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CURRENT ISSUES OF FOOD AND CHEMICAL SAFETY OF CHILDREN AND ADOLESCENTS: ACUTE HOUSEHOLD POISONING

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ABSTRACT. *Ukraine is among the countries with a high prevalence of acute chemical etiology poisoning in the countries of the European region, taking the penultimate place according to WHO (2017).*

The Aim of the Research. To study the risk factors for acute domestic poisoning among children and adolescents in Ukraine and to identify measures to improve it.

Methods and Materials. *The annual statistical reports of WHO, the data of the State Statistics Committee of Ukraine, the Center for Medical Statistics of the Ministry of Healthcare of Ukraine, and statistics of the Department of acute poisoning of the NCSH «Okhmatdyt» were analyzed. Research methods: system approach and benchmarking were applied.*

Results and Discussion. *A comparative estimate of the incidence of acute poisoning over the last 15 years in Ukraine indicates an overall tendency for their growth as a whole: in the group of children 0–14 years, an average of 10.4% (from 13.8 ± 0.05 cases / 10000 in 1996–1998 to 15.4 ± 0.1 cases / 10000 pediatric population in 2006–2010). Among children aged 0–4 years, the rate of increase in the number of acute poisonings was the highest, i.e. it increased from 31.7 ± 0.1 to 37.1 ± 0.2 cases / 10000 of the pediatric population of this age. The incidence of primary diseases of the pediatric population, according to the data of the Injury and Poisoning statistical group, has been practically at the same level in recent years, with a slight upward trend. Thus, over the last 20 years the incidence has fluctuated within 39.6–51.4 cases / 10000 population.*

Conclusions. *An important factor in the emergence of household poisoning is the lack of motivation of the population, including children and adolescents, to lead a healthy lifestyle (including maintaining a healthy diet).*

Key Words: *chemical safety, food safety, toxicology, acute poisoning.*

Introduction. Poisoning today is the third leading cause of accidental deaths in the European Region, accounting for more than 3,000 deaths per year, or about 7% of unintentional injuries.

Non- lethal poisoning is all the more so they have become a major dangerous consequence of loss of health and the occurrence of disability.

Every year millions of people are referred to toxicological centers, tens of thousands of children and adolescents are hospitalized in emergency rooms as a result of the accidental use of various toxic substances. Many of the available substances – medicines, household chemicals, solvents, fuel materials and pesticides are relatively toxic when used enterally, even in small quantities. Most often, poisons are swallowed, inhaled and injected.

Cases of domestic poisoning vary greatly in clinical manifestations and severity of the condition of the victim, depending on the origin of the toxicant, physicochemical composition, dose, route of entry and age of the person. A critical factor in preventing or inhibiting the absorption process of a toxicant is the timely provision of primary health care.

Ukraine is among the countries with a high prevalence of acute chemical poisoning in the countries of the European region, ranking WHO in 2017 with a penultimate place.

The Aim of this research is to investigate the risk factors for acute household poisoning among children and adolescents in the European Region and the United States in order to evaluate the effectiveness of the current food and chemical safety system in Ukraine and to identify measures to improve it.

Methods and Materials. The annual statistical reports of WHO, the data of the State Statistics Committee of Ukraine, the Center for Medical Statistics of the Ministry of Health of Ukraine, and statistics of the Department of acute poisoning of the NCSH «Okhmatdyt» were analyzed. Research methods: systematic approach, content analysis and comparative analysis were applied.

Results and Discussion. The overall share of health poisoning in the European Region is significant. The mortality and lethality rates of poisoning in European countries vary widely. There is a thirty-fold difference between the countries with the lowest and highest rates of economic development. Low- and middle-income countries account for 93% of all poisoning deaths, and mortality rates for people under the age of 20 are 9.2 times higher than in high-income countries [1].

The non-lethal effects of poisoning also need attention. There are no separate statistics on the number of non-lethal unintentional poisoning across the European region, but according to data of individual countries poisoning is known to be a significant contributor to health.

