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Original article

Title Evaluation of the influence of COVID-19 Pandemic on The Incidence and Outcome of Acute Geriatric Poisoned Cases Admitted to the Poison Control Center Ain Shams University Hospitals (PCC -ASUH)

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Abstract

Background: Acute geriatric poisoning during COVID-19 pandemic represented a critical situation for both cases and medical staff. **Aim:** To improve management of geriatrics exposed to pandemic-related consequences. **Objective:** evaluating the influence of COVID-19 pandemic on incidence and outcome of acute geriatric poisoned cases admitted to Poison Control Center Ain Shams University Hospitals (PCC -ASUH) during 2020,2021 and 2022.**Methods**: A retrospective observational study was conducted including all acutely poisoned geriatric cases admitted to PCC-ASUH from 1/3/2020 to 31/12/2022.**Results**: 625 geriatric cases were received with admission of 21.28% who belonged mainly to the age group between 60 and 65 years with males outnumbering females. Recorded comorbidities included both organic and psychiatric illness. Admitted cases were linked mostly to deliberate self-poisoning 119 cases =89.5%). Used agents included therapeutic drugs (62cases=52%) with antipsychotic drugs ranking first (26cases=21.9%) followed by cardiovascular drugs (12 cases=10.1%) in addition to non-drug agents (49 cases=41.2%) mainly insecticides (35 cases=29.4%). Accidental cases (14 cases=10.5%) were mainly envenomations (9cases). Clinical presentations involved mainly gastrointestinal, neurological and cardiovascular manifestations. Recorded overall in-hospital mortality (6%) was related to both drugs and non-drug agents. **Conclusion and recommendation**: Increased incidence of deliberate self-poisoning in the geriatric age group resulting in major morbidities and in-hospital mortalities during COVID-19 pandemic. This warrants further research to evaluate acute poisoning and suicide risk in elderly. Suicide prevention strategy is recommended considering pandemic-related consequences.

Keywords: geriatric poisoning, COVID-19 pandemic, deliberate self-poisoning

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I. Background

Acute poisoning remains a major public health problem but often overlooked in elderly in the clinical setting. Moreover, the serious consequences toxicologic exposures in this age group are often underreported (Yang, 2010; Stern et al., 2019).

People older than 65 years of age represent an increasing proportion of the population worldwide. This is likely to be reflected as an increasing proportion of emergency department presentations and acute poisoning in the elderly especially that they already represent the highest number of hospital and intensive care unit admissions (Stern et al., 2019)

Since the beginning of the worldwide pandemic of the coronavirus disease 2019 (COVID-19), no country has been spared from related morbidity and mortality. The pandemic took a heavy toll on Egyptians in 2020-2021 before it subsided in 2022 (Egyptian Health Ministry, 2023).

Studies suggested important effects on hospital admissions for toxic exposures worldwide. The pandemic itself, the implementation of lockdowns, and the associated economic impact in addition to challenges posed to health systems were among the described reasons. Despite concern, there remains insufficient data on the actual effect on poisoning trends among different age groups especially the geriatric (Mahmoud et al., 2021; Fayed and Sharif, 2021; Hawkins and Phan,2022; Möller et al., 2023).

1. AIM OF WORK

This work aimed to improve management of geriatrics exposed to pandemic-related consequences.

Objectives: To evaluate the influence of COVID-19 pandemic on the incidence and outcome of acute geriatric poisoned cases admitted to Poison Control Center Ain Shams University Hospitals (PCC -ASUH) during 2020,2021 and 2022.

2. SUBJECTS AND METHODS

This study was conducted as an observational retrospective study including all geriatric cases of both sex who were admitted to PCC-ASUH with history of acute poisoning between the period from 1/3/2020 to 31/12/2022. The study was carried out by collecting data of 625 geriatric cases who attend PCC-ASUH

Geriatric age group was defined as ages above or equal to 60 years old according to Singh and Bajorek (2014).

Data were collected using medical records and electronic data base after approval of the Research Ethics Committee of Faculty of Medicine Ain Shams University (FAMSU R03/2023). Additionally, an administrative approval was obtained from the director of the PCC-ASUH. Confidentiality issues were considered with data anonymization. The collected data was used only for the purpose of the study. Recorded data in the present study included: age, gender, intoxication data (type of agent, route of administration, manner of poisoning), history of comorbidities, clinical manifestations, and mortality.

