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Research Paper

The Impact of COVID-19 on Intoxication Pattern by Drugs of Abuse in Egypt

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ABSTRACT

Background: Drug abuse is considered a global and growing problem worldwide. Emergency medical care is required for acute intoxication, which adds to the threat of COVID-19. This study aims to evaluate the effect of the COVID-19 pandemic on the pattern of acute toxicity in drug abuse patients admitted to National Environmental and Clinical Toxicology and Research Center (NECTR), Cairo University.

Methods: This comparative study included 978 cases admitted to NECTR during 12 months before the COVID-19 pandemic (2018-2019) and 12 months during the pandemic (2020-2021).

Results: The number of cases during the pandemic was lower than before; adults and men predominate in both periods. During the pandemic, cannabis, heroin, opium, and alcohol showed a mild increase, while the new synthetic drugs, tramadol, and pregabalin, showed a mild decrease. A significant increase in discharges and a decrease in intensive care unit (ICU) admissions were observed during the pandemic. Besides, more oxygen (O_2) therapy was required, and more cases died on mechanical ventilation. The worst outcome was associated with old age, male gender, heroin and opium toxicity, and the highest score of poisoning severity.

Conclusion: The COVID-19 pandemic had a definite reforming effect on the pattern of intoxication by drugs of abuse in NECTR, Egypt.

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1. Introduction

Substance abuse is still a significant global public health issue. The prevention and treatment of drug use problems are becoming more difficult with the availability of more potent drugs, the increasing number of substances, and their potential combinations [1].

Compared to the global incidence, a higher incidence of substance abuse in Egypt, especially in Greater Cairo, was reported by the national research for addiction from 2007 to 2014 [2]. The toxicity pattern typically varies between locations and countries [3].

Heroin, cocaine, ethyl alcohol, cannabis, and benzodiazepines are still the most common compounds associated with acute drug intoxication, necessitating emergency medical care. New psychoactive substances have arisen and gained popularity in the past ten years, leading to increased number of side effects and emergency room visits associated with synthetic cannabinoids [4, 5].

The global pandemic of COVID-19 affects medical facilities. Compared to past years, the pandemic changed the flow, nature, and severity of cases presented to emergency rooms. However, this shift has not been adequately reported among hospitalizations due to toxic exposure [6].

2. Materials and Methods

This comparative cross-sectional study was conducted on 978 participants who were admitted to the National Environmental and Clinical Toxicology and Research Center (NECTR) with a history of acute intoxication by drugs of abuse during the 12 months (from the beginning of April to the end of September) in 2018 and 2019 before the pandemic and 12 months (from the beginning of April to end of September) in 2020 and 2021 during the pandemic. The study was approved by the Ethics Committee of the Forensic Medicine and Clinical Toxicology Department and the Ethics Committee of the Faculty of Medicine-Cairo University, with reference number MS-276-2021. Data were collected from the archive and analyzed after obtaining written approval from the head of NECTR. Data were collected concerning demographic conditions (age, sex, marital status, residence, and occupation), type of drug, manner of toxicity, duration between exposure and arrival to NECTR, management, duration of stay in the hospital, the severity of poisoning using poisoning severity score (PSS) and outcome.

Statistical analysis

Data were coded and entered using the SPSS software, version 28 (IBM Corp., Armonk, NY, USA). Data were summarized using frequency (count) and relative frequency (percentage) for categorical data. To compare categorical data, Chi-square (χ^2) test was performed. The exact test was used when the expected frequency was less than 5 [7]. P values less than 0.05 were considered statistically significant.

3. Results

According to the case distribution and demographic data analysis, it was found that 602 cases (61.6%) were presented to NECTR before the pandemic, while 376 cases (38.4%) were presented during the pandemic. No statistical difference was observed between the age groups in the two periods. However, teenagers (12 to 18 years) and adults (18 to 40 years) decreased during the pandemic, while the middle (40 to 60 years) and old age (>60 years) groups increased. No change was observed regarding the pediatric age group (<12 years). Men were predominant in both periods (61.8% and 62.8%). Single cases were predominant in both periods (38.9% and 37.2%). Urbanization cases were predominant in both periods (63.1% and 68.9%). Unemployed cases contributed to the majority of cases (75.7% and 72.6%) before and during the COVID-19 pandemic, respectively.

