

<https://doi.org/10.23934/2223-9022-2021-10-1-27-32>

The Structure of Acute Exotoxicosis During the First Three Months of the COVID- 19 Pandemic (According to the Acute Toxicosis Department of N.V. Sklifosovsky Research Institute for Emergency Medicine)

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BACKGROUND The self-isolation regime introduced to limit the spread of COVID-19 disrupted the habitual way of life of the majority of the population, which could cause increased anxiety and depressive states in some citizens and lead to the development of acute exotoxicosis.

AIM OF STUDY To identify the impact of the COVID-19 pandemic on the structure of acute poisonings based on their comparative analysis for March-May in 2019 and 2020.

MATERIAL AND METHODS

"Hospital patient cards" of patients who were treated in the Department of Acute Toxicosis and Somatopsychiatric Disorders of the N. V. Sklifosovsky Research Institute for Emergency Medicine in March–May, 2019 and 2020. The Statistica 10.0 program was used for data processing.

RESULTS The total number and gender composition of patients with acute poisonings (AP) did not differ significantly in the compared periods. In 2020, the share of people aged 30–39 increased by 23%, while patients over 50 decreased by 7%.

In 2020, the frequency of AP caused by medicines decreased by 10%, with sedatives and antidepressants prevailing. There has been an increase in cases of overdose with NSAIDs, antibiotics and antiviral drugs, probably as a result of self-treatment for Covid-19.

The share of drug and psychoactive substance poisoning increased by 5%, mainly due to overdoses of synthetic drugs and combinations of drugs of different groups. At the same time, the number of cases of recreational drug use decreased 2.4-fold.

In March-May 2020, the number of patients with severe AP caused by alcohol increased 4-fold, and the number of people with other forms of AP hospitalized with alcohol intoxication grew 2.7-fold.

Additionally, twice as many household AP have been caused by chlorine vapor, as well as poisoning with isopropyl alcohol, which can be associated with frequent improper use of disinfectants.

CONCLUSION Thus, the pandemic and the introduction of restrictive measures for COVID-19 affected the structure of acute exotoxicosis in Moscow in the period March-May 2020. The revealed changes in the structure of acute poisoning to a certain extent reflect global trends.

Keywords: acute chemical poisoning; COVID-19; synthetic drugs; alcohol; chlorine, disinfectants

For citation Belova MV, Ilyashenko KK, Simonova AY, Potskhveriya MM, Trusov GV. The Structure of Acute Exotoxicosis During the First Three Months of the COVID- 19 Pandemic (According to the Acute Toxicosis Department of N.V. Sklifosovsky Research Institute for Emergency Medicine). Russian Sklifosovsky Journal of Emergency Medical Care. 2021;10(1):27–32. DOI: 10.23934/2223-9022-2021-10-1-27-32 (In Russian)

Conflict of interest Authors declare lack of the conflicts of interests

Acknowledgments, sponsorship The study was conducted without sponsorship

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N&PS, Narcotic and psychotropic substances α-PVP, alpha-pyrrolidinovalerophenone

Social and economic living conditions greatly influence the mental health of a society and may cause such socially significant diseases, as narcomania, alcoholism, and also acute chemical intoxication [1].

The beginning of 2020 was marked by the emergence and worldwide spread of the COVID-19 coronavirus infection, a disease caused by the new SARS-CoV-2 coronavirus, and on March 11, 2020, WHO announced a pandemic of this disease. A self-isolation regimen was declared in Moscow as a measure to prevent the spreading of the disease in the city. This disrupted the habitual way of life of the Muscovites, who found themselves forced to stay at home, and restrictions on moving around the city and within the country for the majority of the population came into force. The threat of job loss, income decrease and fear of infection contamination, and also an exacerbation of chronic somatic and endogenous diseases caused the raised uneasiness and depressions in a part of citizens [2] that, in turn, could become the cause of uncontrollable use of various drugs and materials for self-treatment or committing a suicide with the subsequent development of acute exotoxicoses. We considered it reasonable to analyze the profile of acute poisoning in the first months after the announcement of the pandemic and the self-isolation regime, since during this period, due to the lack of reliable information about the infection, the ways of its spread, course of the disease, methods of prevention and treatment and in connection with a change in the usual way of life, psychoemotional stress arose among a large part of the population with unforeseen ways of its realization.