Statistical analysis:

Collected data were tabulated and statistically analysed using standard SPSS (Standard Package for Social Science) software package, version 20 (Chicago.

IL). 4. RESULTS

A total of 625 geriatric cases were received by the PCC-ASU from 1/3/2020 to 31/12/2022.The majority of geriatric cases were mild requiring observation for 6 hours without admission (492 cases= 78.72%). On the other hand, a total of 133 geriatric cases (21.28%) were admitted to PCC-ASU. Severe cases requiring ICU admission represented 10.24% of all cases received during the period of the study. The number of admitted geriatric cases of poisoning per year was almost consistent for the entire study period (44 cases in 2020& 2022,45 in 2021). Table (1) shows hospital disposition among total geriatric cases during period of the study.

Age, sex, and comorbidities:

More than half of the admitted cases belonged to the age group between 60 and 65 years (59 %= 78 case), while 24.1% (32 cases) were > 65-70, while 17.3% (23 cases) > 70 years (table 2). Males who constituted 60.9% (81cases) of the admitted cases, outnumbered females (52cases=39.1%), this was shown in table (3).

Data concerning preexisting comorbidities were available only in a subset of cases included in the study, namely those received in 2021 and 2022 (89 cases),data of preexisting comorbidities during 2020 was not available.

Comorbidities were recorded in 33.7% of these recorded cases including organic illness in (24 cases=

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26.97%), mixed organic and psychiatric illness in (5 cases=5.61%) and psychiatric illness (one case =1.12%). The distribution of comorbidities is illustrated in table (4) and pie chart(1).

Data of intoxication:

Table (5) illustrates the data of intoxication among admitted geriatric cases during period of the study. A majority of admitted cases were linked to deliberate self-poisoning (suicidal attempt among119 cases =89.5%). Therapeutic drugs' overdose accounted for almost half of these cases (62 cases= 52%). When analyzed by the type of used drugs, antipsychotic drugs ranked first (26 cases= 21.9%) followed by cardiovascular drugs (12 cases= 10.1%). Lower number of cases was related to poisoning by theophylline (9 cases), oral hypoglycemic drugs (6cases), methotrexate (6 cases), drugs of abuse (one heroin, one opioid 2 benzodiazepines) and analgesics. Additionally,4 cases (%3.36%) were unknown.

Non-drug (chemical) agents were employed in deliberate self-poisoning. 49 cases (41.2%). These chemicals included corrosives (9 cases =7.5%), insecticides (organophosphorus compounds, or zinc phosphide) (35 cases= 29.4%), methanol (5 cases= 4.2%), unknown (4 cases= 3.36%).

On the other hand, 10.5% of cases (14 cases) were accidental; including mainly envenomation (9 cases), with a minority of cases due to toxic fish (one case), toxic plants (3 cases), and toxic gases (one case).

Clinical presentations:

Table (6) shows the percentage of clinical manifestations of poisoning among admitted cases during the period of the study. Gastrointestinal manifestations were present in 42.9% of admitted geriatric cases mainly in the form of vomiting (29.3%). Other gastrointestinal manifestations included colic (5.2%), hematemesis (4.5%) and dysphagia (3.7%).

Neurological manifestations were recorded in 38.3% of cases mainly in the form of coma (16.6%) specially grade I coma, in addition to drowsiness (6.7%), pinpointed pupils (7.5%), hallucinations (3%), agitation (2.3%) and extrapyramidal manifestations (1.5%).

Regarding the cardiovascular system, manifestations were present in 36.8% of admitted cases in the form of hypotension (14.3%), bradycardia (9.8%), tachycardia (9%) and hypertension (3.7%). Low incidence of respiratory manifestations was noted among 6% of patients).

Mortality:

Overall in-hospital mortality was 8 cases representing 6% of admitted cases. Mortalities were related both to drugs and non-drug agents. Offended agents and complications leading to mortality are illustrated in table (7): Multiorgan failure and metabolic acidosis were related to mortality in antipsychotic overdose (one case), while tramadol (one case) was related to cardiac arrest. Recorded complications in cases of methotrexate (n=2) were related to multiorgan failure, bleeding, metabolic acidosis, and respiratory acidosis. Similarly 2 cases of corrosives were complicated by shock, renal failure, heart failure, multiorgan failure, and metabolic acidosis. A case of zinc phosphide was complicated by renal failure hepatic failure, and metabolic acidosis.

