

PATTERN OF ACUTE POISONING EXPOSURE BEFORE, DURING AND AFTER THE COVID-19 PANDEMIC: A RETROSPECTIVE STUDY AT POISON CONTROL CENTRE- ZAGAZIG UNIVERSITY HOSPITALS

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ABSTRACT

Background: The COVID-19 pandemic has triggered worldwide changes which affect humans' daily life, with impression on their health either physical or mental and also, their social and recreational behaviors. Acute poisoning is considered as a noteworthy danger to worldwide public health. **Aim of the study:** The study aimed to determine the pattern of poisoned patients before, during and after COVID-19 pandemic at Poison Control Centre-Zagazig University Hospitals (PCC-ZUH). **Patients and Methods:** A retrospective observational study, hospital-based, was conveyed using medical records and electronic databases of acutely poisoned patients attended to PCC-ZUH in the period from January 2019 to December 2021. **Results:** over three years, the PCC-ZUH managed to service large number of patients peaking to 2457 patients were hospitalized in 2021. Most admission were aged 15-25 years old represent 34.67% in 2021. Female represented 55.1% in 2019 and rising to 68% in 2020 and decline to 66% in 2021. Drug- poisoning accounted for 55.23% in 2019, 50.24% in 2020 and rising to 54.82% in 2021. Non-drug poisoning was increased from 44.77% in 2019 to 49.76% in 2020 then decline to 45.18% in 2021. Improvement was the prevalent outcome with increase demand of using toxicological measures in 2021. **Conclusion and recommendation:** The COVID-19 pandemic change pattern of poisoning cases. The lockdown status played a role in increase the suicide incidence. Urgent response from healthcare providers, policymakers and mental health support are needed especially for vulnerable age group and female.

Keywords: COVID-19, Poison Control Centre, Suicide, Poisoning pattern.

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INTRODUCTION

Acute poisoning is a universal health problem affecting all age groups, and considered as a common presentation to emergency room, which need early detection and proper management that include toxicological measures, supportive treatment and psychiatric consultation (*El Gendy et al., 2018*). Over the few past years in the developing countries, this problem has been progressively rising and become one of the foremost reasons of morbidity and mortality (*Bari et al., 2014*). It was reported by the World Health Organization (WHO) that 99% of the mortal poisoning cases have happened in developing countries. The poisoning pattern differs from one country to another and may fluctuate among diverse regions in the country (*Kumar et al., 2012*).

In December 2019, in Wuhan city of China, COVID-19 was started in the Hunan seafood

market, and within few months it has become a worldwide danger on human health (*Wang et al., 2020*). Afterward, it has speedily blowout to affect many peoples in nearly all worlds' countries to be broadcasted as a pandemic by the WHO on 11 March 2020 (*WHO, 2022*). Besides its upsetting effects on human life, COVID-19 has slowdown the economy in most of the world's countries significantly. Consequently, healthcare staffs, governments and the community have to act together for prevention and controlling this pandemic (*Yoo, 2020*).

The Egyptian government broadcasted a lockdown on 15 March 2020, to control the rapid blowout of this pandemic, which comprised closing institute, confining travel, delegating confinements for arriving travelers, closing almost shops excluding pharmacies, and food service shops. After partial opening from lockdown, they apply protection

measures like obligatory masking, distancing, and limiting restaurants to 50% occupancy. Preceding studies has revealed that changes in societal circumstances, as economic declines and natural disasters, can impact the poisoning patterns received by Poison Control Centre (*Greene et al., 2005; Mowry et al., 2013*).

Prior researches have similarly emphasized the effects of pandemic-related stressors, as loneliness, economic distress, and upsurged substance abuse, on the frequency of poisoning either intentional or unintentional (*Mars et al., 2019; Olfson et al., 2018*). Throughout the pandemic, Poison Control Centre's worldwide have stated enlarged calls linked to exposure to household products like disinfectants and hand sanitizers, motivated by the community's heightened attention on cleanliness and controlling the infection (*Gharpure et al., 2020; Raffee et al., 2021*).

Even though there are isolated researches and reports on the COVID-19 effect on certain aspects of poisoning, a complete investigation of the poisoning patterns in PCC before, during, and after the pandemic is deficient (*Li et al., 2022*). With the WHO announcement in May 2023 that "COVID-19 is nowadays a well-known and continuing health issue which no longer establishes a public health emergency of international concern (PHEIC)", it became critical to have a look back on the impact of the COVID-19 pandemic on the poisoning patterns (*WHO, 2023*).

THE AIM OF THE WORK

The current study aimed to examine the pattern, demographics and characteristics of poisoning exposure of patients attended to PCC-ZUH at three different time periods: pre-pandemic (2019), after strict lockdown in Egypt (2020), and post-pandemic (2021). Additionally, the study demonstrates the utility of the PCC-ZUH in the poisoned cases management, along with the various approaches which can be applied to reducing mortality and advance health service.

PATIENTS AND METHODS

Study Design and setting

A retrospective observational study, hospital-based, was accomplished by using medical hospital records and electronic databases of

acutely poisoned cases attended to PCC-ZUH in the period from January 2019 to December 2021. Ethical approval was gained from the Institutional Review Board-Zagazig University (IRB-ZU). (Approval code: 9977-5-10-2022). Patient agreement was surrendered as this study was a retrospective and depends on medical hospital records. The data privacy was preserved and used only for the epidemiologic analysis purpose.

Inclusion Criteria

All admitted cases aged 1 year and more of both genders with acute poisoning were involved in the study. All diagnosed acute poisoned patients' medical records attended to Emergency Department (ED) at PCC-ZUH from January 2019 to December 2021 were involved. The diagnosis was made by history of exposure, clinical examination, and laboratory investigations (routine and toxicological).