The study purpose was to assess the impact of COVID-19 pandemic on the structure of acute poisoning by making a comparative analysis of poisoning cases for the periods from March till May between 2019 and 2020.

The study objectives: 1. To compare total number and gender-and-age profile of the patients with acute chemical poisoning admitted to N.V.Sklifosovsky Research Institute for Emergency Medicine in March-May between 2019 and 2020.

2. To identify differences of acute poisoning cases as categorized by basic nosology groups: medical agents, narcotic, and psychoactive substances, alcohol, its false substitutes and other materials between the study periods.

MATERIAL AND METHODS

We performed the analysis of “in-hospital patient records” for the patients admitted for treatment to the Department of Acute Poisoning and Somatopsychiatric Disorders of N.V.Sklifosovsky Research Institute for Emergency Medicine in March – May, 2020. To compare the hospitalization profiles in the specified institution, we present the figures for the same time period in 2019. The diagnosis “Acute poisoning” in all cases was confirmed by the results of a chemical-toxicological investigation performed according to the adopted scheme [3]. The statistical analysis of data was made using Statistica 10.0 software.

RESULTS AND DISCUSSION

In the compared periods, the numbers of patients hospitalized with acute poisoning of chemical etiology were almost similar 786 and 774 patients in 2019 and 2020, respectively. The gender profile of the casualties did not fundamentally differ either, although the proportion of men increased slightly in 2020:

56.5% in 2020 versus 52.5% in 2019. The analysis of the patient distribution by age groups showed the prevalence of patients aged 30–39 years (n= 302) in 2020, who accounted for 31.2% of the total number of hospitalized patients, which is 23% higher than that in 2019. Meanwhile, the proportion of patients over 50 years old was 21.9% (n=170) in 2020 and was fewer than the number of patients 28.7% (n=244) who received treatment in 2019.

In both compared periods, the most common cause of poisoning was intake of medications, although their share among all acute poisonings in 2020 decreased to 38%. In 2019, it was 48%, and in general in the recent years it has made 50–52% [3]. The predominated psychotropic drugs were hypnotics and sedatives, barbiturates and benzodiazepine derivatives, as well as doxylamine. Also in 2020, the number of poisoning with antidepressants from the class of selective serotonin reuptake inhibitors (SSRIs) - sertraline, fluvoxamine, fluoxetine - increased slightly, but the number of overdoses with the tricyclic antidepressant amitriptyline decreased (11 versus 24 in 2019). Thus, little has changed in this sector. The increase in the proportion of SSRI overdose cases and the decrease in the proportion of amitriptyline poisoning could probably be explained by a gradual change in the generations of antidepressant drugs.

In 28 cases, poisoning with substances of cardiotropic effect - beta-blockers, calcium channel blockers, angiotensin-converting enzyme inhibitors - occurred, which is 28% lower compared to 2019. In our opinion, one of the factors explaining this situation may be the limitation of the amount of these vital medications in patients (mostly aged 65+) due to self-isolation and less frequent visits to doctors and pharmacies.

In the compared periods of both 2019 and 2020, 40 people had poisoning with drugs used for acute respiratory diseases - non-steroidal anti-inflammatory drugs, paracetamol, salicylates. In 6 cases of poisoning that occurred in 2020, overdoses of antibiotics, antiviral and antimicrobial drugs were noted, which was explained by an attempt to self-medicate for suspected COVID-19 infection. In 2019, there was only one case of antibiotic poisoning.

In March – May 2020, the share of poisoning with narcotic and psychotropic substances (N&PSs) taken as drug abuse, increased significantly. It was 23.4% of all nosological forms (n=181). Meantime, in 2019, the share of such poisonings was 1.3 times less and made 18.3% (144 cases).

The numbers of patients with poisoning with traditional opium-type drugs (heroin, morphine, codeine) were almost similar: 19 cases in 2020 and 21 cases in 2019. However, in 2020, they were more often combined with other N&PSs - psychostimulants, methadone, psychopharmacological drugs, and non-opiate analgesics. This occurred in 13 of 19 cases (68.4%) of opiate poisoning in 2020 and in 9 of 21 cases (42.8%) in 2019.