Assessment of substances of abuse before and during the COVID-19 pandemic

Pattern of substances of abuse

A significant difference (P<0.001) was observed between the two periods with the predominance of cannabis followed by benzodiazepine in both periods, with a slight increase in cannabis, opium, heroin, and alcohol versus a slight decrease in benzodiazepine, tramadol, pregabalin, and combined drugs during the pandemic as shown in Table 1.

Manner of toxicity

Accidental toxicity represented 73.4% and 77.9% of cases, while suicidal toxicity represented 26.6% and 22.1% of cases before and during the pandemic period, respectively, with a slight increase in accidental and a decrease in suicidal cases during the pandemic.

Table 1. Relative frequency distribution of drugs of abuse among the studied sample in the two studied periods (P<0.001*)

Substance of Abuse	No. (%)	
	2018-2019	2020-2021
Cannabis	176(29.2)	126(33.5)
New synthetic drugs (strox, voodoo)	28(4.7)	4(1.1)
Tramadol	55(9.1)	24(6.4)
Heroin and opium	55(9.1)	55(14.6)
Pregabalin	62(10.3)	21(5.6)
BZD	125(20.8)	75(19.9)
Alcohol	53(8.8)	44(11.7)
Miscellaneous drugs (CNS stimulants, antihistaminic dextromethorphan, tobacco)	11(1.8)	13(3.5)
Combined drugs (Alcohol+psychotropic drugs/cannabis/opiates)	37(6.1)	14(3.7)

*P<0.05, Abbreviations: CNS: Central nervous system; BZD: Benzodiazepines.

Delay time of presentation

A significant difference (P<0.001) was observed in presentation delay since cases presented before 2 hours and 2-6 hours were more than cases presented more than 6 hours during the pandemic, while cases presented more than 6 hours before the pandemic was more (Figure 1).

Toxicological screening

Table 2 presents a significant difference (P<0.005) between the two periods because the negative cases before the pandemic (43.5%) were more than during the pandemic (35.6%). The pattern of drug screening showed that most drugs of abuse decreased during the pandemic, except for cannabis, heroin, and amphetamine, which increased during the pandemic.

Poisoning severity score (PSS)

No statistically significant difference was observed between the two study periods. However, most of the cases were of moderate severity (70.3%, 71%) before and during the pandemic, respectively (Figure 2).

Admission to hospital

No statistical difference was observed between the two periods, since most cases before and during the pandemic and those who were not admitted (70.3%, 71%), were admitted to the ward (7.1%, 8.2%), before and during the pandemic, respectively, while cases admitted to intensive care unit (ICU) before pandemic (4.5%) were more than (3.2%).

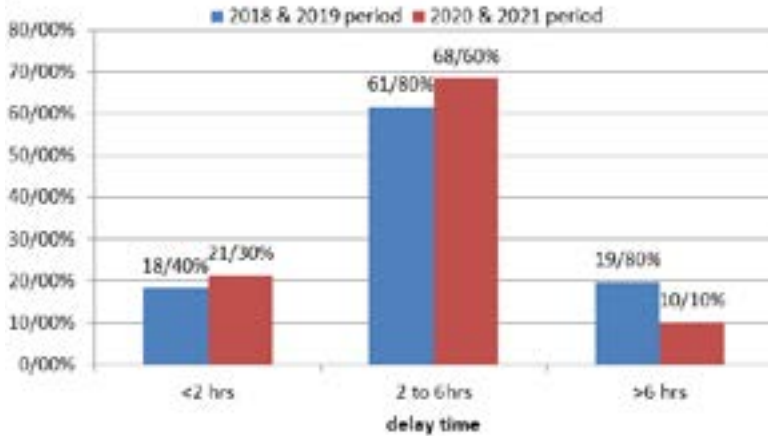

Figure 1. Relative frequency distribution of delay time of presentation among the studied sample in the two studied periods

