



## Original article

# Assessment of Toxicities Associated with Covid-19 Pandemic Period and Management Protocols -Cases Referred to Poison Control Center -Ain Shams University Hospitals -Egypt

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### Abstract:

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**Background:** Dramatic modulation of the population behavior has evolved from uncontrolled fear of Covid-19 and led to increased numbers and changed patterns of poisoning cases. **Aim of the work:** the present study objected at assessing the incidence and pattern of toxicities referred to the Poison Control Center -Ain Shams University Hospital (PCC-ASUH) during 2020, associated with the covid-19 pandemic period and drugs used in its treatment protocols, in comparison to the same toxicities in 2019. **Patients and methods:** Toxicology cases enrolled in the study were recruited to the Poison Control Center -Ain Shams University Hospital (PCC-ASUH) from 1<sup>st</sup> of January 2020 till 31<sup>st</sup> of December 2020 to cases from the same period in 2019. All records of the described two years were examined and analyzed. Data concerning the number and the pattern of poisoning were reviewed. **Results:** The total studied poisoning cases in the two years were 18416. Of them, 12475 cases were in 2019, and 5941 cases were in 2020. The distribution of patients according to different poisoning causes was significantly different between the two years ( $p=0.00$ ). Drugs used in Covid-19 treatment were the predominant cause of poisoning. No significant difference was depicted between the two years in the percentage of CNS drugs poisoning ( $p>0.05$ ). The remaining poisoning causes were significantly different in the two years ( $p<0.05$ ). The total poisoning-related death was significantly higher in the year 2020 than in the year 2019 ( $p<0.001$ ). **Conclusion:** In the current study, an alteration in the frequency and pattern of the poisoning cases during the Covid-19 pandemic was evident. Most cases in the two studied years were Covid-19 treatment poisoning, increasing disinfectants, and paracetamol toxicities during the pandemic. Despite decreased frequency in 2020, the death rate increased by about a cases number. The educational strategy should be adopted to eliminate Covid-19 related behaviors that affect population health.

**Keywords:** Covid-19 pandemic, behavior, poisoning, toxicology.

## I. INTRODUCTION

Acute respiratory syndrome Coronavirus disease (SARS-CoV-2) has suddenly emerged and reported a pandemic in 2020. Together with the scarce data about its nature and the initial phase inconsistent reports, all have been challenging the health care systems globally (Mahmoud et al.,2021). In this era, the Poison Control Center -Ain Shams University Hospital (PCC-ASUH) was involved in the Coronavirus disease -2019 (Covid-19) outbreak; it is the first established poison center in Egypt and one of the leading referral poison centers in the country.

In a pandemic, the medical toxicologist is mainly responsible for recognizing and managing therapy-associated toxicities. SARS-CoV-2 outbreak has been related to various toxicity patterns other than therapy-related ones (Neumann et al.,2020). Within the same context, the toxicologists are the conservative voice warning about the new ways of toxicities. Several aspects of mal-used drugs and other materials emerged with the Covid-19 outbreak (Neumann et al.,2020). Therefore, considering any new therapy or new use of chemicals on a large population is worthy of discussion (Gilead, 2020).

Indeed, dramatic modulation of the population behavior has evolved from uncontrolled fear of Covid-19, such as obsessive cleaning of the houses and detergents misuse for food cleaning and personal hygiene (LeRoux and

Sinno-Tellier,2020). Hence, increased exposure cases to cleaning products are reported globally (Kampf et al.,2020).

Taking this in mind, the present study objected at assessing the incidence and pattern of toxicities referred to the Poison Control Center -Ain Shams University Hospital (PCC-ASUH) during 2020, related to Covid-19 pandemic period and drugs used in its treatment protocols, in comparison to the same toxicities in 2019.

## II. PATIENTS AND METHODS

### 2.1 Study design:

This is a retrospective comparative cross-sectional study, conducted at the Poison Control Center -Ain Shams University Hospital (PCC-ASUH).

### 2.2 Sample characteristics:

Toxicology cases recruited to Poison Control Center -Ain Shams University Hospital (PCC-ASUH) from the start of the COVID-19 pandemic, from 1st of January 2020 till the 31st of December 2020, compared to the year before (from 1<sup>st</sup> of January 2019 till the 31<sup>st</sup> of December 2019). All records of the toxicity cases related to the Covid-19 pandemic period and management protocols, during the described two years, were examined and analyzed. Data concerning the number, the type of poisoning, and deaths were obtained.

### 2.3 Inclusion criteria:

-Toxicity cases related to covid -19 treatment protocols, including paracetamol, salicylates, vitamins, anti-allergic drugs, anticoagulants, antibiotics, theophylline, and beta-blockers.

