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ORIGINAL ARTICLE

Characterization of the phone-calls made to a poison center related to household and cosmetics products exposition in pediatrics

Caracterización de las consultas realizadas a un Centro de Información Toxicológica por productos de aseo y productos cosméticos en niños

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Abstract

Introduction: Household cleaning products and cosmetics are necessary for daily life and widely used by the population. However, their use may not be risk-free, especially when they are not used or stored as recommended. It is important to characterize exposures, as this is useful for developing strategies to reduce morbidity, mortality, and health costs associated, especially in the child population. **Objective:** To describe reports associated with household cleaning products and cosmetics exposure in patients under the age of 12, reported to the Poison Information Center of the Catholic University of Chile (CITUC). **Patients and Method:** Descriptive cross-sectional study of phone calls to CITUC during 2016. The analyzed variables were age, sex, product, caller, caller and incident location, exposure circumstances, exposure route(s), symptoms, and severity from manual records and from the WHO's electronic record software 'INTOX Data Management System'. **Results:** 3,415 cases met the inclusion criteria. Children under the age of five represented 91% of the exposures, and 58.5% were male. 99.4% were accidental exposures, and 98.6% occurred at home. Family members (57%) and health personnel (42%) made the calls. 68.3% of the patients had no symptoms after exposure. The four products with the highest incidence were household bleach (27.6%), floor cleaners and polishers (13.1%), dish soap (7.9%), and perfume/cologne (5.8%). The main exposure route was by ingestion (89.4%). **Conclusions:** Household cleaning products and cosmetics are common causes of exposures especially in children under the age of five. Although these products have a low morbidity and mortality rate, it is important to educate the population to prevent possible poisonings in the child population.

Keywords:
Toxicology;
clinical toxicology;
household cleaning products;
cosmetics;
poison center

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Introduction

The use of household cleaning products and cosmetics is common in everyday life and provides countless benefits for consumers, however, their use may not be risk-free if they are not used and stored according to manufacturers' recommendations. The potential risk in these situations will depend on the inherent hazard of the ingredients contained in the products and the exposure context.

According to the 2016 annual report of the American Association of Poison Control Centers (AAPCC), the top three most frequently occurring categories related to human exposures are: painkillers, cleaning products, and cosmetics[1]. In the same study, it was observed that exposures in children under 12 are mostly accidental. This probably occurs due to errors in the use and/or storage of these products, which generates risk conditions in the pediatric population. In the national context, the Toxicology Information Center of the Pontificia Universidad Católica de Chile (CITUC) receives more than 34,000 calls per year, where the main agents involved are medicines for human use (58.1%) and household products (14.6%)[2].

In cleaning products, the supplier provides the consumer, through the label, all the necessary information on the use, storage, and risk associated with the products, and in some cases, on a voluntary basis, a toxicology emergency telephone number. That's why users have access to the CITUC telephone number in cases of exposure to these substances.

Exposures to these agents are reported voluntarily by the user or patients exposed to the Center, who communicates to request advice and technical recommendations on how to proceed in these situations.

According to this background, it is important to characterize the exposures to cleaning and cosmetic products in the pediatric population, to determine the associated symptoms and the level of severity that the exposures represents. The availability of these data is relevant when implementing strategies to reduce morbidity, mortality, and costs associated with these exposures.

Patients and Methods

A cross-sectional descriptive study was conducted. Table 1 describes the reports included in the study that contain all the calls reported to the CITUC emergency hotline during 2016, associated with exposures to cleaning products and cosmetics in pediatric patients under the age of 12. A report is defined as a record involving a victim/patient exposed to one or more agents and having one or more associated exposure route. This exposure could generate a clinical picture that could eventually require medical treatment. CITUC also receives requests, calls where information is requested to the center with no exposed individuals; and incidents, calls where there are three or more individuals exposed.

The data was collected from the manual registration forms and from the electronic registration software called 'INTOX Data Management System' of the World Health Organization (WHO).

The variables analyzed were sex (female, male), age (newborn: 0 to 28 days; infant: 29 days to < 2 years; preschool children: ≥ 2 years to < 5 years; primary school children: ≥ 6 years to < 11 years; adolescent: ≥ 12 years to < 17 years; adult: ≥ 18 years to < 64 years; older adult: ≥ 65 years), exposure circumstance (accidental, suicidal, environmental, abuse or misuse), agents involved, user, location of the user and incident, exposure routes (swallowing, inhalation, ocular, dermal, oropharyngeal mucosa, and other), symptomatology, referral to emergency service, and severity scale score.