We should note that in 2020, the frequency of overdoses with synthetic drugs and combinations of N&PSs of different drug groups increased significantly. Thus, methadone was found in 52 patients, in 21 of whom (40.4%) it was found in pure form. In the same period of 2019, these numbers were 41 and 11 (26.8%), respectively. Synthetic psychostimulants such as mephedrone, 4-methcathinone, methylenedioxymethamphetamine (MDA), methylenedioxyamphetamine (MDMA) and α -pyrrolidinovalerophenone (α -PVP) became extremely popular during the pandemic. Such poisoning was registered in 44 patients, 31 of whom (70.4%) had taken psychostimulants in pure form. In 2019, these figures were 35 and 16 (28.6%), respectively, while there were no mephedrone abuse. In the two compared periods, there were 8 cases of cocaine poisoning each.

Synthetic cannabomimetics were identified in the biological contents of 21 patients in 2020 and 17 in 2019. Meanwhile, they were mostly met individually. Separately, it should be noted that in the period under review in 2020, the number of poisoning with prescription drugs: tropicamide, pregabalin, baclofen, etc. taken for recreational purposes decreased. They were identified only in 19 patients, and in 46 in 2019. Mostly these drugs were taken simultaneously with other N&PSs and/or alcohol, probably to enhance and modify the effect or to overcome the "withdrawal syndrome".

Based on these data, the following trends in drug abuse can be noted, which manifested themselves against the background of restrictive measures related to COVID-19. First of all, among other nosologies, the share of N&PS poisoning taken for recreational purposes increased.

According to the results of surveys published in the media, up to 43% of consumers admitted that the frequency of N&PV use during the pandemic did not change, and 8% of consumers noted that it even increased. At the same time, 15% of the respondents noted a decreased consumption of these substances, and 34% abandoned them completely. The main reasons for the changes in habits turned out to be as follows:

- 1) permanent staying at home - 47% of the respondents;
- 2) change in the availability (cost) of drugs from dealers - 44%;
- 3) deterioration of the financial situation - 42% of respondents;
- 4) more rare seeing friends - 38%;
- 5) lockdown of clubs and bars - 16%.

Among those people who did not change the drug intake regimen during quarantine were heroin addicts (up to 52%), as well as consumers of synthetic psychostimulants and cannabimimetics [4].

Another trend was an increased share of synthetic drug consumption such as mephedrone and α -PVP. Unlike natural drugs (opiates, cannabis and cocaine), synthetic drugs do not require special growing/manufacturing conditions and appropriate channels for transportation from manufacture areas. The synthesis of synthetic N&PSs is quite simple, the variety and interchangeability of the initial components ensure availability, relatively low manufacturing costs, as well as the possibility of handicraft production in clandestine laboratories, excluding transport across interstate borders. Due to the closure of borders, the decline in the activity of chemical industries, especially in China as the main supplier of precursors and synthetic N&PSs per se, this type of drug turned out to be especially in demand. Although drug prices have generally risen due to surges in currency exchange rates, synthetic N&PSs have remained more affordable in cost [4, 5].

On the other hand, quarantine measures and artisanal synthesis of synthetic N&PSs caused a decrease in N&PS quality (the presence of technological impurities, infringement of production and purification technology, the inclusion of psychoactive additives to enhance and modify the action), which could lead to an increased number of poisonings.

The decrease in the number of “pharmacy drugs” used can be explained, on the one hand, by tightening the control measures for their dispensing from pharmacies [6, 7], and, on the other hand, by quarantine measures and, consequently, by less mobility of consumers. It is also necessary to take into account the reasons listed above for a decrease in consumption and refusal from N&PSs in about half of the surveyed drug addicts.