-Toxicity cases related to the covid -19 situation, including substance abuse, CNS drugs, detergents, and food poisoning

#### **2.4 Exclusion criteria:**

All toxicities not related to covid -19 treatment or related to the situation were excluded.

#### **2.5 Statistical analysis:**

The data were tabulated and statistically analyzed using the SPSS statistical software package (SPSS Inc., Chicago, IL), version 22. Categorical data were presented as frequency and percentage, and the chi-square test was used for comparison, with 0.05 being considered the level of significance.

### **III. RESULTS**

The total studied poisoning cases in the two years were 18416. Of them, 12475 cases were in 2019, and 5941 cases were in 2020. The distribution of patients according to different poisoning causes was significantly different between the two years ( $p=0.00$ ) (Table 1). Among the studied cases of poisoning in the two years, including drugs used in Covid-19 treatment, food poisoning, CNS drugs poisoning (including Antidepressants

and Benzodiazepines), detergents, substance abuse, drugs used in Covid-19 treatment were the predominant cause of poisoning in 2020 and 2019 as well (33.2% & 36.1% respectively) (Table 1).

No significant difference was depicted between the two years in the percentage of CNS drugs poisoning ( $p>0.05$ ). The remaining causes of poisoning were significantly different in the two years ( $p<0.05$ ) (Table 1 and Figure 1).

The total poisoning-related death was significantly higher in the year 2020 than in the year 2019 ( $p<0.001$ ). This significant difference was evident between the two years in the rate of Covid-19 treatment-related deaths ( $p<0.001$ ) (Table 2).

The highest death rate was demonstrated in cases diagnosed with substance abuse (2%), both in the year 2019 (1.7%) and the year 2020 (2.4%) (Table 2).

The distribution of poisoning-related death percentages in the two years is shown in figure 2. Substance abuse poisoning was the incriminated death cause in 74.4% and 77.3% of death cases in the two years.

Assessment of difference between the two years in each category of the different poisoning causes revealed a statistically significant difference in the distribution of patients among the various types of detergents, substance abuse, and Covid-19 treatment toxicity ( $p<0.001$ ) (Table 1).

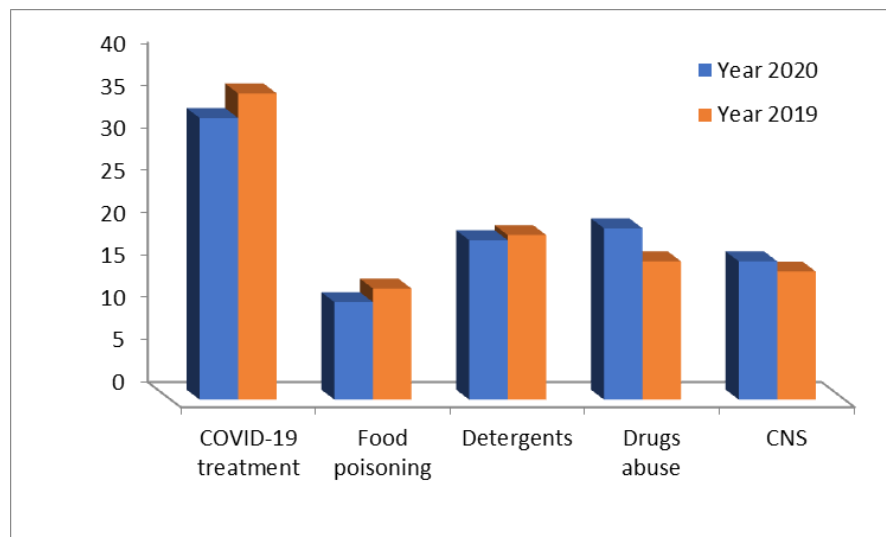
Regarding Covid-19 treatment, 2020 demonstrated an increase in paracetamol toxicity (Table 1). Concerning substance abuse poisoning, 2020 showed an increase in ethanol, methanol, and decrease in other opioids (e.g., tramadol), and subtle changes in cannabis derivatives and heroin poisoning (Table 1).

In food poisoning, there was a decrease in 2020 compared to 2019 (Table 1). As for CNS drugs poisoning, the rates of antidepressants and benzodiazepines toxicity were comparable in the two years (Table 1). Regarding detergents, a considerable increase in corrosives (chlorine) and a decrease in phenol toxicities were evident in 2020 concerning the total number of cases compared to 2019 (Table 1).