Exclusion Criteria

Any acute poisoned cases before January 2019 or after December 2021 were omitted. Moreover, chronic poisoned cases or case with incomplete medical hospital records were omitted.

The study method

The study variables were gained from hospital records: age, gender, residence, occupation, route and mode of poisoning, and the causative agent form (drug or non-drug poisoning). Poisoning Severity Score (PSS) of European Association of Poisons Centers and Clinical Toxicologists (EAPCCT) was applied for grading the poisoning severity at the peak of manifestations regarding the patient's clinical examination (*Persson et al., 1998*). There are 5 grades for this score; None: no poisoning symptoms or signs, Mild: mild or transient and spontaneously resolving symptoms, Moderate: pronounced or prolonged symptoms, Severe: severe or life-threatening symptoms or signs, and fatal: Death.

In addition, the period of stay in the hospital presented in days (arranged into five categories), management measures including toxicological (invasive intervention, decontamination, enhanced elimination, and specific antidotes), or supportive measures and outcome were itemized.

STATISTICAL ANALYSIS

All data were collected, presented in tables and analyzed using SPSS 20.0 (SPSS Inc., Chicago, IL, USA 2011). Qualitative data were presented as frequencies either absolute (number) or relative (percentage). Categorical variables percent were compared using Chi-square test. P-value <0.05 equal to statistically significant, p-value < 0.001 was equal to highly statistically significant, and p-value ≥ 0.05 was equal to statistically non-significant.

RESULTS

Demographic characteristics of acutely poisoned patients attended to PCC-ZUH from 2019 to 2021.

Through the three-year study period (from 2019 to 2021), the whole number of poisoned patients presented to PCC-ZUH was (1834, 2096, and 2457) patients respectively (**Figure 1**), denoting an increasing pattern of poisoning cases. **Table (1)** represents demographic distribution through the three years, the age group (15 - < 25) was considerably the utmost poisoned age category in all examined years, followed by the age groups (25-40) then (7 to 15). The rate of poisoning was notably decreased in the age categories (less than 7 years and more than 40years). Female poisoned patients more significantly (p<0.001) presented to PCC-ZUH than male; especially from rural areas. The highest percent of patients were unemployed (**Figure 2**).

Routes and modes of poisoning in cases attended to PCC-ZUH from 2019 to 2021.

Table (2) over the period of the three-year study, orally ingested poisoning is the most common route of exposure, then inhalation, then dermal and lastly insects' bites or stings. The current results revealed that suicidal and accidental were recorded as the most common mode of poisoning over the course of three years. While, therapeutic error and drug abuse overdose are been represented the lowest mode of poisoning with statistically significant (p<0.001) difference every year (**Figure 3**). Patients with drug poisoning were notably (p<0.001) more than non-drug

poisoning cases in the studied years (**Figure 4**).

Drugs and non-drugs poisoning cases attended to PCC-ZUH from 2019 to 2021.

Table 3 clarifies the various drugs involved in intoxication every year. Centrally acting and analgesic drugs represented the most frequent drugs involved in intoxication, followed by cardiovascular and abusing drugs, finally anti diabetic and other drugs (antibiotics, multivitamins/minerals supplements, chemotherapy, oral contraceptive pills, gastrointestinal drugs), with significant (p<0.001) difference every year. Regarding non-drug poisoning, high percent of patients were intoxicated by insecticides/ rodenticides, corrosives/detergents and alcohols, then food and animal poisoning, then gases and finally others (metals, plants, herbals, clay, cigarettes, naphthalene, and phenylenediamine) with highly significant (p<0.001) difference every year.

Poisoning severity grading, duration of hospitalization and outcome of poisoned patients attended to PCC-ZUH from 2019 to 2021.

High percent of poisoned patients represented with mild degree of severity then moderate and high with highly significant (p<0.001) difference every year (**Figure 5**). Furthermore, high percent of patients were hospitalized from 8 to less than 24 hours. While, small percent of patients were hospitalized for more than 7 days. Also, most of patients were survivors (**Figure 6**). While, small percent of them were be non-survivors with highly significant (p<0.001) difference every year (**Table 4**).

Management of poisoned patients attended to PCC-ZUH from 2019 to 2021

High percent of patients were managed by toxicological measures in all studied years, which included invasive measures, decontaminations, enhanced elimination, and antidote. In the three examined years, the utmost frequent toxicological management was enhanced elimination, then the antidote as atropine (**Table 5**).

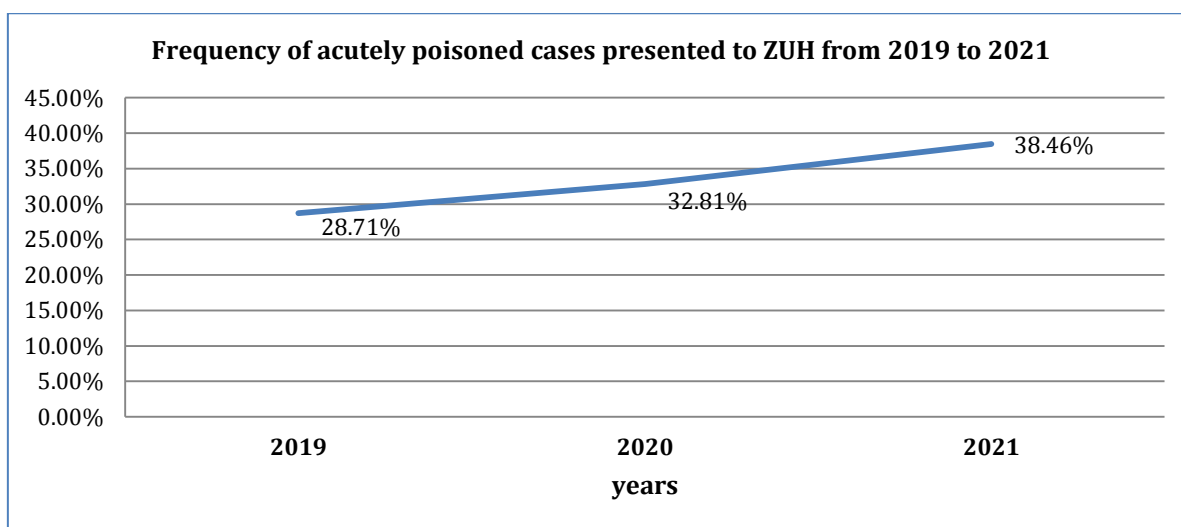


Figure (1): frequency of acutely poisoned cases presented to PCC-ZUH from 2019 to 2021 (total=6387).