Table 2. Relative frequency distribution of toxicological screen among the studied sample in the two studied periods (P=0.005*)

Toxicology Screen	No. (%)	
	2018-2019	2020-2021
Cannabis	157(26.1)	128(34.0)
Heroin and opium	48(8.0)	40(10.6)
Tramadol	57(9.5)	24(6.4)
BZD	40(6.6)	23(6.1)
Amphetamine	0(0.0)	4(1.1)
Cocaine	1(0.2)	0(0.0)
Combined	37(6.1)	23(6.1)
Negative	262(43.5)	134(35.6)

* P value <0.05. Abbreviations: BZD: Benzodiazepines.

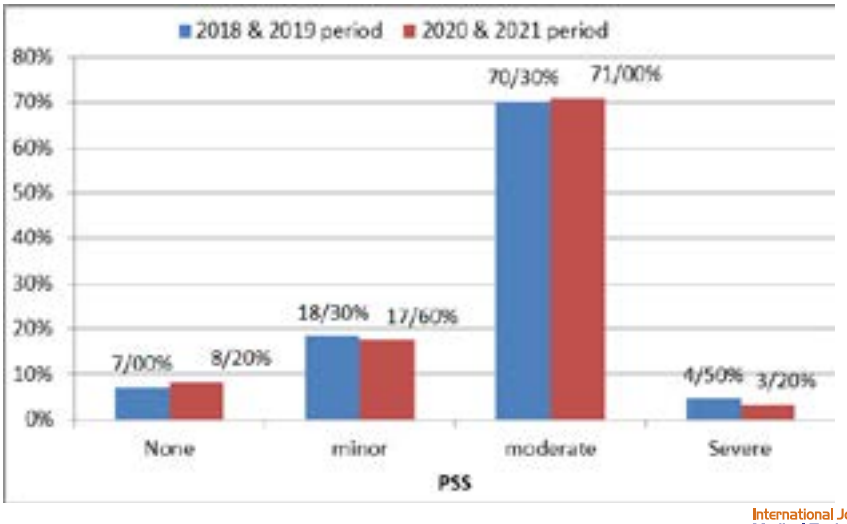

Figure 2. Relative frequency distribution of poisoning severity score (PSS) among the studied sample in the two studied periods

Table 3. The percentage and numbers of cases who received supportive management before and during COVID-19 pandemic

Supportive Management	Method of Supportive	No. (%)		P
		2018-2019	2020-2021	
Airway and breathing	Oxygen	160(26.6)	125(33.2)	0.026*
	Nebulizer	39(6.5)	16(4.3)	0.142
	Suction	46(7.6)	21(5.6)	0.216
	Intubation and mechanical ventilation	26(4.3)	11(2.9)	0.267
Circulatory management	Adequate hydration	447(74.3)	280(74.5)	0.940
	Inotropics	11(1.8)	7(1.9)	0.969
Symptomatic treatment	PPI	422(70.1)	269(71.5)	0.630
	Antiemitics	439(72.9)	282(75.0)	0.473
	Sedative and hypnotic drugs	65(10.8)	35(9.3)	0.455
	Nahco3	43(7.1)	24(6.4)	0.647
	Vit B12	26(4.3)	23(6.1)	0.210

*P value <0.05. Abbreviations: PPI: Proton pump inhibitors.

