American Journal of
Health, Medicine and Nursing Practice
(AJHMN)

Characteristic of Clorox Poisoning Before and During COVID-19 Pandemic, Saudi Arabia, 2019-2020

Hamoud Marzuq Alrougi and Jaber Sharaheeli

AJP

American Journal of Health, Medicine and Nursing Practice
ISSN 2520-4017 (Online)
Vol.7, Issue 10, pp 1 – 8, 2022
www.ajpojournals.org

Characteristic of Clorox Poisoning before and during COVID-19 Pandemic, Saudi Arabia, 2019-2020.

[1*]Hamoud Marzuq Alrougi and [1]Jaber Sharaheeli

Saudi Field Epidemiology Training Program, Ministry of Health, Riyadh, Saudi Arabia

[*]Corresponding Author's Email: homoudalrougi@gmail.com

Abstract

Purpose: Poisoning is one of the leading causes of morbidities and mortalities worldwide. Due to COVID-19 pandemic, there was a dramatic increase in the use of detergents and disinfectants, both in health care and domestic settings. As Clorox is the most used for these purposes; it was expected that there would be changes in the characteristics of Clorox poisoning. Therefore, the current study aimed to investigate characteristics of Clorox poisoning in Saudi Arabia during Covid-19 pandemic compared to the pre-pandemic period.

Methodology: Through a record-based study; all Clorox poisoning cases reported to the ministry of health in 2019 (n=267) representing pre-pandemic and 2020 (n=198) representing during the pandemic periods were collected. The data were retrieved from the electronic database, and it was analyzed using SPSS version 26. Categorical variables are represented as frequency distribution.

Finding*:* There was a decrease in the total number of reported Clorox poisoning cases from 267 pre-pandemic to 198 cases during the pandemic. Females were slightly more than males (55.7% vs 44.3%), and most of the cases were in the age groups (1-5 years) and (20-39 years) (27.3%). The overwhelming majority of the cases occurred at home) (96.3%), with a higher percentage during the pandemic than pre-pandemic (98.0% vs 95.1%), and few minorities occurred intentionally (9.3%). Most of the cases arrived the hospital in stable conditions, with few cases (17.0%) needed antidotes. The great majority of the cases recovered before discharge. The overall incidence of Clorox poisoning reached to 0.57/100,000 population during the pandemic, compared to 0.78/100,000 in the pre-pandemic.

Conclusion: There was a decline in incidence of Clorox poisoning during the pandemic; with a relative increase in home incidents, with nausea and vomiting as most common symptoms and all cases recovered.

Recommendation: It is highly recommended to plan for a health education messages about safe store and using of detergents and disinfectants.

Keywords: *Sodium hypochlorite, Clorox, poisoning, COVID-19.*

1. Introduction

Poisoning is one of the leading causes of morbidities and mortalities worldwide,(1) with a significant burden on health systems (2). The world health organization (WHO) estimated that the number of acute unintentional poisoning cases ranges between two to three million cases every year, with a mortality reaches up to 20000 deaths; while the intentional poisonings reaches about 2 million resulting in 200 000 deaths (3). Chemical substances are widely used in our daily life, however, despite of its benefits in many fields, the hazards of chemical poisoning in significant (4). It had been documented that chemical poisoning is a major cause of emergency admissions and hospitalization both in developed and developing countries (2). The fate of the cases depends on three main factors; the substance; characteristics of the cases and the level of health care provided (1).

Among chemical substances, sodium hypochlorite (NaOCl) products are widely used in the household for bleaching laundry and to clean and disinfect hard surfaces; although it had been recognized as a safe household product, yet, the hazards of poisoning had been proven in many studies (5). The most reported route of exposure is ingestion followed by inhalation; and the great majority of the cases suffer from minor transient adverse effects, with no permanent sequelae (6). The potential toxicity of hypochlorite arises from its oxidizing capacity and its corrosive activity upon contact with mucous membranes and skin; the accidental ingestion of small amounts are very unlikely to cause toxicity, while large ingestions may result in corrosive gastrointestinal injury and systemic effects, including metabolic acidosis, hypernatremia, and hyperchloremia. The inhalation of hypochlorite alone might lead to mild irritation of the upper respiratory tract (7).