Table (1): Demographic Characteristics of acutely poisoned cases attended to PCC-ZUH from 2019 to 2021.

Demographic data	2019 (n= 1834)	2020 (n= 2096)	2021 (n= 2457)	χ^2 (p-value)
Age (years)				
<7	214 (11.7)	346 (16.5)	305 (12.41)	173.192 (0.001**)
7-15	304 (16.6)	412 (19.66)	439 (17.87)	
15-25	611 (33.32)	723 (34.5)	852 (34.67)	
25-40	582 (31.73)	416 (19.84)	784 (32.0)	
>40	123 (6.7)	199 (9.5)	77 (3.13)	
Sex				81.381 (0.001**)
Female	1010 (55.1)	1425 (68.0)	1623 (66.0)	
male	824 (44.9)	671 (32.0)	834 (34.0)	
Residence				7.563 (0.023*)
Urban	748 (40.8)	946 (45.1)	1064 (43.3)	
Rural	1086 (59.2)	1150 (54.9)	1393 (56.7)	
Occupation				95.304 (0.001**)
Farmer	220 (12.0)	238 (11.4)	187 (7.6)	
Student	459 (25.0)	521 (24.9)	790 (32.2)	
Employee	256 (14.0)	319 (15.2)	388 (15.8)	
Unemployed	775 (42.3)	951 (45.4)	1004 (40.9)	
Unreported	124 (6.8)	67 (3.2)	88 (3.6)	

Data expressed as number and percent, n: number of cases in each year, χ^2 : Chi square test, *: statistically significant ($p < 0.05$), **: statistically highly significant ($p < 0.001$).

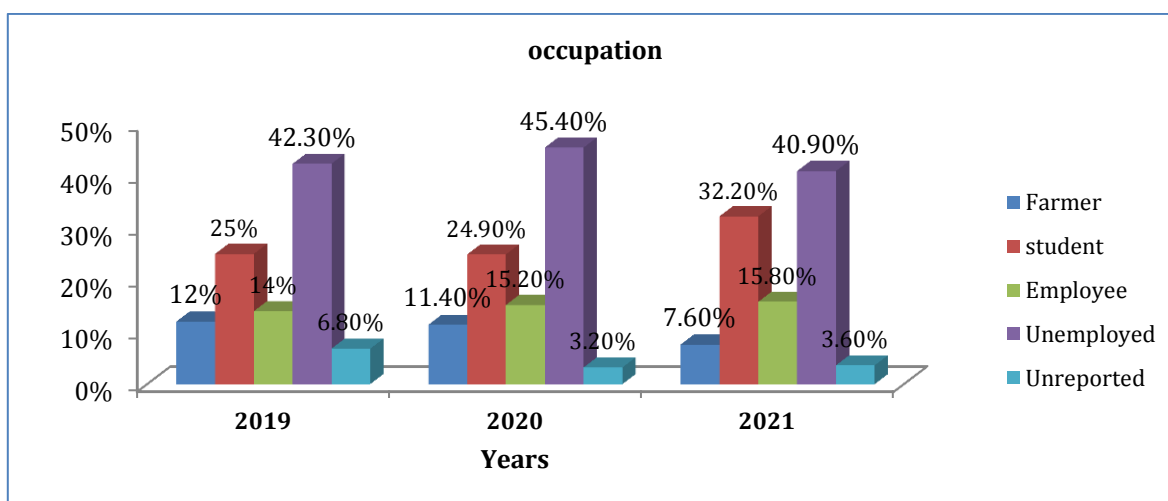


Figure (2): Occupation of acutely poisoned cases presented to PCC-ZUH from 2019 to 2021 (total=6387).

Table (2): Routes and modes of poisoning in cases attended to PCC-ZUH from 2019 to 2021.

Items	2019 (n= 1834)	2020 (n= 2096)	2021 (n= 2457)	χ^2 (p-value)
Route				
Oral	1434 (78.19)	1409 (67.2)	2009 (81.8)	411.926 (0.001**)
Dermal	187 (10.2)	222 (10.6)	123 (5)	
Inhalation	67 (3.65)	421 (20.1)	234 (9.5)	
Bite / sting	146 (7.96)	44 (2.1)	91 (3.7)	
Mode of poisoning				
Accidental	735 (40.1)	923 (44)	877 (35.7)	122.259 (0.001**)
Suicidal	832 (45.36)	1048 (50)	1367 (55.64)	
Therapeutic error	114 (6.2)	61 (2.9)	92 (3.74)	
Drug abuse overdose	153 (8.34)	64 (3.1)	121 (4.92)	
Causative agents				
Drug poisoning	1013 (55.23)	1053 (50.24)	1347 (54.82)	12.896 (0.001**)
Non-drug poisoning	821 (44.77)	1043 (49.76)	1110 (45.18)	

Data expressed as number and percent, n: number of cases in each year, χ^2 : Chi square test, **: statistically highly significant ($p < 0.001$).