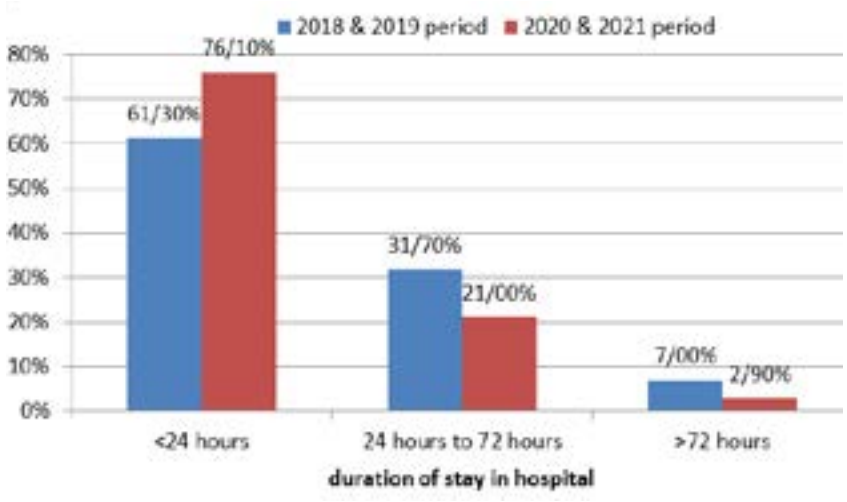

Figure 3. The percentage of cases according to the duration of stay at the hospital before and during the COVID-19 pandemic

Management

A) Supportive management (Table 3).

1. Airway and breathing: all measures of breathing decreased except oxygen inhalation increased significantly during the pandemic.

2. Circulatory management, such as adequate hydration and inotropes showed a non-significant decrease during the pandemic.

3. Similarly, the symptomatic treatment showed a non-significant decrease during the pandemic.

B) In terms of gastrointestinal decontamination, no significant difference was observed, but more than half of cases (54.4%) needed activated charcoal during the pandemic compared to less than half of cases (45%) before the pandemic.

C) Antidote therapy showed a non-significant increase during the pandemic period.

Duration of stay at the hospital

Most cases were discharged before 24 hours in both study periods, but more percentage during the pandemic with significant difference (P<0.001) as discharged cases were 61.3% and 76.1%, before and during the pandemic, respectively. The duration of stay more than 24 hours during the pandemic decreased significantly compared to before the pandemic (Figure 3).

Table 4. The relation between drugs of abuse and outcome before and during COVID-19 pandemic

Substances of Abuce	2018-2019, No. (%)			P	2020-2021, No. (%)			P
	Improved and Discharge	Discharge on Own's Responsibility	Died		Improved and Discharge	Discharge on Own's Responsibility	Died	
Cannabis	149(84.6)	27(15.3)	0(0.0)		108(85.7)	18(14.3)	0(0.0)	
New synthetic drugs	13(46.4)	15(53.6)	0(0.0)		1(25)	3(75)	0(0.0)	
Tramadol	34(61.8)	19(34.5)	2(3.6)		19(79.2)	5(20.8)	0(0.0)	
Heroin and opium	32(58.2)	19(34.5)	4(7.3)		24(43.6)	24(43.6)	7(12.7)	
Pregabalin	28(45.2)	34(54.8)	0(0.0)	0.001*	17(81)	4(19)	0(0.0)	0.001*
BZD	116(92.8)	9(7.2)	0(0.0)		66(88)	9(12)	0(0.0)	
Alcohol	48(90.6)	5(9.4)	0(0.0)		39(88.6)	5(11.4)	0(0.0)	
Miscellaneous drugs	8(72.7)	3(27.3)	0(0.0)		9(69.2)	4(30.8)	0(0.0)	
Combined drugs	24(64.9)	12(32.4)	1(2.7)		8(57.1)	6(42.9)	0(0.0)	

*P value <0.05. Abbreviations: BZD: Benzodiazepines.

Table 5. The relation between delay time of presentation and outcome before and during COVID-19 pandemic

Delay Time (Primary Assessment)	2018-2019, No. (%)			P	2020-2021, No. (%)						P
	Improved and Discharge	Discharge on Own Responsibility	Died		Improved and Discharge		Discharge on Own's Responsibility		Died		
<2 h	90(81.1)	20(18.0)	1(0.9)	0.041*	64	80.0	15	18.8	1	1.3	0.818
2-6 h	267(71.8)	102(27.4)	3(0.8)		195	75.6	57	22.1	6	2.3	
>6 h	95(79.8)	21(17.6)	3(2.5)		32	84.2	6	15.8	0	0.0	

*P <0.05.