The economic costs of child and adolescent poisoning are a significant financial burden. US statistics show that poisoning and control measures are a costly problem. The cost of living caused by poisoning was found to be $ 400 million for the under-15 age group, 9% of which was medical expenses. Thus, the minimum total cost of treatment for a single poisoning case in this age group is $ 1,780. These costs include salaries for medical services, medical costs, and a significant reduction in quality of life [2].

Prevalence and types of poisoning among children and adolescents depend on socio-economic status, cultural characteristics, industrial development and application of agrotechnical measures in different countries. Poisonings are most commonly occurring at home, although there are many toxicants in the environment.

An important factor in the occurrence of poisoning is the age of the person, as it directly affects the behavior and susceptibility to the poison. The low body weight versus the dose of a toxic substance and the physiological status of the enzyme neutralization system make children and adolescents extremely vulnerable to poison.

The sharp jump in mortality rates for men older than 15 years in the European Region is partly linked to alcohol poisoning [3]. Poisoning among older children is also associated with alcohol, medicine and drug abuse, leading to high mortality rates. In all age categories, these figures are higher for men, especially in the 15- to 19-year-old group, 1.6 times higher for men than for women. The highest rates of poisoning mortality in European countries are observed in boys aged 15 to 19 years, in girls between 1 and 4 years old [4]. In many high- and middle-income countries (Russian Federation, Belarus), alcohol poisoning among older adolescents has been a problem, but in recent years – among young children. In some regions of Italy, alcohol is the dominant cause of poisoning among children aged 10 to 15 years (30 – 40% of all poisoning cases) [5]. In Norway, among older children, alcoholic poisoning is 46%, medicines – 36% [6].

In high-income countries, substances associated with the highest risk of fatal poisoning among children and adolescents include anticonvulsants and antidepressants.

Information from several toxicological centers and hospitals in the European Region indicates that the most common poisonous substances are:

— medicines;
— household products such as bleaches, disinfectants, detergents, cleaning products, cosmetics, vinegar;
— pesticides, including products for rodents, insecticides and herbicides;
— poisonous plants, insects and animals.

The nature of the substances causing the poisoning directly affects the course of the poisoning. Their concentration and strength significantly affect its toxicity and the effects of poisoning. Poisoning is more often associated with liquid compounds than with solids. Clear liquids are extremely dangerous because they can also cause poisoning. Seasonal variations in the frequency of poisoning are observed in all countries of the European region. The most dangerous period for poisoning is in July. Summer months are a risk factor for all ages. This is due to the summer application of various toxic chemicals in agriculture and everyday life.

Socio-economic determinants and poverty also affect the poisoning situation of children and adolescents. Poisoning mortality rates differ between countries and within countries, which correlates with indicators of socio-economic development. In most developed economies, there is a strong legislative and regulatory frame-

work for the control of toxic substances, while the countries with transition economies do not have the necessary infrastructure and regulators to implement such measures. An important risk of poisoning among children and adolescents is socio-economic status, it is linked to a number of other factors and is an important component of the fatal effects of poisoning. Particular mention should be made of rural areas, where there is widespread access to highly toxic pesticides and limited access to toxicological services.

In many European countries, there are different rates of hospitalization related to poisoning, depending on social status. Poisoning results are significantly affected by low levels of nutrition for children, since the population is poor, especially in rural areas, that often consumes poisonous berries and mushrooms in search of something consumable. Poverty is clearly associated with both mortality and morbidity due to poisoning. Studies in the United Kingdom have shown that children from poorer backgrounds are three times more likely to be poisoned than wealthy children. The difference is most often related to medicinal poisoning and non-medicinal products, the maximum difference being reported among medicinal poisoning among wealthy populations and solvent poisoning among the poor [7, 8].

Legislative approaches to creating an effective system for the prevention of poisoning are constantly being improved. This is a multifactorial process. In addition to the usual requirements of ongoing oversight, prevention strategies should include and take into account environmental changes, provide outreach, implement technical measures, bring legislation to the masses, and actively engage in education.

Lack of regulations, guidelines and policies in the field of production, storage, distribution and disposal of many products and by-products, as well as the absence of legal measures contribute to fatalities. Examples include tragic incidents of dairy products contaminated with melamine in China, some medicines in the United States, toothpaste, and other cases. A clear legal basis should be drawn up for the above.