Table 1 details the agents involved according to the CITUC classification.

To analyze the severity level of each case, the WHO Poisoning Severity Score (PSS) was used[3,4] which classifies the poisoning severity through a qualitative evaluation of the morbidity associated with them, identifying risks and analyzing the clinical picture.

For this study, the scale was applied according to the symptoms reported at the time of the call to CITUC, which represents the severity of the time of the call and not the final condition of the patient.

The severity analysis is carried out based on the following numerical scale, where: None (PSS 0): No symptoms or signs related to intoxication, Minor (PSS 1): Mild, transient, spontaneously resolving symptoms, Moderate (PSS 2): Prolonged or pronounced symptoms, Severe (PSS 3): Severe or life-threatening symptoms, and Fatal (PSS 4): Death.

Exclusion criteria. Records associated with incidents, requests, and reports in which the agent is not a cosmetic or cleaning product were excluded.

Statistical analysis. The results are expressed as descriptive data with the respective percentage value and frequency. For the calculation of Odds ratio, 95% CI and p-value the online software OpenEpi® was used.

Results

From January 1 to December 31, 2016, CITUC received 32,146 records that include cases. Out of these, 3,415 (10.6%) were analyzed in this study. Calls to CITUC were made mostly from home (58.5%), followed

Table 1. Agent categories included in the characterization

Cleaning products and related agents	N° reports	%
Disinfectants/whiteners: Hypochlorite: domestic hypochlorite	956	27.63%
Disinfectants/whiteners: Hypochlorite: pool hypochlorite	28	0.81%
Disinfectants/whiteners: Other	5	0.14%
Cleaning agents: degreasers	39	1.13%
Cleaning agents: Environment deodorant/perfumer	188	5.43%
Cleaning agents: Abrasive/polisher	83	2.40%
Cleaning agents: Dishwasher	274	7.92%
Cleaning agents: Pipe cleaner: muriatic acid	17	0.49%
Cleaning agents: Pipe cleaner: sodium hydroxide	95	2.75%
Cleaning agents: Pipe cleaner: other	0	0
Cleaning agents: Floor cleaner	452	13.06%
Cleaning agents: Leather cleaner	20	0.58%
Cleaning agents: Bathroom cleaner	51	1.47%
Cleaning agents: Glass/windows cleaner	53	1.53%
Cleaning agents: Furniture polisher	37	1.07%
Cleaning agents: Other cleaners/polishers	58	1.68%
Cleaning agents: Stain remover	60	1.73%
Cleaning agents: Unknown	4	0.12%
Laundry products: Liquid detergent/pods	141	4.08%
Laundry products: Stain remover	8	0.23%
Laundry products: Fabric softener	5	0.14%
Laundry products: Powder detergent/granulated/tablets	97	2.80%
Total cleaning products and related agents	2.671	77.20%
Cosmetics and personal hygiene agents		
Antiperspirant/deodorant	39	1.13%
Dental care product: Dental adhesive	0	0
Dental care product: Toothpaste	20	0.58%
Dental care product: Mouthwashes	8	0.23%
Dental care product: Mouthwash: Antiseptic	0	0
Hair cosmetics: Shampoo	48	1.39%
Hair cosmetics: Hair conditioner	12	0.35%
Hair cosmetics: Hair dyer	21	0.61%
Hair cosmetics: Hairspray	1	0.03%
Other hair cosmetics	17	0.49%
Cosmetic soaps: Bath foam	0	0
Cosmetic soaps: Common soap	97	2.80%
Cosmetic soaps: Shaving foam	2	0.06%
Cosmetic soaps: Bath salts	4	0.12%
Nail cosmetics: Nail polish	50	1.45%
Nail cosmetics: Nail polish remover	109	3.15%
Nail cosmetics: Nail hardener	0	0
Nail cosmetics: Nail biting treatment product	1	0.03%
Fragrance/perfume	199	5.75%
Skin cosmetics: Astringent	0	0
Skin cosmetics: Make-up remover/skin cleaner	3	0.09%
Skin cosmetics: Hair remover cream	14	0.40%
Skin cosmetics: Eye cosmetics	0	0
Skin cosmetics: Lipstick	20	0.58%
Skin cosmetics Make-up	14	0.40%
Skin cosmetics: Skin moisturizer	62	1.79%
Skin cosmetics: Skin powder/talc	23	0.66%
Skin cosmetics: Bronzer	0	0
Skin cosmetics: Sunscreen	0	0
Other cosmetic/personal hygiene	1	0.03%
Unknown cosmetic/personal hygiene	24	0.69%
Total cosmetics and personal hygiene	789	22.81%
Total	3.460	100%

by medical institutions (40.6%). In 57% of the cases, a family member made the call, and in 42% was the health personnel. The exposure occurred mainly at home (98.6%).