A comparative analysis of alcohol poisoning deserves attention. During the specified period of 2020, 361 patients were hospitalized in alcoholic intoxication condition of various severities accounting for 46.6% of the toxicological patient population. Of these, 92 subjects (11.9% of all) were poisoned with ethyl alcohol (ethanol) only. Its average concentration in blood of these patients was 2.66 ± 1.14 g/L, 4.16 ± 1.78 g/L, and in urine. During the same period of 2019, 133 patients (16.9%) were hospitalized in alcoholic intoxication condition. At the same time, poisoning with ethanol alone was found in 23 patients (2.9%). In this group of patients, the mean ethanol concentration was 2.11 ± 0.93 g/L in blood, and 3.14 ± 0.97 g/L in urine. Thus, in March-May 2020, there was a statistically significant increase by 4 times in the number of cases of acute alcohol poisoning, and by 2.7 times in the number of patients with other nosological forms of poisoning who were hospitalized in alcoholic intoxication condition as compared to the same period of the previous year. Differences in the alcoholic intoxication severity between the investigated groups of patients, when comparing the ethanol concentrations in their biological media contents: blood ($p = 0.041$) and urine ($p = 0.019$) were also statistically significant. In our opinion, this situation is caused by a misconception that alcohol consumption reduces the risk of COVID-19 infection and by high stress levels. Many people believe that taking alcohol is one of the most affordable ways to relieve anxiety, fear, and depression. Not the least role in alcoholic excesses was played by the forced stay in isolation and the lack of jobs among part of the population. Similar statistics on the change in alcohol consumption in the United States were reported by M.S. Pollard et al. [8].

In March-May 2020, there were 3 cases of severe isopropyl alcohol (isopropanol) poisoning, while there were no such cases in the whole of 2019. Isopropanol poisoning and some ethanol poisoning are associated with the misuse of alcohol-containing liquids intended for sanitizing hands and surfaces, which began to be ubiquitous and sold during the pandemic. A similar explanation is given in a number of foreign publications as the cause of the growth in poisoning with toxic alcohols [9, 10].

Another nosology of poisoning, which cases increased in number as associated with the COVID-19 pandemic, is household chlorine vapor poisoning. Some disinfectants can emit active chlorine gas when using chlorine-containing disinfectants and bleaches [11], especially when they are used simultaneously with acid [12]. In 2020, there were 13 such cases, while in 2019 there were only 7. A quantitative increase in poisoning with household bleaches and disinfectants was noted in other countries as well [10, 11].

Accidental poisoning with corrosive substances occurred in 63 cases in 2019 and in 70 (10% more often) in 2020. Poisoning with carbon monoxide and combustion products were recorded in 17 people in 2019 and in 27 in 2020. The group "Others" included isolated cases of poisoning with pesticides, plant and animal poisons. Due to isolation and quarantine in May 2020, there were no patients with the toxic effects of snake (viper) venom, traditional for this month. At the same time, 10 such cases were registered in 2019.

CONCLUSION

Based on the above, it follows that the pandemic and the introduction of restrictive measures in connection with COVID-19 affected the acute exotoxicosis profile in Moscow in the period from March to May 2020. The results obtained reflect global trends to a certain extent.

FINDING

1. There were no statistically significant differences in the total number of patients hospitalized with acute chemical poisoning between the periods from March to May 2020 and 2019. Meanwhile, in March – May 2020, the percentage of men increased slightly, the share of persons aged 30–39 years increased noticeably, by 24%.

2. Against the background of a general decrease in the share of drug intoxication (by 10–14%), an increase in the number of poisonings with modern antidepressants, sedatives and pharmacological drugs used in the treatment of acute respiratory diseases was noted. The number of alcohol intoxication, poisoning with narcotic and psychotropic substances (by 5%) increased significantly (4 times), especially with their various combinations and in combination with alcohol.

Cases of poisoning with gaseous chlorine and isopropyl alcohol due to misuse of disinfectants have been reported.