Toxicological centers and health care are important tools for minimizing the effects of poisoning among children and adolescents. The activities of toxicological centers in this area are proven by their effectiveness in the United States. Therefore, their activity reduced the number of outpatients with poisoning by 24% and the number of hospitalizations by 12% [9].

Today, toxicological centers manage the process of providing medical assistance, help primary and emergency medical services to hospitalize the victims in special detoxication wards.

The processes of globalization and Internet technologies allow medical professionals to get the information they need quickly and make predictions. Unfortunately, there is no network of toxicological centers in Ukraine, including information centers. There is limited access to toxicological services in rural areas. This situation confirms the low level of awareness of the governmental bodies of the state of chemical danger in the country, which in recent years has worsened dramatically against the background of negative socio-political processes and military conflict.

The toxic loading on the population and some epidemiological indicators of acute poisoning in Ukraine show dangerous trends in the number of poisonings among children and adolescents.

The basis for systematization and analysis of the toxicological situation in Ukraine is the statistical data of the Ministry of Healthcare of Ukraine, the Main Bureau of Forensic Medical Examination of the Ministry of Healthcare of Ukraine, where the registration of poisoning cases is carried out in accordance with the accepted classification of nosological forms according to ICD-10.

A comparative estimate of the incidence of acute poisoning over the last 15 years indicates an overall tendency for their growth as a whole: in the group of children 0–14 years, an average of 10.4% (from 13.8 ± 0.05 cases / 10000 in 1996–1998 to 15.4 ± 0.1 cases / 10,000 of the pediatric population in 2006–2010). Among children aged 0-4 years, the rate of increase in the number of acute poisonings was highest, ranging from 31.7 ± 0.1 to 37.1 ± 0.2 cases / 10000 of the population of this age, according to the indicated study periods. The incidence of primary diseases in the pediatric population, according to the Injury and Poisoning Statistical Group, has remained almost at the same level in recent years, with a slight upward trend. For example, over the last 20 years the incidence has been in the range of 39.6–51.4 cases / 10000 population.

The high stability of this class of diseases is characteristic of the national average as a whole and is 39.4–43.4 cases / 10000 population. Among children aged 15–17, the incidence of acute poisoning was 11.9 cases / 10,000 of the population of the relevant age. Among this group

of children 1.8–2.1 times more often cases of severe course of acute poisoning were registered than among children under 14 years of age. A similar pattern is observed in the prevalence rate in the «injury and poisoning» group. In Ukraine, this figure was 40.4–44.7 cases / 10000 population. Regional features include higher incidence rates (7.2%) and prevalence (4.4%) in this statistical group. Comparative analysis of this class of diseases revealed that over the last 20 years, «trauma and poisoning» have been consistently at the 5th (incidence) and 7th (prevalence) places in the general structure of pathology. Such dynamics indicate a high intensity of influence of external risk factors on the pediatric and adult population on the one hand, and on the other hand – the insufficient effectiveness of the primary prevention measures.

Table 1 provides data on the structure of acute household poisoning among children and adolescents in 2019.

Alcohol, medicines and household chemicals have an absolute advantage in the structure of poisoning.

An important indicator in the process of evaluating the causes of poisoning is the age of the patients (Table 2) and the ways in which the toxic substance enters children's bodies (Table 3). The results of studies show that children aged 14–17 years, 1–3 years and 11–14 years are at the highest risk of chemical poisoning, with the enteral route of toxicity being the main route for all age groups.

According to the study, number and structure of acute chemical poisonings in Kyiv in 2001–2010, the provision of medical care for acute poisoning was carried out by ambulances in prehospital phase in 67%, only a third of cases were hospitalized in specialized departments [10].