Most of the individuals were men (58.5%), and 99.4% of the exposures were accidental. Regarding age, children under 5 years of age accounted for the majority of cases, representing 91% of the total (Table 2). Out of these, infants aged between 1 and 2 years had more reports (47.6% and 24.4%, respectively).

Regarding the categories of agents involved, cleaning products and related represents 77.2% of exposures (Table 1). Within this category, household bleach is the agent with the highest incidence (27.6%), followed by floor cleaners and polishes (13.1%), dishwasher (7.9%), and fragrance/perfume with 5.8% of the cases.

Exposures to household products reported to CITUC were mainly related to a single agent (98.8%), however, a case may be associated with more than one product. For this reason, the values analyzed in Table 1 correspond to a higher number than the total number of studied cases.

95.9% of the people affected were exposed through a single exposure route, while 4.1% of cases were associated with multiple routes. Ingestion was the main exposure route (89.4%), and the second-highest incidence was inhalation and ocular exposure, each accounting for 1.9% of the cases (Table 3). 30.6% of those

Table 2. Age and sex distribution of human exposure n= 3415

Age	Sex						Total	
	F		M		Unknown			
	n	%	n	%	n	%	n	%
< 1	68	2.0	104	3.0	0	0.0	172	5.0
1	633	18.5	987	28.9	4	0.1	1.624	47.6
2	372	10.9	459	13.4	3	0.1	834	24.4
3	146	4.3	173	5.1	0	0.0	319	9.3
4	69	2.0	91	2.7	0	0.0	160	4.7
5	32	0.9	58	1.7	0	0.0	90	2.6
6	27	0.8	31	0.9	0	0.0	58	1.7
7	23	0.7	25	0.7	0	0.0	48	1.4
8	16	0.5	24	0.7	0	0.0	40	1.2
9	9	0.3	15	0.4	0	0.0	24	0.7
10	7	0.2	14	0.4	0	0.0	21	0.6
11	9	0.3	16	0.5	0	0.0	25	0.7
Total	1.411	41.3	1.997	58.5	7	0.2	3.415	100

F: female. M: male.

Table 3. Route of exposure and Poison Severity Score (PSS) n = 3.384

SCORE		Route of exposure														Total	
		Ingestion		Multiple routes		Inhalation		Ocular		Dermal		Orofaringeal mucose		Other			
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Non Symptomatic	PSS 0	2.170	64.13	69	2.04	27	0.80	4	0.12	22	0.65	30	0.89	0	0.00	2.322	68.62
Symptomatic	PSS 1	843	24.91	69	2.04	31	0.92	58	1.71	25	0.74	11	0.33	2	0.06	1.062	31.38
	PSS 2	12	0.35	1	0.03	7	0.21	2	0.06	1	0.03	0	0.00	0	0.00		
Total general		3.025	89.39	139	4.11	65	1.92	64	1.89	48	1.42	41	1.21	2	0.06	3.384	100

31 reports are excluded from this analysis because there is not enough information related to symptoms and signs, so these reports cannot be granted a severity score.

cases reporting a single route developed symptoms. When analyzing the severity level according to this variable, it was observed that in ocular and inhalation exposures, most of the patients presented symptoms, 93.8% and 58.5% respectively, unlike exposures by other routes where, in most of the cases, the patients did not present symptoms.

In reports associated with more than one exposure route, 50.4% of patients developed symptoms (Table 3). When comparing a single exposure route with multiple routes, exposure to more than one route has 2.3 times higher risk of developing symptoms (OR: 2.3; 95%CI: 1.6 to 3.2; $p < 0.0001$).

69.0% of the affected people showed no symptoms or signs after the exposure. Out of the patients who presented symptoms, 97.8% were classified in the severity category 1. The signs and symptoms associated with this severity category are mainly irritative at a mucous membrane level. 23 cases were classified in the category 2 of the severity scale, that is, moderate severity, in which pronounced or prolonged symptoms are presented such as tachycardia, loss of consciousness, crepitus, among others. No cases associated with PSS 3 and 4 were reported. 31 cases were excluded from the severity scale analyses since there was not enough information on the symptoms and signs associated with the exposure to the analyzed agents.