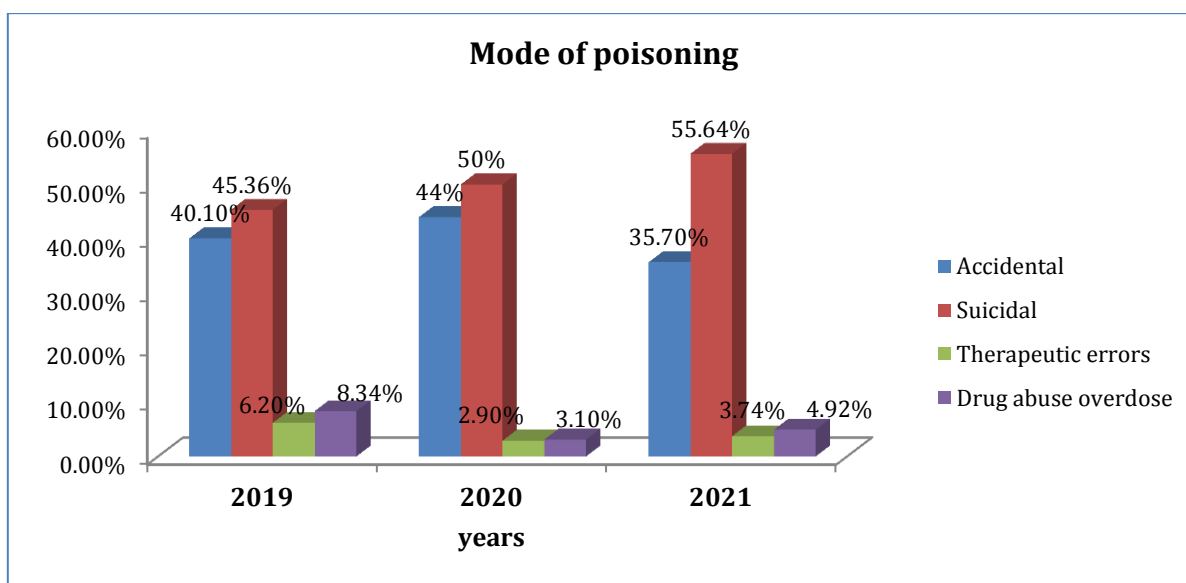


Figure (3): Mode of poisoning of acutely poisoned cases presented to ZUH from 2019 to 2021 (total=6387).

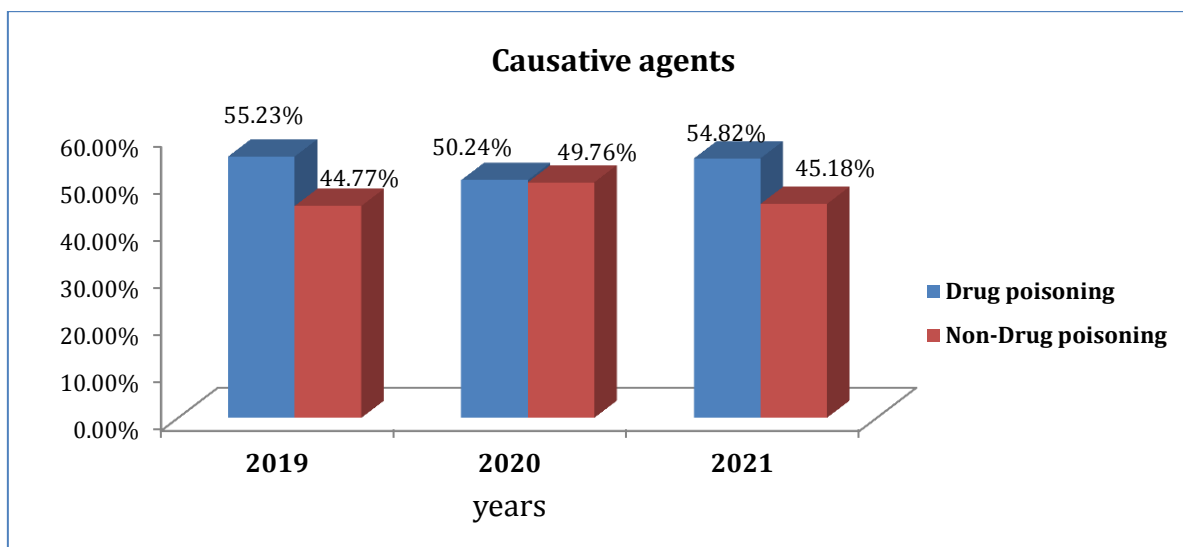


Figure (4): Causative agents in acutely poisoned cases presented to PCC-ZUH from 2019 to 2021 (total=6387).

Table (3): Drugs and non-drugs involved in poisoned cases attended to PCC-ZUH from 2019 to 2021.

Items	2019 (n= 1834)	2020 (n= 2096)	2021 (n= 2457)	χ^2 (p-value)
Drug- poisoning	(n= 1013)	(n= 1053)	(n= 1347)	190.963 (0.001**)
Centrally acting	317 (31.29)	278 (26.4)	465 (34.52)	
Cardiovascular	226 (22.31)	189 (17.95)	278 (20.64)	
Analgesic	180 (17.77)	265 (25.17)	326 (24.2)	
Abusing drug	136 (13.43)	212 (20.13)	234 (17.37)	
Antidiabetic	93 (9.18)	102 (9.69)	32 (2.37)	
Others	61 (6.02)	7 (0.66)	12 (0.9)	
Non-drug poisoning	(n= 821)	(n= 1043)	(n= 1110)	94.165 (0.001**)
Insecticides/ Rodenticides	254 (30.94)	257 (24.64)	354 (31.89)	
Corrosives/ Detergents	156 (19.0)	317 (30.39)	223 (20.1)	
Alcohols	113 (13.76)	218 (20.9)	229 (20.6)	
Food poisoning	136 (16.57)	114 (10.93)	143 (12.9)	
Animal poisoning	43 (5.23)	68 (6.52)	48 (4.32)	
Gas	87 (10.6)	53 (5.08)	92 (8.29)	
Others	32 (3.9)	16 (1.54)	21 (1.9)	

¹Others: including antibiotics, multivitamins/minerals supplements, chemotherapy, oral contraceptive pills, gastrointestinal drugs, ²others: including metals, plants, herbals, clay, cigarettes, naphthalene, phenylenediamine, Data expressed as number and percent, n: number of cases in each year, χ^2 : Chi square test, **: statistically highly significant ($p < 0.001$).