According to research conducted by the specialists of SE L.I. Medved's Research Center of Preventive Toxicology, Food and Chemical

Table 1

Etiological factors of acute poisoning in children and adolescents (NCSH «Okhmatdyt», 2019)

Etiological factor	Number of cases per year, abs.	%
Suspicion of poisoning	36	5.34
Alcohol	247	36.7
Household chemicals	129	19.16
Animal poisons	1	0.14
Medicines	140	20.8
Drugs	48	7.13
Unidentified poisons	58	8.61
Plant poisons	14	2.08
Total:	673	100

Table 2

Age composition of patients with acute household poisoning (NCSH «Okhmatdyt», 2019)

Age groups	Number of cases per year, abs.	%
up to 1 month	1	0.14
1 month - 1 year	27	4
1–3 years	208	3.9
4–7 years	41	6.09
8–10 years	19	2.82
11–14 years	109	16.04
14–17 years	268	39.52
Total:	673	100

Table 3

Ways of toxic substances to the body of children and adolescents in the process of poisoning (NCSH «Okhmatdyt», 2019)

Route of entry	Number of cases per year, abs.	%
Gastral	629	93.46
Inhalant	24	3.56
Nasal	9	1.33
Unknown	10	1.48
Parenteral	0	0
Transdermal	1	0.14
Total:	673	100

Safety, the Ministry of Healthcare of Ukraine, Kyiv and the Ukrainian Center for Pediatric Toxicology, Intensive and Effective Therapy of the NCSH «Okhmatdyt» the Ministry of Healthcare of Ukraine on the study of poisoning among children and adolescents aged 0 to 14 years, were found to be the main causes that led to poisoning in adolescents are the deliberate intake of various chemicals in toxic doses, suicidal attempts, and the use of psychotropic toxicants to produce euphoria. There is a stable tendency to increase acute alcohol intoxication in the structure of poisoning.

In Ukraine, particular concern is raised by the practice of consuming alcoholic beverages in families. The levels of poisoning among children living in large cities are 2 to 3 times the same in some regions of Ukraine. In 1999–2001, children accounted for 12–13% of all non-medicinal poisoning. The share of poisonings mainly by medicines was 51–55% [11, 12].

According to research conducted in 2015 on the basis of the Toxicological Center of the Kyiv City Clinical Hospital Emergency Medical Services for the study of the structure of acute poisoning among adolescents and young people aged 15 to 21 years for the period 2005–2015, an increase in the number of patients in recent years age group from 15 to 21 years old (2005 – 9.8%, 2015 – 11.7%). Among 88 patients, 73.9% were male, 26.1% were female. The vast majority of patients – 19 years old – 23 cases (26.1%) and 21 years old – 25 cases (28.4%). In the general structure of poisonings, psychotropic medicines amounted to 56.8%, alcohols – 20.5%, mixtures of medicines of different groups – 9.1%, unidentified substances – 5.7%. Among the medicines, the most common causes of poisoning were: Baclofen, Truxal, Paracetamol, Amitriptyline, Taren; among drug substances: Amphetamines, Oxybutyrate, Methadone, synthetic cannabinoids (smoking mixtures).

The characteristics of the structure of youth poisoning include the poisoning of plant toxicants observed in patients aged 14 to 17 years. The reason for such poisoning was deliberate intake for narcotic intoxication of plant toxins – hallucinogens found in fungi of the genus Inocybe and Clitocybe and plants of the family Solanacea [13, 14].

Conclusions

1. Ukraine is among the countries with the highest prevalence of acute chemical poisoning among countries in the European Region (WHO, 2017).

2. In recent years, there has been a negative trend in the increase in the number of poisonings among children and adolescents, indicating a high intensity of exposure of external risk factors to the population, on the one hand, and, on the other hand, the lack of effectiveness of primary prevention measures.

3. Important factors of household poisoning is the lack of motivation of the population, including children and adolescents to a healthy lifestyle (including nutrition).

4. In the context of increasing chemical risks in Ukraine, implementation of the successful experience of the EU countries is needed, where today toxicological centers are functioning, carrying out the functions of observation, monitoring, laboratory research, information and training, ensure the availability of antidotes, direct public services in cases of mass poisoning.