Recent studies in Saudi Arabia showed that Clorox, which is the most common brand based on sodium hypochlorite, came on the top of the list of chemical poisoning in Jeddah,(8) and same finding was reported in Qatar (9). In December 2019, the outbreak of corona virus disease (COVID-19) began in China, to turn shortly into a pandemic affecting the whole world as declared by the World Health Organization (10). Among the precautionary measures to prevent spread of COVID-19, the health authorities emphasized on the importance of cleaning hard surfaces with disinfectants (11). The compliance with the precautionary measures during COVID-19 pandemic has been associated with significant increase in the use of disinfectants; such as sodium hypochlorite, hydrogen peroxide and alcohol (12). Despite that these products had been proven to be effective in mitigating the virus burden; the incorrect overuse of these products could have adverse effect on human health as well as the environment (13).

The lack of knowledge and awareness of the public about the correct measures for using disinfectant chemicals during the COVID-19 pandemic have deleterious effect on the human environment and health on short and long term (12). The full spectrum of the these effects are not well known (14). Therefore, the current study aim at determining the impact of overusing disinfectants during COVID-19 pandemic on the rates of chemical poisoning compared to pre-pandemic.

2. Material and Methods

This was a cross-sectional retrospective record-based study design. That had been conducted in the environmental health department, MOH, Saudi Arabia, where all poisoning cases are reported as part of the national program of food, drug and chemical safety. All the cases who had been reported to have poisoning with “Clorox” in the period between January 2019 and December 2020 were included in the study. Provided that the objectives of the study necessitate inclusion of all the cases, and the data are well defined and accessible; no sampling was carried

out. All reported clinical and laboratory data were retrieved in an excel format from the database of the environmental health department, including the patient's demographic data (age, gender, nationality and weight), poison characteristics (type, physical form, route of exposure and date of exposure), general condition on arrival at the hospital, patient medical history (signs and symptoms), management details and prognosis.

Data entry and statistical analysis was done using Statistical Package for Social Science (SPSS) version (20). Quality control was done at the stages of coding and data entry. Categorical variables were presented as frequency distribution and percentages. Approval was collected from the local Institutional Research Board (IRB) in the Ministry of Health. All the collected data will be kept confidential and will not be used except for the study purposes.

3. Results

Table 1 demonstrates that a total of 267 Clorox poisoning cases had been reported in 2019, compared to 198 cases reported during the pandemic. There was slight dominance of females (55.7%) and marked dominance of Saudis (85.2%). Most of the cases were in the age group (1-5 years) (47.7%), followed by those in the age group (20-39 years) (27.3%).

Table 1: Distribution of Clorox poisoning cases by years according to their demographic characteristics before and during COVID-19 Pandemic in Saudi Arabia.

	Time				**Total**	
	Pre-Pandemic (2019)		**During Pandemic (2020)**			
	N=267		**N=198**		**N=465**	
	Freq	**%**	**Freq**	**%**	**Freq**	**%**
Gender						
Male	124	46.4%	82	41.4%	206	44.3%
Female	143	53.6%	116	58.6%	259	55.7%
Nationality						
Saudi	223	83.5%	173	87.4%	396	85.2%
Non-Saudi	44	16.5%	25	12.6%	69	14.8%
Age groups						
<1 Year	5	1.9%	4	2.0%	9	1.9%
1-5 Years	124	46.4%	98	49.5%	222	47.7%
6-12 Years	7	2.6%	17	8.6%	24	5.2%
13-19 Years	24	9.0%	14	7.1%	38	8.2%
20-39 Years	82	30.7%	45	22.7%	127	27.3%
>39 Years	25	9.4%	20	10.1%	45	9.7%

Regarding clinical characteristics of the cases, table 2 shows that the overwhelming majority of the cases occurred at home (96.3%), with a higher percentage in 2020 (98.0%) than in 2019 (95.1%), and few minorities (9.7%) occurred intentionally, with a relatively lower percentage in 2020 (7.6%) than in 2019 (11.2%). Most of the Clorox poisoning were due to exposure to the liquid form (94.0%), that was higher in 2020 (95.5%) than in 2019 (92.9%). The great majority of the cases arrived the hospital in stable conditions (99.1%); they were mostly suffering from vomiting (60.2%) followed by nausea (21.1%), abdominal colic (15.5%) and dyspnea (15.3%). Only 79 cases (17.0%) needed antidotes, that was mainly activated charcoal

(8.0%), that was used more frequently in 2020 (10.0%) than in 2019 (6.0%). The great majority of the cases recovered (93.8%) before discharge, while the rest (6.2%) were discharged against medical advice.