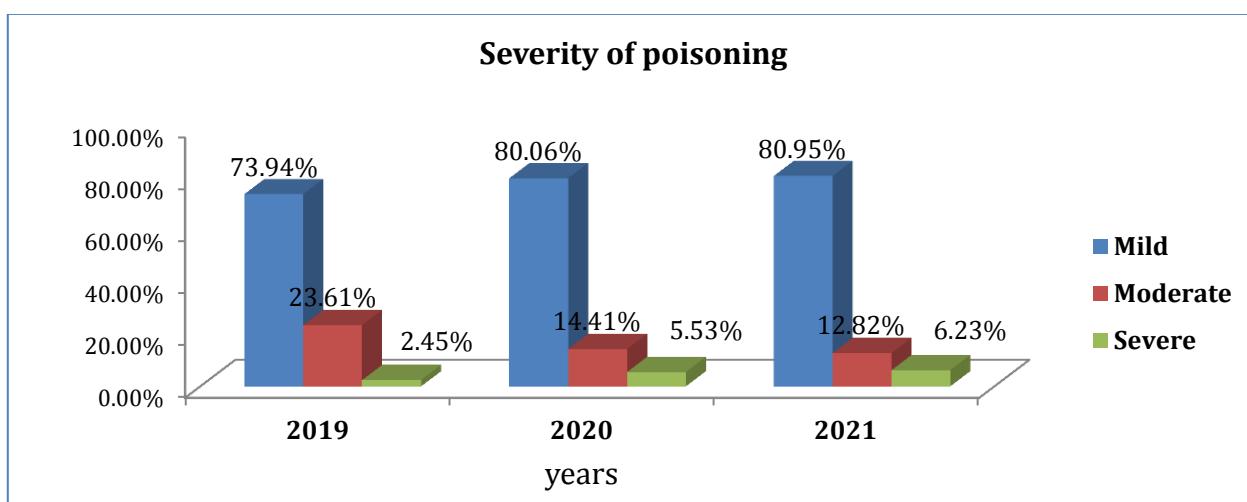


Figure (5): Poisoning severity of acutely poisoned cases presented to PCC-ZUH from 2019 to 2021 (total=6387).

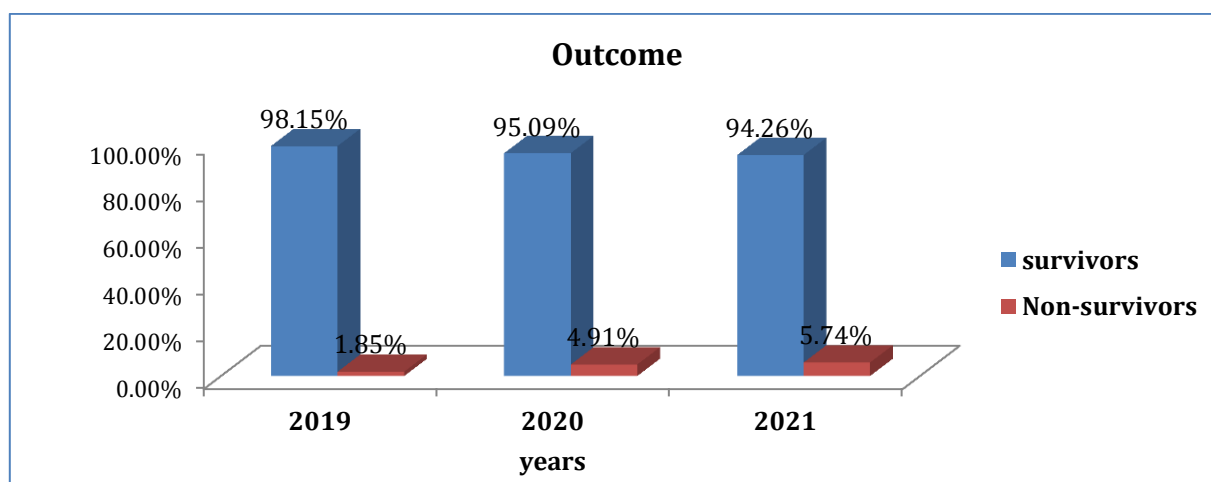


Figure (6): Outcome of acutely poisoned cases presented to PCC-ZUH from 2019 to 2021 (total=6387).

Table (4): Poisoning severity grading, duration of hospitalization and outcome of poisoned cases attended to PCC-ZUH from 2019 to 2021.

Items	2019 (n= 1834)	2020 (n= 2096)	2021 (n= 2457)	χ^2 (p-value)
Degree of severity				
Mild	1356 (73.94)	1678 (80.06)	1989 (80.95)	122.391 (0.001**)
Moderate	433 (23.61)	302 (14.41)	315 (12.82)	
Severe	45 (2.45)	116 (5.53)	153 (6.23)	
Duration of hospitalization				
<8h	435 (23.72)	714 (34.06)	798 (32.48)	118.092 (0.001**)
8h- <1day	769 (41.93)	843 (40.22)	996 (40.54)	
>1day -3days	412 (22.46)	324 (15.46)	398 (16.2)	
>3days- <7days	154 (8.4)	198 (9.45)	232 (9.44)	
>7days	64 (3.49)	17(0.81)	33 (1.34)	
Outcome				
Survivors	1800 (98.15)	1993 (95.09)	2316 (94.26)	40.432 (0.001**)
Non-survivors	34 (1.85)	103 (4.91)	141 (5.74)	

Data expressed as number and percent, n: number of cases in each year, χ^2 : Chi square test, **: statistically highly significant ($p<0.001$).