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The relation between drugs of abuse and outcome before and during the pandemic

A significant difference (P<0.001) was observed between the outcome of drugs during and before the pandemic, as shown in Table 4, since the improvement and discharge were more before the pandemic, except for pregabalin and tramadol. Discharge on request was more during the pandemic, except for pregabalin, tramadol, and cannabis. Fatalities were reported for heroin, opium, and tramadol before the pandemic, which occurred during the pandemic, but only for heroin and opium.

The relation between the delay time of presentation and the outcome

Table 5 presents a significant increase in the percentage of improved cases and a marked decrease in discharged cases on their responsibility (except for cases presented before 2 hours of exposure) during the pandemic. Death cases during the pandemic were more in cases presented during the first 6 hours of exposure, and none in cases presented after 6 hours, while more deaths occurred in cases presented after 6 hours before the pandemic.

The relation between poison severity score (PSS) and outcome

The cases of without and mild PSS were all improved and discharged. The worst outcome was fatalities in cases with severe PSS in both periods, with a highly significant increase (P<0.001) during the pandemic (Table 6).

The relation between duration of stay in hospital and outcome

A significant increase in discharged patients during the fiirst 24 hours and between 24 to 72 hours during the pandemic. Fatal outcome was detected in cases that stayed more than 72 hours throughout of the pandemic, with more cases longer than 72 hours during the pandemic (Table 7).

4. Discussion

Since the emergence of COVID-19 from Wuhan at the end of 2019, it has spread rapidly throughout the world and hence was considered a pandemic by the World Health Organization on March 11, 2020 [8]. The 1st confirmed case in Egypt was reported on February 14, 2020. The Egyptian government, as well as many other countries, provided lockdowns and curfews to confine the disease [9].

Table 6. Relation between the poisoning severity score and the outcome before and during COVID-19 pandemic

PSS	2018-2019, No. (%)			P	2021-2022, No. (%)			P
	Improved and Discharge	Discharge on Own Responsibility	Died		Improved and Discharge	Discharge on Own's Responsibility	Died	
None	42(100)	0(0.0)	0(0.0)	<0.001*	31(100)	0(0.0)	0(0.0)	<0.001*
Mild	110(100)	0(0.0)	0(0.0)		66(100)	0(0.0)	0(0.0)	
Moderate	285(67.4)	138(32.6)	0(0.0)		190(71.2)	77(28.8)	0(0.0)	
Sever	15(55.6)	5(18.5)	7(25.9)		4(33)	1(8.3)	7(58.3)	

*P <0.05. Abbreviations: PSS: Poisoning severity score.

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Table 7. The relation between the duration of stay in hospital and outcome before and during COVID-19 pandemic

Duration of stay in hospital	2018-2019, No. (%)			P	2021-2022, No. (%)			P
	Improved and Discharge	Discharge on Own's Responsibility	Died		Improved and Discharge	Discharge on Own's Responsibility	Died	
<24 h	269(72.9)	100(27.1)	0(0.0)	<0.001*	214(74.8)	71(24.8)	1(0.3)	<0.001*
24-72 h	155(81.2)	36(18.8)	0(0.0)		71(89.9)	6(7.6)	2(2.5)	
>72 h	28(66.7)	7(16.7)	7(16.7)		6(54.5)	1(9.1)	4(36.4)	

*P <0.05.

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The COVID-19 pandemic has a high mortality rate and is responsible for a significant amount of panic, anxiety, trauma, psychosis, and suicide risk worldwide [10]. Additionally, research has linked alcohol and drug abuse to loneliness and social isolation [11].

Although many studies have established a link between substance use disorders (SUDs) and COVID-19, currently, little research is conducted on how this may relate to the Egyptian healthcare system [12-15].

The study included 978 cases admitted to the NECTR, Cairo University. During the study period, about two-thirds of the included patients (61.6%) were admitted to NECTR before the pandemic (2018 and 2019). This means that the total number of cases during the pandemic decreased compared to before the pandemic. This is consistent with the Italian study conducted by Milella et al., who found that toxicology calls from hospitals and emergency departments were reduced during the lockdown [16]. The quarantine restrictions on transporting people living in remote locations are the best reason for this decrease in admissions during the lockdown period.