Table 2: Clinical characteristics of paracetamol poisoning cases before and during COVID-19 Pandemic in Saudi Arabia.

	Pre-Pandemic (2019) N=267		During Pandemic (2020) N=198		Total N=465	
	No.	%	No.	%	No.	%
Place of incidence						
Home	254	95.1%	194	98.0%	448	96.3%
Others	13	4.9%	4	2.0%	17	3.7%
Circumstances of exposure						
Intentional	30	11.2%	15	7.6%	45	9.7%
Unintentional	150	56.2%	149	75.3%	299	64.3%
Unknown	87	32.6%	34	17.2%	121	26.0%
Form of paracetamol						
Solid	19	7.1%	9	4.5%	28	6.0%
Liquid	248	92.9%	189	95.5%	437	94.0%
Provisional assessment						
Confirmed	234	87.6%	179	90.4%	413	88.8%
Suspected	33	12.4%	19	9.6%	52	11.2%
Condition on arrival to hospital						
Stable	265	99.3%	196	99.0%	461	99.1%
Critical	2	0.7%	2	1.0%	4	0.9%
Symptoms						
Nausea	71	26.6%	27	13.6%	98	21.1%
Vomiting	163	61.0%	117	59.1%	280	60.2%
Abdominal colic	54	20.2%	18	9.1%	72	15.5%
Dyspnea	33	12.4%	38	19.2%	71	15.3%
Headache	11	4.1%	7	3.5%	18	3.9%
Others	37	13.9%	23	11.6%	60	12.9%
Antidote						
Activated charcoal	16	6.0%	21	10.6%	37	8.0%
Benztropine	1	0.4%	0	0.0%	1	0.2%
Cyanide	1	0.4%	0	0.0%	1	0.2%
Oxygen	12	4.5%	7	3.5%	19	4.1%
Others	46	17.2%	33	16.7%	79	17.0%
Outcome						
Recovered	246	92.1%	190	96.0%	436	93.8%
DAMA	21	7.9%	8	4.0%	29	6.2%

Table 3 shows that there was a decline in the incidence of Clorox poisoning during the pandemic as it reached to 0.57/100,000 population during the pandemic, compared to 0.78/100,000 in the pre-pandemic. The highest rates (per 100,000 population) were reported in AlQassim (11.83/100,000) and AlQrayat (9.14/100,000), while the lowest rate was recorded Hail (0.04/100,000). There were marked variations in the changes of the rates within regions. While there was remarkable decline in most of the regions, there was increment in few regions such as AlQassim, AlQrayat and AlJouf.

Table 3: Distribution of Clorox poisoning cases and rates per 100,000 population b efore and During COVID-19 Pandemic in Saudi Arabia, according to Admin Region.

Health Region	Pre-Pandemic (2019) N=267			During Pandemic (2020) N=198		
	Freq	%	Rate per 100,000 population	Freq	%	Rate per 100,000 population
Najran	43	16.1%	0.66	29	14.6%	0.85
AlAhsa	34	12.7%	0.60	10	5.1%	0.80
Jeddah	33	12.4%	0.00	14	7.1%	0.74
Riyadh	26	9.7%	0.22	38	19.2%	0.27
Eastern	22	8.2%	0.20	14	7.1%	0.53
Northern Borders	19	7.1%	0.55	16	8.1%	1.84
Hail	17	6.4%	0.03	3	1.5%	0.04
Asir	16	6.0%	0.09	15	7.6%	0.14
Beshah	16	6.0%	0.68	26	13.1%	1.32
AlTaif	8	3.0%	0.68	5	2.5%	1.78
Hafer AlBatin	6	2.2%	0.43	1	0.5%	0.70
AlMedina AlMonawarah	5	1.9%	0.12	1	0.5%	0.14
Jazan	5	1.9%	2.33	0	0.0%	2.74
Tabouk	5	1.9%	0.31	8	4.0%	0.31
AlBahah	3	1.1%	0.37	1	0.5%	0.52
AlQassim	3	1.1%	7.07	5	2.5%	11.83
AlQrayat	3	1.1%	4.96	7	3.5%	9.14
AlQunfutha	3	1.1%	0.30	1	0.5%	0.74
AlJouf	0	0.0%	0.53	4	2.0%	1.37
TOTAL	**267**	**100.00%**	**0.78**	**198**	**100.00%**	**0.57**