Table (1): Number and Percentage of hospital disposition among total geriatric cases presented to PCC -ASUH during the period from 1/3/2020 to 31/12/2022.

Hospital disposition		**Number**	**%**	
Observation		492	78.72	
Admission	Inpatients	69	11.04	21.3
	ICU	64	10.24	
Total		625	100	

(Number of cases= 625)

Table (2): Age distribution among geriatric cases admitted to PCC -ASUH during the period from 1/3/2020 to 31/12/2022).

Age	**Number**	**%**
60-65	78	59
>65-70	32	24.1
>70	23	17.3
Total	133	100

(Number of cases= 133)

Table (3): Sex distribution among geriatric cases admitted to PCC -ASUH during the period from 1/3/2020 to 31/12/2022.

Sex	Number	%
Male	81	60.9
Female	52	39.1
Total	133	100

(Number of cases= 1

Table (4): Number and percentages of concomitant disease among geriatric patients admitted to PCC -ASUH during the period between 2021 and 2022.

Concomitant disease	Number	%
None	59	66.3
Organic illness	24	26.97
Mixed organic and psychiatric illness	5	5.61
Psychiatric illness	1	1.12
Total	89	100

(Number of cases= 89)

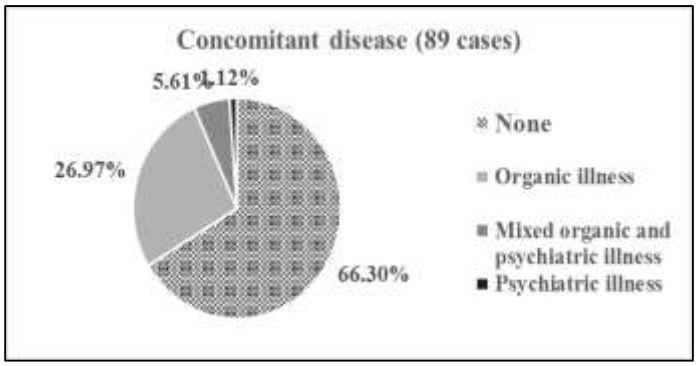

Figure (1): Number and percentages of concomitant disease among geriatric patients admitted to PCC -ASUH during the period between 2021 and 2022.

Table (5): Distribution of mode of poisoning and type of xenobiotics among geriatric cases admitted to PCC -ASUH during period from 1/3/2020 to 31/12/2022.

Mode	Type of toxic agent		Number n=133	%
Deliberate (intentional)	Therapeutic overdose	Antipsychotics	26	21.9
		CVS drugs	12	10.1
		Theophylline	9	7.6
		Hypoglycemic drugs	6	5
		Methotrexate	6	5
		Analgesics	3	2.5
		Total	62	52.1
	Chemicals	Insecticides		
		Corrosives	9	7.5
		Methanol	5	4.2
		Total	49	41.18
	Drugs of abuse	Tramadol	1	0.84
		Opioid	1	0.84
		Benzodiazepine	2	1.68
		Total	4	3.36
	Unknown agent		4	3.36
Total			119	89.5
Accidental	Envenomation	Snake	5	35.72
		Scorpion	3	21.44
		Unknown bite	1	7.14
	Toxic fish	Ciguatera	1	7.14
	Toxic plants	Mushroom	1	7.14
		Colocynth	1	7.14
		Croton seeds	1	7.14
	Toxic gas	Carbon monoxid	1	7.14
Total			14	10.5

Table (6): Number and percentage of clinical manifestations of poisoning among geriatric cases admitted to PCC -ASUH during period from 1/3/2020 to 31/12/2022.

Clinical manifestations		Number (n=133)	%
Gastrointestinal	Vomiting	39	29.3
	Colic	7	5.2
	Hematemesis	6	4.5
	Dysphagia	5	3.7
Total		57	42.9
Neurological*	Drowsiness	9	6.7
	Coma I	14	10.5
	Coma II	3	2.3
	Coma III	3	2.3
	Coma IV	2	1.5
	Pin -point pupils	10	7.5
	Hallucinations	4	3
	Agitation	3	2.3
	Extrapyramidal manifestations	2	1.5
	Dilated pupils	1	0.75
Total		51	38.3
Cardiovascular	Hypotension	19	14.3
	Bradycardia	13	9.8
	Tachycardia	12	9
	Hypertension	5	3.7
Total		49	36.8
Skin	Edema	5	3.7
	Ulcer	4	3
	Cyanosis	1	0.75
Total		10	7.5
Respiratory	Dyspnea	7	5.2
	Apnea	1	0.75
Total		8	6

* Coma classification is according to Reed's classification, (Number of cases= 133)

Table (7): Distribution of geriatric mortality cases who admitted to PCC -ASUH during period from1/3/2020 to 31/12/2022regarding the causative toxic agents.