Regarding the calls made from homes, educational institutions, public space or the workplace, only 6.3% required referral to health care services. There were also 444 reports in which observation at home was indicated for a certain period of time, according to the history of each particular report, with indication to go to a health service in case of clinical manifestations previously informed by professionals from CITUC emergency center, equivalent to 21.9%.

Exposures referred to emergency services were associated to fragrance/perfume (22%), followed by floor cleaners and polishes (10.2%), and environment deodorants along with household bleach (7.9% each).

Discussion

During the study period, 3,415 cases associated with exposures to cleaning and cosmetic products were reported in individuals under 12 years of age. The high number of exposures in the pediatric population could be due to a combination of factors, such as the storage of these products at home and/or easy accessibility to them. This is reflected in the fact that most exposures occur at home and the call is made by a family member. This can also be influenced by the characteristics of the products' packaging which, due to their striking colors and odors, attract the attention of children. If we also consider exploratory behavior and the tendency to take objects and put them in their mouth, this creates a scenario that could explain the incidence of reported cases[1].

Children under the age of 5 were the most exposed to this products. This is consistent with the AAPCC 2016 annual report, which shows that patients in this same age group are more frequently exposed to cosmetic/personal hygiene and cleaning products[1]. It should be noted that within this group a higher number of cases was observed in patients between 1 and 2 years of age.

Of the two categories of agents analyzed in this study, the one with the highest exposure was cleaning products and related products (Figure 1). This finding relates to the AAPCC 2016 annual report, which states that the first three categories of highest frequency related to human exposures are painkillers, cleaning, and cosmetic/personal hygiene products[1]. In the data collected by CITUC, the most frequent agents were household bleach, followed by floor cleaners and polishes, and dishwasher. These data were similar to that observed in the study conducted by the Dr. Felix Bulnes Cerda Hospital between 2000 and 2001, where the agents most associated with exposures in pediatric patients were drugs, hydrocarbons, and bleach-based products[7]. This may reflect the easy access to these substances at home, therefore it is even more important to educate on the proper storage of products, which ideally should be placed in an enclosed place out of the reach of children to reduce accidents.

Exposure to these agents may eventually generate symptoms, which will vary depending on the agent, dose, and exposure route. Due to their components and concentrations, most household products have a low hazard potential[8]. In addition to this, the events are mostly accidental, so children are exposed to mild or moderate doses. Together, this means that the symptoms following the event are of low severity, or simply no symptoms at all. The results of our research indicate that in more than half of the reported cases the patients remained asymptomatic (PSS 0). The reports that developed symptoms presented mainly gastrointestinal and respiratory effects (Table 3), which coincides with other studies[9].

According to the results obtained in the analysis of the exposure route, the ocular, inhalation, and dermal route were associated with greater development of symptoms.

Regarding the agents, no association with the level of severity was observed, since at all levels the presence of the same agents could be seen. Even when the characteristics of some products could generate a more serious health condition, this was not identified. The development of symptoms may be related to the context