Table (5): Management of poisoned cases presented to PCC-ZUH from 2019 to 2021.

Items	2019 (n= 1834)	2020 (n= 2096)	2021 (n= 2457)	χ^2 (p-value)
Management procedures				
Toxicological measures	1046 (57.03)	1252 (59.73)	1587 (64.6)	26.736 (0.001**)
Supportive measures	788 (42.97)	844 (40.27)	870 (35.4)	
Invasive intervention	61	212	510	
Endotracheal intubation	21 (34.4)	123 (58.0)	210 (41.2)	21.479 (0.001**)
Mechanical ventilation	23 (37.7)	57 (26.9)	197 (38.6)	
Noradrenaline	17 (27.9)	32 (15.1)	103 (20.2)	
Decontamination	120	157	195	
Gastric lavage	37 (30.8)	61 (38.9)	76 (39.0)	2.515 (0.284)
Skin wash	83 (69.2)	96 (61.1)	119 (61.0)	
Enhanced elimination	913	1158	1348	
Activated charcoal	909 (99.6)	1148 (99.1)	1345 (99.8)	5.261 (0.072)
Hemodialysis	4 (0.4)	10 (0.9)	3 (0.2)	
Antidotes	373	467	868	
Atropine	110 (29.5)	121 (25.9)	223 (25.7)	41.419 (0.001**)
Obidoximes	56(15.0)	63 (13.5)	87 (10.0)	
N-acetyl cysteine	86 (23.1)	132 (28.3)	309 (35.6)	
Sodium bicarbonate	89(23.9)	109 (23.3)	202 (23.3)	
Naloxone	15 (4.0)	21 (4.5)	31 (3.6)	
Hyperbaric o2 therapy	3 (0.8)	6 (1.3)	4 (0.5)	
Anti-venom	8 (2.1)	4 (0.9)	3 (0.3)	
Anti-botulinum	2 (0.5)	1 (0.2)	1 (0.1)	
Folinic acid	4 (1.1)	10 (2.1)	8 (0.9)	

Data expressed as number and percent, n: number of cases in each year, χ^2 : Chi square test, non-significant($p>0.05$), **: statistically highly significant ($p<0.001$).

DISCUSSION

The COVID-19 pandemic has a marvelous consequence on the people's psychological state. There are many influences that worsen the people's psychological state throughout the pandemic such as terror of the changeable future, financial slowdown, loss of careers and income source, vagueness, loss of family member, aloneness etc., Also, frequently altering government strategies concerning the restrictions, misrepresentation on social media regarding COVID-19, additional generates fright amongst public leading to depression and anxiety (*Chakraborty and Maity, 2020; Sher, 2020*).

The present study demonstrated the patients' data medical records of the PCC-ZUH from 2019 to 2021 to analyze the possible changes in the pattern of toxicities before, during and after the pandemic. As well as, the management of cases in PCC-ZUH in order to update numerous approaches which can be applied to decline mortality and advance health service.

An interesting trend is the substantial increase in the number of admitted patients from 2019 to 2021, from 1834 to 2457. These findings were coinciding with *Raffee et al. (2021)* who stated that 2020 lockdown led to a 91% rise in calls correlated to poisoning exposures compared with 2019. Also, Poison centers have also stated parallel results in France, USA, and Canada (*Chang et al., 2020*).

There was no clear explanation for this an upsurge. Although, *Le Roux et al. (2020)* suggested for such rise; the behavioral changes as a result of fear of COVID-19, extreme cleaning of house and misapplication of cleaning products for individual hygiene or foodstuff cleanliness. Moreover, other issue is isolation measures that resulted in declining of cognitive skills and decision-making, mutual with an augmented impulsivity contributing to such upsurge.

On other side, *Lai et al. (2020)* showed decreased number of patients with the first year of the COVID-19 pandemic, when global lockdown measures were most forcible. The restricted mobility could have limited exposure to certain toxic substances, contributing to the decrease in poisoning cases. In addition, the decrease in the number

of admitted cases could be related to fear of exposure to COVID-19 in healthcare settings (*Holmes et al., 2020*).

Concerning the demographic data, the mean age of admitted patients increased each year and the age distribution was influenced by the COVID-19 pandemic. For age groups less than 7 years, there was increase from 11.7% in 2019 to 16.5% in 2020 then rebound decrease to 12.41% in 2021. This finding contributed with *Yasseen et al. (2021)* otherwise, *Ashry et al. (2023)* showed significant decrease in this age group.

School-age children (7-15) recorded an also increase in percent of toxicity from 16.6% in 2019 to 19.66% in 2020 and declined to 17.87% in 2021, these findings coincided with *Helal et al. (2021)* who found that mood and anxiety disorders of adult people through the lockdown led to rise in troubles amongst parents that lead to less care quality provided to kids with school closures.

There was marked increase in (15-25) age group among all age groups during the studied years, as it increased from 33.32% in 2019 to 34.5% in 2020 reaching 34.67% in 2021. Similar findings were reported by *Fayed and Sharif (2021)* where the number of toxicities was more encountered in adults during the pandemic. The increase could potentially be due to their greater likelihood of exposure to toxic substances, both in the workplace and general environment in addition to pandemic-induced stress (*Gummin et al., 2021*).

Moreover, in the current study the age group 25-40 showed different pattern of toxicity as marked decline from 31.73% in 2019 to 19.84% in 2020 then rising to 32% in 2021. These findings were contributed with *Behera et al. (2022)*.

