haemodynamics. Sodium bicarbonate was administered for persistent acidosis.

Her circulation, consciousness, and internal environment gradually improved. Liver and kidney functions returned to normal. On the fourth day of hospitalization, she was transferred in a stable condition to a general ward where she was examined by a psychiatrist and a psychologist. The following day, she was released to home and outpatient psychiatric care in a good clinical condition.

CASE 6

A 15-year-old girl was transferred from the Department of Pediatrics of the Jeseník Hospital for an uncontrollable condition during intentional intoxication with trandolapril and verapamil (Tarka®). The girl was transported by the EMS to the Department of Pediatrics in Jeseník for repeated vomiting and diarrhoea. Three empty bottles of the drug were found near her bed. On admission, a slowed psychomotor pace was evident; she was sleepy but awake, and responded with latency. She was hypotensive 63/30 mm Hg. Gastric lavage was performed after consultation with the TIC. A lipid emulsion and atropine were administered. CT of the head with a negative finding was added due to a finding of spectacle haematoma. The girl was later bradycardic with a heart rate of 48/min. She was transferred to the pediatric ICU.

On arrival, there was an irregular heartbeat with a rate of 40/min, third-degree AV block, hypotension 60/30 mm Hg, cold periphery, prolonged capillary refill time, and a GCS of 4. Noradrenaline, dopamine, midazolam, calcium gluconicum, and crystalloids were administered. Hypokalaemia, hypocalcaemia, and hyperglycaemia were all corrected. Activated carbon, lactulose, and fat emulsions were administered. The presence of high levels of verapamil and trandolapril was toxicologically confirmed in both urine and gastric contents.

Irregular heartbeat with bradycardia 40/min and hypotension 100/40 mm Hg persisted. After the administration of glucagon, transient hyperglycaemia with massive vomiting occurred. Subsequently, her cardiac output began to decrease to 1.8 L/min with a heart rate of 39/min. Cardiac output increased after administration of isoprenaline; however, there was respiratory insufficiency with hypoxaemia, exacerbation of impaired consciousness, hypercapnia of 6.5 kPa, and progression of acidosis to pH 7.21. Respiratory insufficiency occurred, possibly due to aspiration after massive vomiting. The girl was intubated and placed on controlled ventilation. After increasing the doses of isoprenaline, her cardiac output and frequency increased, vascular resistance decreased, and peripheral circulation and diuresis were restored. She was extubated uneventfully after two days of favourable development. On the following days, she was gradually mobilized. After stabilization, she was transferred to a general ward, and psychiatric and psychological examinations were ordered. The further course of hospitalization was uneventful and the girl was transferred to the care of a psychiatric hospital in Šternberk eight days after intoxication.

3. INTOXICATION OF AN EXPERIMENTAL NATURE

CASE 7

A 15-year-old boy was admitted for intoxication with medications which he took for better sleep.

The boy could not sleep because of worries about school. He found on the internet that he should take a few tablets of alprazolam in combination with codeine to calm down and sleep better. Alprazolam, which he found at home, had exceeded the expiration date, so he took 12 tablets for a sufficient effect. However, he definitely did not want to overdose; he checked the dosage several times on the internet to make sure it was safe. In the morning, he was very tired after waking up, but otherwise in a good condition. He did not confess to taking the pills and went to school. His teacher then noticed that the boy did not respond adequately, had slurred speech, and had difficulty moving. So she contacted EMS and the police

who performed tests for alcohol and drugs. The EMS then transported him to hospital.

On admission, the boy was slightly somnolent, dysarthric, and in a stable respiratory and circulatory condition. An ECG revealed an incomplete right bundle branch block and prolongation of the cQT interval. Laboratory tests showed respiratory acidosis. Gastric lavage was performed, activated charcoal was administered, and infusion therapy was initiated. Subsequently, all symptoms improved. A psychological examination was ordered.

At the request of his parents, the boy was released to home care on the same day in a good condition.

CASE 8

An 8-year-old girl was admitted for observation due to ingestion of 1.5 tablets of unspecified drugs. A friend brought to school a bag full of unpacked tablets which she found at her grandfather's. The girl chose two coloured tablets and tried them. Her teacher who found out contacted her parents. They brought the girl to hospital.

She was admitted to a general ward for observation and continuous monitoring of vital signs. Gastric lavage was not indicated. Low levels of paracetamol and desloratadine were detected on urine and serum toxicology screening. The girl showed no signs of cardiopulmonary compromise, was afebrile and without any problems during the whole hospitalization. The next day, she was released to home care in a stable condition.

CONCLUSION

In the 10 years, 162 children and adolescents under the age of 19 had been admitted to hospital for acute drug intoxication. Girls accounted for 67% of cases. The highest incidence of intoxications was reported in toddlers between 1 and 3 years of age and in adolescents between 15 and 19 years of age. In 72% of cases, it was accidental intoxication. This was observed mainly in younger children. The remaining 28% of cases were suicide attempts, characteristic for older school-age children and adolescents. Although in most cases it was only slight intoxication with mild or no symptoms, several serious life-threatening conditions were reported. Unfortunately, in one case, a toddler died.

According to our results and determination of the two most numerous age groups, we need to understand drugs from several perspectives. They are not just a medical product intended to treat or improve health. From the point of view of young children, medicines, especially coloured ones, must also be perceived as attractive-looking sweets. For older children and adolescents, medication can be an unfortunate way out of their suffering and a means of ending life. For both these reasons, medicines should be kept out of the reach of children and parents should educate their children about the dangers of these substances.

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