**Table 1:** Distribution of the study patients according to each category of different poisoning causes using Pearson Chi-square analysis

Type	Item	2020 (N=5941)	2019 (N =12475)	X <sup>2</sup>	P
Covid-19 treatment	Salicylates & NSAID	351 (17.9)	781 (17.4)	106.5	<0.001*
	Paracetamol	435 (22.2)	833 (18.6)		
	Vitamins	116 (5.9)	328 (7.3)		
	Anti-allergic	175 (8.9)	558 (12.4)		
	Anticoagulants	29 (1.5)	70 (1.6)		
	Theophylline	380 (19.4)	611 (13.6)		
	Systemic antibiotics	109 (5.6)	511 (11.4)		
	Beta-blockers and antihypertensive.	368 (18.7)	794 (17.7)		
CNS drugs	Cyclic antidepressants	511 (51.6)	992 (51.7)	0.05	0.98
	Benzodiazepines	455 (45.9)	879 (45.9)		
	Other and unspecified antidepressants	25 (2.5)	46 (2.4)		
Detergents	Corrosives (chlorine)	856 (76.9)	1394 (57.8)	132.2	<0.001*
	Phenol	48 (4.3)	100 (22.4)		
	Other detergents	209 (18.8)	918 (19.8)		
substance abuse	Ethanol	295 (24.7)	426 (21)	19.97	<0.001*
	Methanol	34 (2.8)	42 (2.1)		
	Cannabis derivatives	555 (46.5)	936 (46.1)		
	Heroin	216 (18.1)	382 (18.8)		
	Other opioids (e.g., tramadol)	93 (7.8)	245 (12.1)		
Food poisoning	Foodborne staphylococcal intoxication	681 (11.5)	1629 (13.1)	--	--

N= number ; X<sup>2</sup> = chi-square test; \* P value < 0.05 is considered significant.

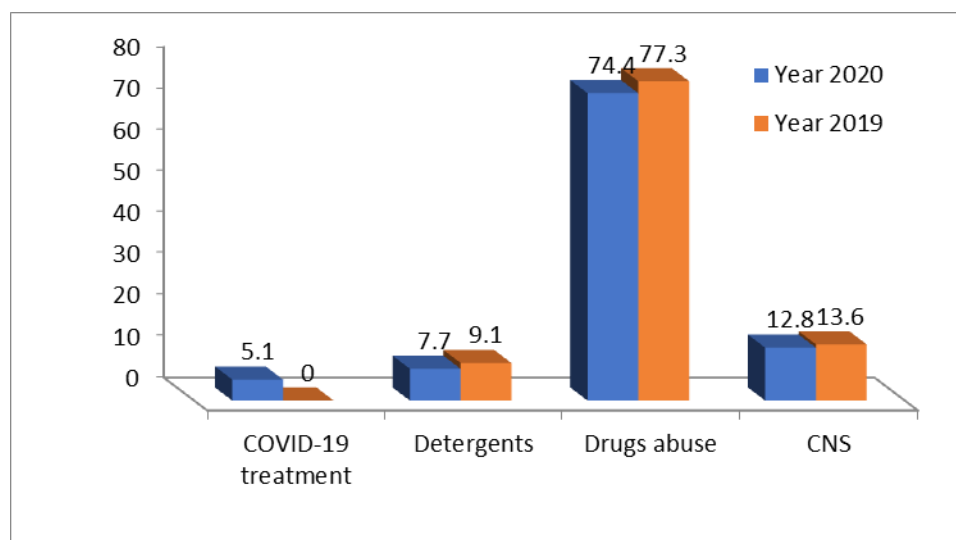


**Figure 1:** Percentages distribution of study patient types of poisoning in the two years.

**Table 2:** Distribution of study patient types of poisoning in the two years using Pearson Chi-square analysis

Type		2020 (N=5941)	2019 (N=12475)	Total (N=18416)	Z	P
COVID-19 treatment	N (%)	1963 (33.2)	4486 (36.1)	6449 (35.2)	-3.9	<0.001*
	Death cases n (%)	2(0.1)	0(0)	2 (0.003)	2.1	0.03*
Food poisoning	N (%)	681 (11.5)	1629 (13.1)	2310 (12.6)	-3.1	0.002*
	Death cases n (%)	0 (0)	0 (0)	0 (0)	--	--
CNS drugs	N (%)	991 (16.3)	1917 (15.1)	2908 (15.5)	2.3	0.02*
	Death cases n (%)	5 (0.5)	6 (0.31)	11(0.38)	0.8	0.42
Detergents	N (%)	1113 (18.8)	2412 (19.4)	3525 (19.2)	-0.97	0.3
	Death cases n (%)	3 (0.27)	4 (0.17)	7(0.2)	0.64	0.52
substance abuse	N (%)	1193 (20.2)	2031(16.3)	3224 (17.6)	6.3	<0.001*
	Death cases n (%)	29 (2.4)	34 (1.7)	63 (2)	1.5	0.13
Total	N (%)	5941 (100)	12475(100)	18416 (100)		
	Death cases n (%)	121 (2)	88 (0.7)	209 (1.1)	7.8	<0.001*
$\chi^2$		56.3				
P		<0.001*				

N= number;  $\chi^2$  = chi-square test, Z= Z scores for proportion; \* P value < 0.05 is considered significant.