Toxic agents	Complications led to mortality								
	Number of mortality cases	Cardiac arrest	Shock	Renal failure	Hepatic failure	MOF	Bleeding	Metabolic acidosis	Respiratory acidosis
Antipsychotics	1	—	—	—	—	Yes	—	Yes	—
Tramadol	1	Yes	—	—	—	—	—	—	—
Methotrexate	2	—	—	Yes	Yes	Yes	Yes	Yes	Yes
Zinc phosphide	2	—	—	Yes	Yes	—	—	Yes	—
Corrosives	2	—	Yes	Yes	Yes	Yes	—	Yes	—
Total	8 = 6%								

MOF: multisystem organ failure, (Number of cases= 8)

3. DISCUSSION

The current study provides an overview on the pattern of geriatric cases of poisoning received by PCC-ASU during years 2020, 2021 and 2022. This coincides with the hit of COVID-19 pandemic in Egypt before it subsided in 2022.

A total of 625 geriatric cases attended at PCC-ASU during the period from 2020 to 2022. Although the majority of geriatric cases were mild in comparison to cases requiring hospital admission (21.28%), severe cases requiring ICU admission exceeded half of the admitted cases (56.6%).

In a study performed in PCC-ASU during 2019, substantially higher numbers of geriatric cases of poisoning were both received (250 cases) and admitted (91 cases), though severe cases constituted similar percentage (56%) (Abdelhamid et al., 2021). Janke et al. (2021) reported a similar decline in emergency department visits for emergent conditions among older adults across USA in relation to COVID-19. They proposed a few possible explanations for these observations. First: delayed perception of urgency in conditions that may present with atypical and less well recognized symptoms in older adults leading to delayed seeking of medical care. Second: the implementation of quarantine measures during the pandemic isolated older adults from family members and caregivers who has a key role in both recognition of health status changes and transportation to emergency department. Moreover, the fear of visiting medical facilities and the risks of COVID-19-related fatality exposure frequently overweigh benefits of seeking emergency care. Other studies suggested that time-sensitive unscheduled emergency care non-COVID-19 illnesses was generally avoided (Howley et al 2021; Venkatesh et al., 2021).

In the current study, most cases belonged to the age group between 60 and 65 years with declining incidence with the increase of age and prevalence of male cases.

The majority of admitted cases were linked to deliberate self-poisoning (119=89.5%). Therapeutic drugs' overdose accounted for almost half of these cases (62 cases) with antipsychotic drugs ranking first among used drugs followed by cardiovascular drugs. tendency to ingest their prescribed medication in self-poisoning episodes.

The substances used in self-poisoning often came from the patient's own medication. As self-harm is often impulsive, the most common involved drugs ingested were those likely to be close at hand (Gjelsvik et al., 2012; Rodríguez et al., 2020; Calle et al., 2022). This correlation can be viewed alongside the history of organic and psychiatric comorbidities recorded in the current study.

Additionally, insecticides topped chemical agents employed in deliberate self-poisoning followed by corrosives. On the other hand, accidental poisoning through envenomation represented 10.5% of cases (14 cases).

In contrast, Kastanje et al., (2022) in a study conducted in Estonia unintentional poisonings in elderly outnumbered suicidal cases and the most common causative agents were medications followed by caustic chemicals.

The present study highlights a probable increase in the incidence of self-harm in the geriatric population in relation to COVID-19 pandemic. John et el. (2020) conducted a systematic review reporting a high level of self-harm tendency during COVID-19. Similarly, Obidoa et al., (2022) showed a slight increase in self-harm in an older adult population during the COVID-19 pandemic in the southwest of England. The study also hypothesized higher impact of prolonged social isolation on older adults as a potential trigger for self-harm owing to their limited mobility, lack of social interaction, mental stress due to vulnerability to infection and other health complications.