4. Discussion

Chemical poisoning is one of the common causes of emergency visits and hospitalization in developed and developing countries. In response to the recommendations of using Clorox as disinfectant during Covid-19 pandemic, it was expected that its extensive use would be

reflected on incidence of poisoning. This study aimed at exploring changes in Clorox poisoning during the pandemic. One of the strengths of the study, is that the results were based on official data for all the cases reported to the ministry of health in Saudi Arabia, therefore, the described epidemiological pattern of Clorox poisoning during the pandemic presents valid reference for further comparative epidemiological studies.

Previous researches in Saudi Arabia showed that Clorox poisoning is the most common type of chemical poisoning, (8,16) which accords what had been reported in most countries worldwide according to a systematic review about epidemiology of Sodium Hypochlorite poisoning (7). The observed decline in the incidence of Clorox poisoning in the current study had been explained in Italy, where the researchers attributed it to the effectiveness of the public health messaging about proper use of household disinfectants during the Covid-19 pandemic (17).

Females were found to be more susceptible to Clorox poisoning. In contrast to our findings, the incidence of chemical poisoning in Qassim region was found to be higher among males (16). This difference could be attributed to the variation in the scopes of the study; where the researchers in Qassim studied all types of chemical poisoning, as males are more prone for exposure to chemical products, while in the current study, the focus was on Clorox, which is commonly used for domestic purposes that come within females' affairs. Few minorities of cases occurred due to intentional exposure, which comes in accordance to what had been reported in Saudi preadolescents, that was explained by the researchers by the possibility of an underreported figure in a culturally and religiously conservative community (18).

The results showed that there was increased home incidents of Clorox poisoning during the pandemic, which accords what had been reported in Italy, where the researchers found that during the lockdown, while the calls from private citizens due to chemical poisoning showed a highly significant increase, occupational exposures decreased (19). The relative increase in domestic Clorox poisoning had been attributed partly in France to the widespread advertising of these products in mass media which included a mix of false and true facts about it without declaring its safe use (20).

The current study showed that the incidence of Clorox poisoning was relatively higher among preschool children, which comes in agreement with similar study which stated that "children under 5 years were mainly exposed to disinfectants held in not-labelled bottles and left within reach of children" (19). The incidence was also high in those aged 20-29 years, that has been explained by the assumption that adults exposed to disinfectants poisonings are usually caused by the use of improperly treat face masks or by poisonous aerosols released by mixing different household products. As ingestion is the common route for Clorox poisoning, which eventually harms the gastrointestinal tract; therefore, nausea and vomiting were the most reported symptoms of Clorox poisoning,(7) which supports the findings of the current study. The great majority of the cases arrived the hospitals in stable states; and only few cases needed chelating agents as main antidote, and all cases recovered. These findings accord what had been documented about management of Clorox poisoning, and effectiveness of the used treatment (7,16,20,21).

5. Conclusion and Recommendations

There was a decline in incidence of Clorox poisoning during COVID-19 pandemic; with a relative increase in home incidents. The incidence is more common in pre-school children and mid aged adults. Nausea and vomiting were the most common symptoms and all cases

recovered. There is a need for health education messages about safe store and using of detergents and disinfectants including Clorox.