On the other hand, the age group more than 40 years showed the least rate of poisoning exposure. Its level increased from 6.7% in 2019 to 9.5% in 2020 then returned to 3.13% in 2021. *Alhussein et al. (2023)* recorded similar findings in their study covering the period of the pandemic. The pandemic didn't dramatically influence the frequency of toxic exposures in this age group.

For gender distribution, the female proportion increased from 55.1 % in 2019 up to 68% in

2020, then 66% in 2021 as they are more passionately affected by the pandemic consequences. This increase could be related to factors like increased stress, changes in daily routines and increased time spent at home. *El-Sarnagawy et al. (2022)* reported same findings like current study.

On the other hand, *Fernández-Lázaro et al. (2022)* reported an initial rise in male to female ratio because of the economic consequences of the pandemic leading to unemployment, worsening living conditions among males, and then tended to normalize in 2021.

This study denoted that most of attended patients were from rural regions; this was in agreement with earlier Egyptian studies (*Fayed and Sharif, 2021*) and other countries (*Singh et al., 2011*). Deficiency of health services in rural regions requires transfer to the cities. Somewhere else, reports indicated a mainstream of patients were from urban regions. Discrepancies may be due to geographical variances among countries (*Islambulchilar et al., 2009*).

Moreover, the toxic rate increased among the unemployment group in this study from 42.3% in 2019 up to 45.4% in 2020, then 40.9% in 2021 and this was coincided with *EL Sarnagawy et al. (2022)*. Also, there was greater involvement of students with intoxication (24.9%) in 2020 which was contributed with *Fayed and Sharif (2021)*.

Among route of exposure to poison, oral route was the commonest route of poisoned cases. Also, these findings were reported with *Huynh et al. (2018)*. However, oral route decreased from 78.1% in 2019 to 67.2% in 2020. And the inhalation route showed the sharpest increase from 3.6% in 2019 to 20.1% in 2020 then, 9.5% in 2021.

Chang et al. (2020) in USA reported that inhalation route was the uppermost during the lockdown. That was associated with increased use of disinfectants by improper use, such as mixing numerous chemical products together, not wearing protective gear, and applying in poorly ventilated areas.

Concerning the mode of poisoning, this study found that compared to the accidental group which rose from 40.1% in 2019 to 44% in 2020 then returned to 35.7% in 2021, the

suicidal poisoning group had a significant increase from 45% in 2019 to 50% in 2020 up to 55% in 2021. Those findings correlated with *El Sarnagawy et al. (2022)* and *Caballero-Bermejo et al. (2022)*.

The suicidal rates increased during COVID-19 pandemic could be credited to multifaceted mental health problems that are frequently associated to the morbidity and mortality of the COVID-19, public terror, and lengthy societal isolation. Also, financial problems caused by the COVID-19 pandemic are contributed to the increase in suicides. As job losses because of COVID-19 crisis were between 2135 and 9570 suicides per year worldwide (*Sher, 2020*).

Oppositely, *Le Roux et al. (2021)* reported that suicidal cases through the lockdown have declined. This reduction might be debatably due to the communal and domestic support as a result of home staying. Contempt the COVID-19 pandemic and the home-based isolation were proposed to rise anxiety and depression, the findings of present study demonstrated a decrease in therapeutic errors from 6.2% in 2019 to 2.9% in 2020 and drug of abuse poisoning from 8.34% in 2019 to 3.1% in 2020. This mirrors similar trends seen in *Motawei et al. (2022)* and *Deng and Peng (2020)*.

Concerning substance abuse, *Le Roux et al. (2021)* stated that addictive substance decreased, the common reasons for reducing the use of abuse drugs during the year 2020, were the less availability of drugs to buy, lessened income, and restricted movement through lockdown. Also, for therapeutic errors, this could be attributed to increased awareness about medication safety during the pandemic as reported by *Ashry et al. (2023)*.

The data of the current study illustrated the pandemic effect on the patterns of various types of toxicities. The most evident changes were observed in the causative agents of poisoning. Concerning the drug-poisoning, there was noticeable decrease from 55.23% in 2019 to 50.24% in 2020, rising to 54.82% in 2021. While the non-drug poisoning, there was a sharp surge from 44.77% in 2019 to 49.76% in 2020 then declined to 45.18% in 2021.

Mahmood et al. (2020) and **McCulley et al. (2021)** were reported the same findings correlated with the current study.

In the present study, CNS-drugs exposure was decreased from 31.29% in 2019 to 26.4% in 2020 then raised again to 34.52% in 2021, this was in similarity with **Cleland (2020)**, who reported that the pandemic, may have a defensive effect initially. On the other side, mild rise in CNS drugs toxicity was reported in 2020 by **Abd ElHakim and Hadhoud (2022)**. As COVID-19 pandemic and isolation tended to elevate the incidences of anxiety and depression disorders.

On contrast, the use of analgesics increased from 17.77% in 2019 to 25.17% in 2020 and 24.2% in 2021. These findings correlated with **Fayed and Sharif (2021)**. Moreover, **Sestili and Fimagnari (2020)** demonstrated that, analgesics were the utmost common home medication used to treat early COVID-19 symptoms such as lessen pain, fever.

Concerning substance abuse poisoning in this study, the study results was in parallel with **Le Roux et al. (2021)**. As in 2020 there is increase from 13.43% in 2019 up to 20.13% in 2020. The increase was in alcohols (ethanol and methanol), but decline in others, opioids (like tramadol) (**Robins et al., 2023**), and elusive variations in cannabis constitutes and heroin intoxication (**EMCDDA, 2020**).