In the present study, both groups were comparable in terms of age and sex, and the most common age group was the adult age group (18-40 years) and men contributed a higher percentage of the patients in the two study periods. This is comparable with the Egyptian study conducted by Zaki et al. [17] and the Turkish study of Öztürk et al. [10], who found that the highest percentage of patients were in the age group of 18-40 years. This is also consistent with Fayed and Sharif's study, although they found a higher contribution of women [6]. This age group prevalence can be explained by the fact that people in this age range lose their parents' protection. Moreover, it was noted that men are more prone to engage in drugs offered by their peers, but females usually resist the offer when faced with the same conditions [17].

This study showed no statistically significant difference between the two periods in terms of marital status so that according to Sinha et al., the single group had the highest prevalence in the admitted cases that marriage hastens the decline in drug abuse compared to single people [18].

Most cases in this study were unemployed. Regarding the relationship between substance abuse and economic conditions, Chalmers et al. have found that reduced expenditures during economic downturns affected drug use behavior [19]. However, de Goeij et al. have shown that economic downturns and the stresses they cause, including job loss, are associated with increased problematic drinking [20]. This may be attributed to financial difficulties that can be associated with anxiety, depression, and psychological distress, which usually lead to abnormal behaviors, including substance abuse.

The most common drugs of abuse during the two periods were cannabis and benzodiazepines. These results are consistent with Hashem et al., who reported that the incidence of synthetic cannabinoid toxicity has recently increased in Egypt [21]. Additionally, benzodiazepines were the most commonly used substances in Romania, Chile, and Japan [22-24].

The present study showed that the two study periods have a significant difference in terms of the type of abused drug. During the pandemic, a mild increase was observed in the use of cannabis, heroin and opium, alcohol, and miscellaneous drugs, mainly central nervous system (CNS) stimulants (amphetamine and cocaine), while a mild decrease was observed in new synthetic drugs (strox and voodoo), tramadol, and pregabalin. Our findings are consistent with Holland et al., who found a 32% rise in emergency department admissions due to opioid toxicity during the pandemic compared to pre-pandemic values [25]. These results differ slightly from the study of Le Roux et al., as the authors reported that

addictive exposures remained stable in 2020 [26]. It was declared that the most common reasons for the reduced use of some drugs of abuse in 2020 were less available for purchase, reduced income, and limited movement during the lockdown [27]. On the other hand, Manthey et al. reported that alcohol use decreased during the pandemic [28], and Öztürk et al. found that cocaine and cannabis use declined significantly during the pandemic, the frequency of synthetic cannabinoid and tramadol abuse was comparable in the two periods while pregabalin use increased significantly during the pandemic [10].

This study showed that the accidental pattern was the most common manner of toxicity, followed by the suicidal pattern. Our findings are consistent with the results of another study by Huynh et al. [29]. Likewise, Zaki et al. observed a predominance of accidental overdose (86.8%) followed by suicidal intake (12.2%) [17]. Vallersnes et al. reported that most cases (94%) were accidental poisoning, and only 4% were suicidal in an emergency outpatient clinic in Oslo, Norway [30]. Pritchard and Amanullah showed that the low frequency of suicide in Islamic countries may be due to its prohibition in the Quran and religious beliefs [31] in contrast to studies in many European countries that indicated higher suicidal risk among abusers as reported by Sorodoc et al. that suicidal poisoning was the most common pattern [22].

The present study showed a decrease in suicidal cases during the pandemic. This is consistent with the results reported in many other countries (Canada, Scandinavia, and Germany) which is hypothesized to be due to focusing on social and familial support systems [32-34]. Japan, which historically has high suicide rates, experienced a continuous decline in the world's suicide rates by 2020 [35].

The current study showed a significant difference between the two periods in terms of the delay time of presentation. It was found that during the pandemic, a higher percentage of cases were presented to NECTR in less than 2 hours or from 2 to 6 hours. It was suggested that a delayed presentation of more than six hours is because mild toxicity is frequently treated at home [22]. Additionally, it may be explained by the lockdown status, which makes roads empty with a better flow of the ambulance.