**Figure 2:** Percentages distribution of study patients' death causes in the two years

#### IV. DISCUSSION

The primary outcome for this study was describing the poisoning rate and pattern of cases referred to the Poison Control Center -Ain Shams University Hospital (PCC-ASUH)- Cairo-Egypt, during the first year of the COVID-19 pandemic, related to its treatment protocols and toxicities associated with this situation in 2020 compared to the same period in the year 2019.

In the present study, the total poisoning cases in 2020 decreased at a rate of 52.4%, compared to 2019, despite the natural population increase in this year (1.94%) (Worldometer,2021). This finding is in accordance with results of a study conducted in Italy by Milella et al. (2021) to investigate the same issue; they reported a reduction in toxicology calls from hospitals and emergency departments during the

lockdown, and contradictory to the Saudi study that reported that increased number of the consultation calls reported by Dammam Poison Control Center (DPCC) in 2020 (Mahmoud et al.,2021), another study conducted in France also reported increased toxicology cases calls (LeRoux et al.,2021). This finding could be attributed to the long lockdown hours experienced during the pandemic and the social fear of stigmatization.

The distribution of patients according to different poisoning causes significantly differed between the two years. Regarding Covid-19 treatment, the year 2020 demonstrated an increase in paracetamol toxicity. Paracetamol is the most common home medication used to manage early symptoms of Covid-19 to alleviate pain, fever and control inflammation. Some research reports warn that the NSAIDs supposed induction of ACE2 protein levels (the

receptor used by SARS-CoV2). Hence, the use of NSAIDs has been strongly discouraged, while paracetamol use as the preferred alternative has been adopted (Sestili and Fimagnari, 2020). This could explain the reported increase in paracetamol toxicity during the Covid-19 pandemic.

Of all studied poisoning cases, 15% had CNS drugs poisoning. Depression and anxiety disorders prevalence has shown continuous rise globally, and they were considered common mental disorders (WHO,2017). This growing prevalence is also reported in Egypt (Odejimi et al.,2020). In the current study, a mild increase in CNS drugs toxicity was noted in 2020. The literature has described the psychiatric consequences of Covid-19 and the resultant lockdown with wide controversy. Some publications related the COVID-19 pandemic and isolation to elevated incidences of anxiety and depression disorders (Gunnel et al.,2020). Others argued that the pandemic, in contrast, may have a protective effect initially (Cleland,2020).

Concerning substance abuse poisoning, 2020 showed an increase in ethanol and methanol, and decrease in other opioids (e.g., tramadol), and subtle changes in cannabis derivatives and heroin poisoning. Our results agree with Le Roux et al. (2021); the authors reported that addictive exposures remained stable in 2020. It was declared that the most common causes in Europe, for reduced use of some abuse drugs during the year

2020, were being less available to buy, reduced income, and limited movement during lockdown (EMCDDA,2020) and with the easy access of beverages and tobacco.

In the present study regarding detergents, the increase in corrosives (chlorine) toxicity was evident in 2020. In accordance, the studies of Chang et al. (2020), McCulley et al. (2020), and Le Roux et al. (2021) reported that disinfectants containing a biocide were among the categories showing the most prominent increased frequencies. Chang et al. (2020) declared that some patients had exposure due to putting disinfectants in the water used for cooking. Kampf et al. (2020) found that some people frequently highly use concentrations of sodium hypochlorite, although a concentration of 0.1% eliminates COVID-19 infectivity on the inert surface effectively. Home isolation was supposed to contribute to such behaviors due to its deleterious influence on decision making and mental performance (Chumet et al.,2009) & (Rovetta and Bhagavathula,2020). However, other factors lead to increased exposure to detergents, such as attitudes towards hygiene and disinfection, lack of knowledge about using and storing cleaners and disinfectants, and lockdown with staying of young children at home with varying degrees of supervision from caregivers (Gharpure et al.,2020) & (Chan and Chan, 2018). Indeed, uncontrollable fear about the Covid-19 leads to improper use of detergents, obsessive repeated cleaning of houses,

and forming mixtures of cleaning products (Nabi et al.,2020).