References

1. Ali I, Sawlani K, Dandu H, Chaudhary S, Usman K, Atam V, et al. Study of pattern and outcome of acute poisoning cases at tertiary care hospital in north India. J Evid Based Med Healthc. 2017 Jan 19;4:326–31.
2. Pawer S, Rajabali F, Zheng A, Pike I, Purssell R, Zargaran A, et al. Socioeconomic factors and substances involved in poisoning-related emergency department visits in British Columbia, Canada. Health Promot Chronic Dis Prev Can Res Policy Pract. 2021 Aug;41(7–8):211–21.
3. World Health Organization. Poison control and unintentional poisoning [Internet]. [cited 2021 Dec 21]. Available from: https://www.who.int/data/gho/data/themes/topics/indicator-groups/poison-control-and-unintentional-poisoning
4. Oraie M, Hosseini MJ, Islambulchilar M, Hosseini SH, Ahadi-Barzoki M, Sadr H, et al. A Study of Acute Poisoning Cases Admitted to the University Hospital Emergency Department in Tabriz, Iran. Drug Res. 2017 Mar;67(3):183–8.
5. Household bleaches based on sodium hypochlorite: Review of acute toxicology and poison control center experience. Food Chem Toxicol. 1994 Jan 1;32(9):845–61.
6. Hoy RH. Accidental Systemic Exposure to Sodium Hypochlorite (Clorox) during Hemodialysis. Am J Hosp Pharm. 1981 Oct 1;38(10):1512–4.
7. Slaughter RJ, Watts M, Vale JA, Grieve JR, Schep LJ. The clinical toxicology of sodium hypochlorite. Clin Toxicol. 2019 May 4;57(5):303–11.
8. Alzahrani SH, Ibrahim NK, Elnour MA, Alqahtani AH. Five-year epidemiological trends for chemical poisoning in Jeddah, Saudi Arabia. Ann Saudi Med. 2017 Jul;37(4):282–9.
9. Ahmed A, AlJamal AN, Mohamed Ibrahim MI, Salameh K, AlYafei K, Zaineh SA, et al. Poisoning emergency visits among children: a 3-year retrospective study in Qatar. BMC Pediatr. 2015 Aug 28;15(1):104.
10. World Health Organization. Coronavirus Disease (COVID-19) Dashboard. 2020.
11. Chang A, Schnall AH, Law R, Bronstein AC, Marraffa JM, Spiller HA, et al. Cleaning and Disinfectant Chemical Exposures and Temporal Associations with COVID-19 — National Poison Data System, United States, January 1, 2020–March 31, 2020. Morb Mortal Wkly Rep. 2020 Apr 24;69(16):496–8.
12. Dewey HM, Jones JM, Keating MR, Budhathoki-Uprety J. Increased Use of Disinfectants During the COVID-19 Pandemic and Its Potential Impacts on Health and Safety. ACS Chem Health Saf [Internet]. 2021 Aug 25 [cited 2021 Dec 24]; Available from: https://doi.org/10.1021/acs.chas.1c00026
13. Koksoy Vayisoglu S, Oncu E. The use of cleaning products and its relationship with the increasing health risks during the COVID-19 pandemic. Int J Clin Pract. 2021;75(10):e14534.

14. Pritha Bhandari. Population vs sample: what's the difference? [Internet]. Scribbr. 2020 [cited 2021 Dec 25]. Available from: https://www.scribbr.com/methodology/population-vs-sample/
15. Banerjee A, Chaudhury S. Statistics without tears: Populations and samples. Ind Psychiatry J. 2010;19(1):60–5.
16. Alnasser S, Hussain SM, Alnughaymishi IM, Alnuqaydan AM. Pattern of food, drug and chemical poisoning in Qassim region, Saudi Arabia from January 2017 to December 2017. Toxicol Rep. 2020 Jan 1;7:1438–42.
17. Soave PM, Grassi S, Oliva A, Romanò B, Stasio EDI, Dominici L, et al. Household disinfectant exposure during the COVID-19 pandemic: A retrospective study of the data from an italian poison control center. Eur Rev Med Pharmacol Sci. 2021;25(3):1738–42.
18. Q M, Alanazi -, Salam M. Intentional poisoning among preadolescents at one poison center in Saudi Arabia. Indian J Child Health. 2017 Mar 28;4(1):44–8.
19. Giordano F, Petrolini VM, Spagnolo D, Fidente RM, Lanciotti L, Baldassarri L, et al. Significant variations of dangerous exposures during COVID-19 pandemic in Italy: a possible association with the containment measures implemented to reduce the virus transmission. BMC Public Health. 2022 Mar 5;22:441.
20. Le Roux G, Sinno-Tellier S, Puskarczyk E, Labadie M, von Fabeck K, Pélissier F, et al. Poisoning during the COVID-19 outbreak and lockdown: retrospective analysis of exposures reported to French poison control centres. Clin Toxicol Phila Pa. 2021 Sep;59(9):832–9.
21. Chang A, Schnall AH, Law R, Bronstein AC, Marraffa JM, Spiller HA, et al. Cleaning and Disinfectant Chemical Exposures and Temporal Associations with COVID-19 - National Poison Data System, United States, January 1, 2020-March 31, 2020. MMWR Morb Mortal Wkly Rep. 2020 Apr 24;69(16):496–8.