REFERENCES

1. Zhdanova TN. The impact of social factors on mental health (an example of people with health disorders). *Vestnik Sankt-Peterburgskogo Universiteta. Seriya 12. Psikhologiya. Sotsiologiya. Pedagogika*. 2013;(2):144–151. (in Russ.).
2. Ostrovsky DI, Ivanova TI. Influence of the new coronavirus COVID-19 infection on human mental health (literature review). *Omsk Journal of Psychiatry*. 2020;(2–1S):4–10. (in Russ.)
3. Belova MV, Klyuev AE, Potskhveriya MM. Osobennosti khimiko-toksikologicheskoy diagnostiki ostrykh otravleniy na sovremennom etape (po dannym NII skoroy pomoshchi im. N.V. Sklifosovskogo). *Moskovskaya meditsina*. 2019;(6):22–23. (in Russ.)
4. Logacheva A. (ed.) Chto proiskhodilo s rossiyskim rynkom narkotikov vo vremya pandemii [Web article, June 19, 2020]. *The Village.ru*. (in Russ.) Available at: https://www.the-village.ru/city/news-city/383425-narko-pandemiya?comment_id=18882269 [Accessed Nov 19, 2020]
5. Falaleev M. Na ostrie igly. *Rossiyskaya gazeta*. The release of the Federal. 2020; 139(8193). (in Russ.) Available at: <https://rg.ru/2020/06/28/kak-pandemiia-povliiala-na-oborot-narkotikov-v-rossii-i-v-mire.html> [Accessed Nov 19, 2020]
6. *Postanovlenie Pravitel'stva RF ot 29 dekabrya 2007 g. No 964 "Ob utverzhdenii spiskov sil'nodeystvuyushchikh i yadovitykh veshchestv dlya tseley stat'i 234 i drugikh statey Ugolovnogo kodeksa Rossiyskoy Federatsii, a takzhe krupnogo razmera sil'nodeystvuyushchikh veshchestv dlya tseley stat'i 234 Ugolovnogo kodeksa Rossiyskoy Federatsii"*. (in Russ.) Available at: <https://base.garant.ru/12158202/> [Accessed Nov 19, 2020]
7. *Prikaz Ministerstva zdavookhraneniya RF ot 22 aprelya 2014 g. No 183n "Ob utverzhdenii perechnya lekarstvennykh sredstv dlya meditsinskogo primeneniya, podlezhashchikh predmetno-kolichestvennomu uchetu"*. (in Russ.) Available at: <https://base.garant.ru/70705334/> [Accessed Nov 19, 2020]
8. Pollard MS, Tucker JS, Green Jr HD. Change in Adult Alcohol Use and Consequences During the COVID-19 Pandemic in the US. *JAMA Network Open*. 2020;3(9):e2022942. PMID: 32990735 <https://doi.org/10.1001/jamanetworkopen.2020.22942>
9. Chen R, Roper L, Krueger J. Trend of toxic alcohol ingestions in the setting of the COVID-19 global pandemic. *Clinical Toxicology*. 2020;58(Is 11: North American Congress of Clinical Toxicology (NACCT)):37–38. Abstracts #58. Available at: https://eapcct.org/publicfile.php?folder=congress&file=Abstracts_NACCT2020.pdf [Accessed Nov 19, 2020]
10. Ferruzzi M, Celentano A, Sesano F, Milanese G, Assisi F, Bissoli M, et al. Desinfectant and hand sanitizer product exposures in Italy: a «side effect» of the COVID-19 Pandemic. *Clinical Toxicology*. 2020;58(Is 11: North American Congress of Clinical Toxicology (NACCT)):37. Abstracts #57. Available at: https://eapcct.org/publicfile.php?folder=congress&file=Abstracts_NACCT2020.pdf [Accessed Nov 19, 2020]
11. Cleaning and Disinfectant Chemical Exposures and Temporal Associations with COVID-19 – National Poison Data System, United States, January 1, 2020–March 31, 2020. *Weekly*. April 24, 2020;69(16):496–498. Available at: <https://www.cdc.gov/mmwr/volumes/69/wr/mm6916e1.htm> [Accessed Nov 17, 2020]
12. Hoffman RS, Nelson LS, Howland MA, Lewis NA, Flomenbaum NE, Goldfrank LR. (eds.) Goldfrank's Manual of Toxicologic Emergencies. New York: McGraw-Hill Medical; 2007. (Russ. ed.: Khoffman R, Nel'son L, Khauland M-E, L'yuin N, Flomenbaum N., Goldfrank L. *Ekstrennaya meditsinskaya pomoshch' pri otravleniyakh*. Moscow: Praktika Publ.; 2010.)

Received on 09.12.2020

Review completed on 01.02.2021

Accepted on 01.02.2021