No statistically significant difference was observed between the two periods in the grades of the poisoning severity scale (PPS); this is consistent with Le Roux et al. [26] and Milella et al. [16], who found no difference in overall case severity during the pandemic compared to the pre-pandemic period. In both periods, most cases presented with moderate severity, followed by mild severity, no severity, and then with a severe presentation, which was consistent with Alanazi et al.'s study [36].

In this study, patients' management included airway and circulation support, symptomatic management, gastrointestinal tract (GIT) decontamination, and antidote use. No significant difference was found between the two periods in any of the indicated treatments apart from the need for oxygen therapy which was increased during the pandemic. We think that this may be related to COVID-19 itself as it can combine with the poisoning status and lead to lung affection with an increased need for oxygen therapy.

The current work displayed a significant difference between the two periods in the pattern of weaning from mechanical ventilation because the cases that died on mechanical ventilation increased during the pandemic period. The coronavirus can make addicts more susceptible to the serious complications of drug use. These findings are consistent with Hulin et al. [37] and Ornell et al. [38], who reported that respiratory affection has already been associated with higher opioid overdose death rates.

On the other hand, we found that a higher percentage of cases were discharged during the 1st 24 hours of the pandemic, with a significant difference between the two periods. This is probably due to the comparable mild severity of the cases (those not needing ICU) as previously described, together with the higher need for hospital beds during the pandemic, which may affect the discharge system [39].

The current study showed that the patient outcome was comparable during the two periods, with most of the cases improved and discharged from NECTR after completing their treatment, less than a quarter were discharged on their responsibility, and a few dying (1.2% and 1.9% of cases, before and during the pandemic, respectively). Consistent with our findings, Fayed and Sharif found that most of their cases were discharged after the completion of treatment, and the death rate was also elevated during the pandemic period [6].

In this study, we found that, during the two periods, the highest death rate was observed in cases with heroin and opium toxicity. Likewise, similar results were reported in Australia [40]. Mehrpour et al. [41] in Iran, and Zaki et al. [17] in Egypt, observed that opioids were the most common agent of fatal poisoning because they cause respiratory depression, adding to their serious adverse

effects, such as pulmonary edema, aspiration, hypothermia, rhabdomyolysis, cardiopulmonary arrest, and pneumonia, leading to death [42].

In the current study, the highest percentage of mortality was observed in cases that stayed more than 72 hours before and during the pandemic. This result is consistent with Mehrpour et al. [41], Fayed and Sharif [6], and Abdelhamid et al.'s study [43], which reported a higher death percentage in cases with a longer hospital stay, and this may reflect the fact that cases requiring a longer hospital stay almost have a poorer prognosis.

Finally, as expected, the current study revealed that all death cases occurred in individuals with the highest PSS scores, denoting severe affection. According to this study, Abdelhamid et al. [43] found that the PSS scores were predictors of case mortality.

5. Conclusion

This study revealed that COVID-19 has modified the pattern of drug abuse, acute intoxication, and availability of healthcare services, leading to different outcomes accordingly. Cannabis, opiates, benzodiazepines, and alcohol increased, while pregabalin, new synthetic drugs, tramadol, and combined drugs decreased during the pandemic. The single, unemployed, adult age group, men are involved more than others. Fatal outcomes increased during the pandemic, particularly with opiates and heroin intoxication. The duration of hospital stay was significantly decreased due to rapid discharge to provide more beds for COVID-19 patients.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of the Forensic Medicine and Clinical Toxicology Department and the Ethics Committee of the Faculty of Medicine, Cairo University (Code: MS-276-2021).

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Authors' contributions

Conceptualization and Supervision: Nadia Abd El Monem Kotb, Heba Mohamed Aboubakr, and Ezzeldin Shalaby; Writing – original draft: Fatma Shaban and Heba Mohamed Aboubakr; Writing review & editing: Nadia Abd El Monem Kotb and Hanaa Mohamed Samir Elattar; Data collection: Fatma Shaban; Data analysis: Nadia Abd El Monem Kotb, Heba Mohamed Aboubakr, Ezzeldin Shalaby, and Fatma Shaban.

Conflict of interest

The authors declared no conflict of interest.

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