Despite the decreased frequency of poisoning cases in the year 2020, the total poisoning-related death was significantly higher, but about the total number of cases, with a difference evident in the rate of fatalities from Covid-19 treatment and substance abuse. This is inconsistent with other studies which reported that despite the increased exposure frequencies, the severity of the exposed cases decreased (Mahmoud et al.,2021) (Milella et al.,2021) (LeRoux et al.,2021).

It is widely accepted that several phenomena may evolve from a major medical catastrophe that has no known accurate treatment. The public anxiety and increased connection to social media and the internet, with their powerful, influential authority, may lead to multiple wrong practices, as self-medication and drugs misuse (Neumann et al.,2020). This emphasizes Egypt's prevalent drugs misuse behavior, which should call alert.

The strength of this study is its conduction in a large poisoning center, providing a large sample size and being one of the first studies handling such a critical issue in Egypt. However, the study is limited by its retrospective design and the lack of socio-demographic data of the patients.

## V. CONCLUSION

In the current study, an alteration in the frequency and pattern of the poisoning cases during the Covid-19 pandemic was evident. Most cases in the two studied years were Covid-19 treatment poisoning, increasing disinfectants, and paracetamol toxicities during the pandemic. Despite decreased frequency in 2020, the death rate increased in relation to cases number. An educational strategy should be adopted to eliminate Covid-19 related behaviors that affect population health, including awareness against misuse of analgesics, over-the-counter medications, and household disinfectants.

## VI. ETHICAL CONSIDERATIONS

All ethical principles were considered in this article. This study was performed after the approval of the research ethics committee of the Faculty of Medicine, Ain Shams University. Official permission for obtaining the records and appropriate data was retrieved from the director of Poison Control Center -Ain Shams University Hospital (PCC-ASUH), preserving the confidentiality of documents by using coding numbers.

## VII. ACKNOWLEDGEMENTS

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## تقييم حالات التسمم المتعلقة ببروتوكولات العلاج والمرحلة الخاصة بفترة جائحة كورونا-الحالات المحولة الى مركز علاج السموم - مستشفيات جامعة عين شمس - مصر

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حدث تطور لسلوك السكان من الخوف غير المنضبط من جائحة كورونا وأدى إلى زيادة أعداد حالات التسمم وأنماطها المتغيرة. هدف العمل: هدفت الدراسة الحالية الى تقييم حالات التسمم المتعلقة ببروتوكولات العلاج والمرحلة الخاصة بفترة جائحة كورونا المحالة إلى مركز مراقبة السموم - مستشفى جامعة عين شمس خلال عام 2020، وهي فترة جائحة كوفيد-19 والأدوية المستخدمة في علاجه مقارنة بنفس حالات التسمم في عام 2019. المرضى والطرق: تم اختيار حالات السموم المسجلة في الدراسة من الحالات المحالة إلى مركز علاج السموم - مستشفى جامعة عين شمس من 1 يناير 2020 حتى 31 ديسمبر 2020 والحالات من نفس الفترة من عام 2019. تم فحص وتحليل جميع سجلات العاميين الموصوفين. تمت مراجعة البيانات المتعلقة بعدد ونمط التسمم. النتائج: بلغ إجمالي حالات التسمم المدروسة في العاميين 18416 حالة منها 12475 حالة في عام 2019 و5941 حالة في عام 2020. وكان توزيع المرضى حسب أسباب التسمم المختلفة مختلفاً بشكل كبير بين العاميين. كانت العقاقير المستخدمة في علاج كوفيد-19 هي السبب الرئيسي للتسمم. لم يظهر فرق معنوي بين السنتين في نسبة التسمم بأدوية الجهاز العصبي المركزي ( $p > 0.05$ ). كانت أسباب التسمم المتبقية مختلفة بشكل كبير في العاميين ( $P < 0.05$ ). كان إجمالي الوفيات المرتبطة بالتسمم أعلى في عام 2020 منه في عام 2019 ( $P < 0.001$ ). الخلاصة: في الدراسة الحالية، كان هناك تغيير واضح في وتيرة ونمط حالات التسمم خلال جائحة كورونا. كانت معظم الحالات في السنتين المدروستين تسمماً بسبب علاجات فيروس كورونا، وزيادة المطهرات، وتسمم الباراسيتامول أثناء الوباء. على الرغم من انخفاض التواتر في عام 2020، إلا أن معدل الوفيات ارتفع بنحو عدد الحالات. يجب اعتماد الاستراتيجية التعليمية للقضاء على السلوكيات المرتبطة بكوفيد-19 التي تؤثر على صحة السكان.