Furthermore, there was particular increase in the exposure to alcohol toxicity from 5.23% in 2019 to 6.5% in 2020 returned to 4.32% in 2021. As hand sanitizers which are alcohol-based usually contain either ethanol or isopropanol. The COVID-19 prevalence produced a decrease in the alcohol amount on the marketplace led to production of illegal hand sanitizers from Methanol and kept in unknown bottles that increase the accidental exposure risk. The same results were stated by **Yip et al. (2020)**, **Motawei et al. (2022)** and **Delirrad and Mohammadi (2020)**. Moreover, devious persons have used bleach to facade the industrial methanol color in order to facilitate selling. Subsequently, alcohol was consumed with the untruthful guess that it would kill the virus (**Mehrpour and Sadeghi, 2020**).

In the present study regarding corrosives exposure, there was remarkable increase from

13.76% in 2019 up to 20.9% in 2020 and to 20.6% in 2021. In agreement, the researches of **McCulley et al. (2020)**; **Chang et al. (2020)** and **Le Roux et al. (2021)** stated that the most rising frequencies were disinfectants due to adding to the water used for cooking. **Kampf et al. (2020)** reported that some individual commonly use these products to eradicate COVID-19 contamination on the inert surface efficiently.

Rovetta and Bhagavathula (2020) stated that domestic isolation was contributed to those habits due to its harmful impact on decision making and cognitive skills. Nevertheless, other influences result in augmentation of disinfectants exposure, as arrogances to hygiene, deficient information about proper using and storage of disinfectants, and home isolation with staying of kids at home with variable supervision degrees by caregivers (**Gharpure et al., 2020**).

Certainly, irrepressible fear from the COVID-19 resulted in inappropriate detergents usage, obsessive repeated cleaning of houses and creating mixtures of cleaning products combined with the easy availability of corrosives (**Nabi et al., 2020**).

Also concerning rodenticide, there was sharp increase from 19% in 2019 to 30.39% in 2020, then 20.1% in 2021. These correlated with the high rate of suicide as the using of aluminum phosphide increased during lockdown. The researches of **El Sarnagawy et al. (2022)**; **Behera et al. (2022)** and **Deraz et al. (2022)** correlated with present study findings and explained that by the widespread accessibility owing to unrestrained sales in agricultural area. Besides, there is no precise antidote existing for aluminum phosphide making it the way of choice for suicide.

Regarding the severity of cases, most of them 80.06% were mild, while 14.31% were moderate and only 5.53% were sever cases, Coincided with **Pathare et al. (2020)**. These findings also correlated with present study concerning the duration of hospitalization. As long as most cases were mild so the time spent in hospital was decreased. In 2020, there were about 30.06% of patients spent less than 8 hours, while 40.22% of patients remained for less than 24h in hospital that was contributed with **Neumann et al. (2020)**.

On the other hand, *Fayed and Sharif (2021)* reported that the hospital stays length through the lockdown was prolonged than usual, that denotes an increased pressure on the ED through pandemics.

Regarding the outcome, the percent of survivors was 95.09% in 2020 and for non survivors there was sharp increase from 1.85% in 2019 to 4.91% in 2020. That was attributed to the increase use of aluminum phosphide in suicidal poisoning. That was in similarity with *Behera et al. (2022)* who demonstrated that the tardy arrival to the ED through lockdown owed to problematic transportation facility, lead to faster deterioration to patients. Accordingly, several patients presented with multi-organ dysfunction.

Concerning the toxicological measures, the present study showed that 59.73% of cases managed using toxicological measures in 2020. As a result of the increase in inhalation route from 2019 to 2020, due to the increase use for all cleaners and disinfectants, so common clinical symptomatology of poisoned patients was respiratory distress, coincided with the use of invasive measures, endotracheal intubation 58%, and mechanical ventilation 26.9%, these findings correlated with *Chang et al. (2020)* and *Behera et al. (2020)*.

Moreover, the decontamination showed increase in gastric lavage from 30.8% in 2019 to 38.9% in 2020. That could be explained by the increase rate of suicide and also the increase use of analgesics as mentioned before. Owing to the change in pattern of toxicity, so the antidote and supportive measures showed steady stable state among the studied years. Also, *Eisenbecket al. (2022)* reported the same results.

On the other hand, *Chacon et al. (2021)* and *Cusinato et al. (2021)* reported decrease in pharmaceuticals overdose and therefore decrease in gastric decontamination and elimination. Performing the study in one center is considered a limitation. Cases with incomplete medical records that excluded might affect data analysis. Hence, other multicenter studies are recommended to further explore this important public health issue.

CONCLUSION

The current study affords valuable insights into the influence of the COVID-19 pandemic on the poisoning pattern and the way of seeking the medical care. Corrosives and household chemicals exposures amplified, whereas drug overdose decreased in 2020 compared to 2019. While animal (snake and scorpion) and plant exposures and occupational exposures have reduced. COVID-19-associated lockdown greatly associated with higher phosphides exposure. The lockdown status suggestively played a role in increase the suicide incidence. The study recommends the importance of mental health support, and substance misuse initiatives, with special attention to vulnerable age groups. The study underscores that preventing and managing poisoning in the wake of such global crises requires an interdisciplinary, integrated approach, including not just healthcare but societal and policy-level efforts as well.

RECOMMENDATIONS

- In order to enhance the pliability of healthcare systems in the face of future public health crises, the present research recommends that enabled healthcare accessibility (emergency services and poison control centers), must be continued throughout pandemics.
- Tele-medicine and additional remote consultation facilities can be used to afford proficient assistance and guidance.
- The study recommends for the development and implementation of mental health facilities and campaigns to address the psychological distress caused by the pandemic.
- More researches on the long-term effects of the pandemic are required. Additionally, improved supervision and maintaining observance by parents and caregivers for kids must be continued.

These recommendations, if applied properly, could help save lives and lessen the adverse impacts of upcoming disasters.

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