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АКТУАЛЬНІ ПИТАННЯ ХАРЧОВОЇ ТА ХІМІЧНОЇ БЕЗПЕКИ ДІТЕЙ І ПІДЛІТКІВ: ГОСТРІ ПОБУТОВІ ОТРУЄННЯ

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РЕЗЮМЕ. *Україна відноситься до країн з високими показниками розповсюдженості гострих отруєнь хімічної етіології серед країн Європейського регіону, посідаючи за даними ВООЗ (2017 р.) передостаннє місце.*

Мета дослідження. *Вивчити фактори ризику виникнення гострих побутових отруєнь серед дітей і підлітків в Україні та визначити заходи щодо покращення ситуації.*

Матеріал і методи дослідження. Проведено аналіз річних статистичних звітів ВООЗ, даних Держкомстату України, Центру медичної статистики МОЗ України, статистичних даних відділення гострих інтоксикацій НДСЛ «Охматдит». Застосовано методи дослідження: системного підходу і порівняльного аналізу.

Результати дослідження. *Порівняльна оцінка частоти виникнення гострих отруєнь за останні 15 років в Україні вказує на загальну тенденцію до їхнього зростання в цілому: в групі дітей 0-14 років у середньому на 10,4 % (з 13,8±0.05 вип. /10000 в 1996-1998 р. до 15,4±0,1 вип./10000 дитячого населення в 2006–2010 рр.). Серед дітей вікової групи 0-4 роки темп зростання кількості гострих отруєнь був найбільшим, тобто зріс з 31,7±0.1 до 37,1±0.2 вип./10000 дитячого населення цього віку. Частота первинних захворювань дитячого населення, відповідно до даних статистичної групи «Травми й отруєння», в*

останні роки практично була на одному рівні з незначною тенденцією до зростання. Так, протягом останніх 20 років захворюваність коливалась у межах 39,6 – 51,4 вип./10000 населення.
Висновки. *Важливим чинником виникнення побутових отруєнь є недостатня мотивація населення, в тому числі дітей та підлітків, до ведення здорового способу життя (в тому числі додержання раціонального харчуванню).*
Ключові слова: *хімічна безпека, харчова безпека, токсикологія, гострі отруєння.*

АКТУАЛЬНЫЕ ВОПРОСЫ ПИЩЕВОЙ И ХИМИЧЕСКОЙ БЕЗОПАСНОСТИ ДЕТЕЙ И ПОДРОСТКОВ: ОСТРЫЕ БЫТОВЫЕ ОТРАВЛЕНИЯ

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РЕЗЮМЕ. *Украина относится к странам с высокими показателями распространенности острых отравлений химической этиологии среди стран Европейского региона, занимая по данным ВОЗ (2017 г.) предпоследнее место.*
Цель исследования. *Изучить факторы риска возникновения острых бытовых отравлений среди детей и подростков в Украине и определить меры по их устранению.*
Материал и методы исследования. *Проведен анализ годовых статистических отчетов ВОЗ, данных Госкомстата Украины, Центра медицинской статистики МЗ Украины, статистических данных отделения острых интоксикаций НДСБ «Охматдет». Применены методы исследования: системного подхода и сравнительного анализа.*
Результаты исследования. *Сравнительная оценка частоты возникновения острых отравлений за последние 15 лет в Украине указывает на общую тенденцию к их росту: в группе детей 0–14 лет в среднем на 10,4 % (с 13,8±0,05 случая/10000 в 1996–1998 гг. до 15,4±0,1 случая / 10000 детского населения в 2006–2010 гг.). Среди детей возрастной группы 0–4 года темп роста числа острых отравлений был самым большим и составил с 31,7±0.1 до 37,1±0.2 случая/10000 детского населения этого возраста. Частота первичных заболеваний детского населения, согласно данным статистической группы «Травмы и отравления», в последние годы находилась практически на одном уровне с незначительной тенденцией к росту. Так, за последние 20 лет заболеваемость была в пределах 39,6–51,4 случая/ 10000 населения.*
Выводы. *Важным фактором возникновения бытовых отравлений является низкий уровень мотивации населения, в том числе детей и подростков, к ведению здорового образа жизни (в том числе и соблюдение рационального питания).*
Ключевые слова: *химическая безопасность, пищевая безопасность, токсикология, острые отравления.*

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