There has been widespread concern regarding the negative effect of COVID-19 on mental health and its psycho-social consequences. The pandemic-imposed measures may increase the risk of suicide , through its effects on several well‑established suicide risk factors: isolation, loneliness, economic fallout, domestic abuse, stigma and fear increased levels of distress, anxiety, grief, depression, loneliness, and financial loss, in addition to biological vulnerabilities such as exacerbation of pre-existing mental illnesses along with lack of access to mental health care services (Gunnell et al., 2020; Reger and Stanley, 2020; Pierce et al., 2020;Yao et al., 2020; Banerjee et al., 2021; Breslau et al., 2021).

In addition to psychological stressors associated with the pandemic, SARS-CoV-2-induced neurobiological changes have been implicated in the increase of suicidal vulnerability and the overall risk of suicidal acts (Conejero et al., 2021). Suggested mechanisms that contribute to emergence or exacerbation of suicidal behaviour include First: direct neurotropic effects mediated by the retrograde axonal transport of the virus from the respiratory mucosa, hypoxic brain injury, associated cytokine ‘storm’, and the disruption of the blood-brain barrier precipitating prolonged neuroinflammatory and

neurodegenerative cascades. Second: associated neurotransmitter dysregulation (namely serotonin, glutamate, GABA) and dysfunction of large cortical networks and subcortical brain structures. Additional possible contributing factors include COVID-19 related sleep disturbances, neuroendocrine changes involving dysregulation of the hypothalamus-pituitary-adrenal axis, as well as the dysregulation of the gut microbiota and the brain-gut axis (Solomon, 2020; Troyer et al., 2020; Chen and Vitetta, 2021; Conejero et al., 2021; Ngo,2021).

In the present study, clinical presentations in admitted cases were recorded as gastrointestinal (42.9%), and neurological manifestations (38.3%) mainly in the form of coma specially grade I coma, in addition to cardiovascular manifestations (36.8%) in the form of hypotension and heart rate changes. Low incidence of respiratory manifestations was noted. These presentations reflect the type of causative toxicants with antipsychotics topping the list.

Antipsychotic overdose causes a spectrum of toxic manifestations involving multiple organ systems, but the most serious toxicity involves the CNS and cardiovascular system. Depressed level of consciousness is both common and dose-dependent feature of antipsychotic overdose, but significant respiratory depression is uncommon. Coexistent central manifestations, include agitation, delirium, psychosis, and hallucinations (Burns,2001; Juurlink,2019).

Regarding cardiovascular manifestations, hypotension is a common feature of antipsychotic overdose and is generally caused by peripheral α1-adrenergic blockade and reduced myocardial contractility. Associated tachycardia reflects reduced vagal tone or a compensatory response to hypotension. On the other hand, bradycardia may be more related to the ingestion of negative chronotropic drugs such as β-adrenergic antagonists, calcium channel blockers, cardioactive steroids, and opioids. Moreover, bradycardia and hypotension may be preterminal findings in cases of poisoning (Juurlink, 2019; Li et al., 2021).

In the present study, overall in-hospital mortality represented 6% of admitted cases. Mortalities were related both to drugs and non-drug agents.

Studies suggest that major outcomes and mortality are more common among elderly patients, especially with deliberate self-poisoning compared to accidental exposure. Increased fatality ratio is likely attributed to age-related physiologic vulnerability which influence pharmacokinetics and pharmacodynamics of drugs (Barman et al., 2018; Stern et al., 2019).

The most consistent age-associated pharmacokinetic change is reduction of glomerular filtration rate, which is further worsened by chronic illness and medications. Hepatic changes with age can also impact drug metabolism including decline in liver mass, hepatic blood flow and enzymatic processes. Xenobiotic disposition is also affected by the alterations in body composition in elderly leading to altered volume of distribution of both lipid and water-soluble xenobiotics. Examples of these changes are the decreased lean muscle mass and total body water with the increase of fat-to-lean ratio. Furthermore, changes in pharmacodynamic processes with aging may lead to altered sensitivity to a drug at tissue and cellular levels resulting in increased potential for toxicity (Hu et al., 2009; Yang,2010; Stern et al., 2019)

4. CONCLUSION AND RECOMMENDATIONS

There is substantial incidence of deliberate self-poisoning in the geriatric age group in relation to COVID-19 pandemic with subsequent significant morbidities and in- hospital mortalities.

Further multicentred prospective studies are required to identify characteristics and magnitude of acute poisoning in the elderly with the evaluation of self-harm/suicide risk in this age group. Holistic care of older adults is strongly suggested targeting both medical and mental morbidities.

Development and implementation of a thorough national suicide prevention strategy is recommended considering pandemic-related consequences in all age groups.

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