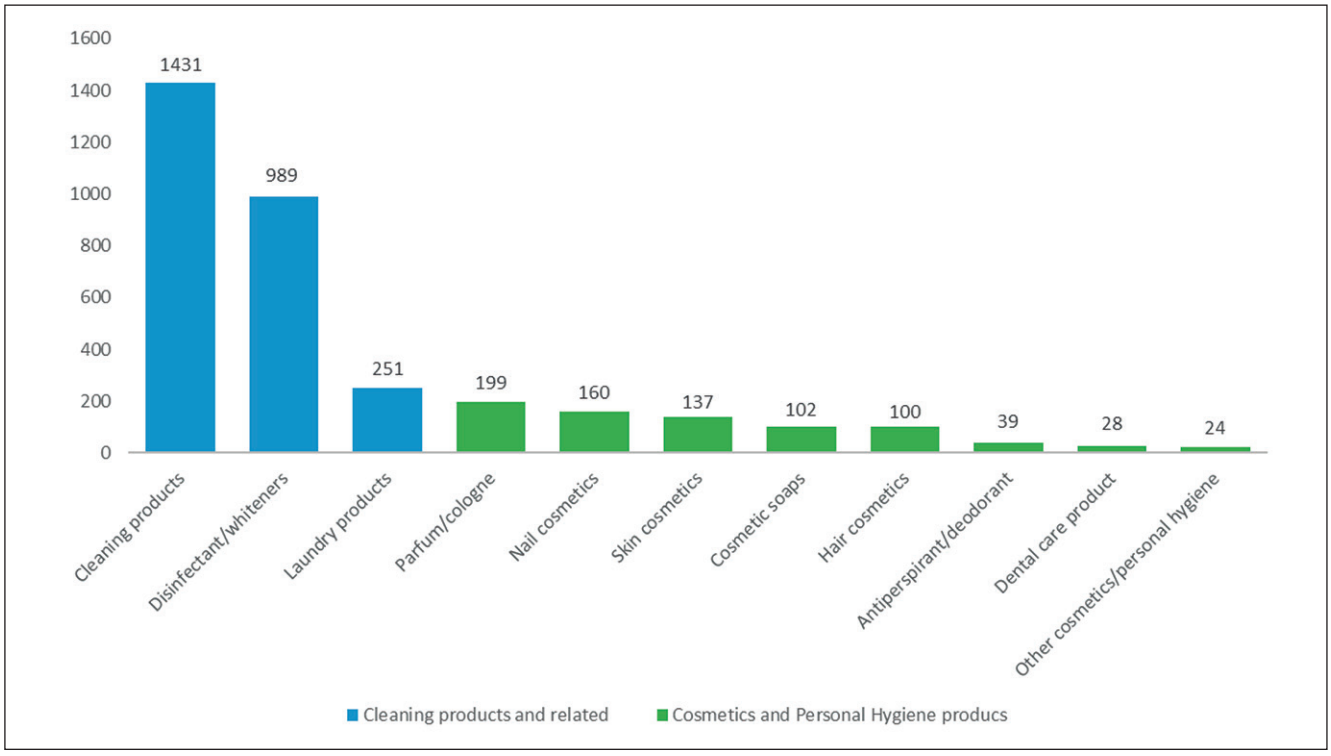

Figure 1. Distribution by use or function of the agent n = 3.460. The differences between agent number is explained because most of reports are made by exposure to just one agent (98,8%), some reports are made by exposure to 2 or more agents.

of the exposure, rather than to the agent itself (Table 4). Therefore, the level of severity will be determined by the inherent hazard nature of the substance, exposure route(s), dose, duration of the exposure, among other factors.

Of the calls that were not made from health centers, only 6.3% required referral to an emergency service, indicating that fewer exposures require management by health professionals.

For consumers, the only way to communicate dan-

Table 4. Characterization of the symptoms by agent n = 3571

	Asymptomatic	Metabolic alterations	Dermal	Unknown	Gastrointestinal	Nervous	Not available	Ocular	Respiratory	Cardiovascular	Total
Cleaning agents	962	7	18	1	329	17	17	47	74	1	1473
Antiperspirant/deodorant	22	1	1	1	13	0	0	0	3	0	41
Nail cosmetics	100	1	2	0	48	2	1	3	5	0	162
Hair cosmetics	69	0	2	0	27	2	0	1	5	0	106
Skin cosmetics	98	0	2	0	29	2	2	4	4	0	141
Disinfectant/whiteners	699	3	7	2	214	17	5	22	47	0	1016
Cosmetic soaps	65	1	3	0	29	2	2	2	4	0	108
Other cosmetics/personal hygiene products	12	0	0	0	9	0	1	2	1	0	25
Fragrance/perfume	138	2	1	1	48	4	0	5	9	0	208
Laundry products	174	0	3	0	63	4	1	7	10	0	262
Dental care products	14	0	1	0	10	0	0	1	3	0	29
Total	2353	15	40	5	819	50	29	94	165	1	3571

The total symptoms number is greater than the study number because one agent can produce symptoms on several organs or systems.

gers and recommendations for the proper use and storage of products is through labeling, so it is important to regulate this information. This is exactly the way that consumers have access to CITUC's telephone and may call when situations of risk occur. Although most household products are not classified as hazardous, they are not legally required to have this emergency call service. A large part of the national market for household products purchases CITUC's toxicological emergency service to provide consumers with timely assistance in cases of incidents related to their products. This is useful to give instructions on how to proceed initially with the individual exposed to these products and, therefore, avoid unnecessary emergency visits and reduce the associated health costs.

This study shows that cosmetic and cleaning products and related products do not represent a high level of concern, however, it is necessary to strengthen among the population the necessary measures to ensure proper storage and handling of them, in order to reduce the number of exposures in pediatric patients. For this, it is essential that consumers can read and understand the information contained in the label attached to the packaging.

Ethical Responsibilities

Human Beings and animals protection: Disclosure the authors state that the procedures were followed according to the Declaration of Helsinki and the World Medical Association regarding human experimentation developed for the medical community.

Data confidentiality: The authors state that they have followed the protocols of their Center and Local regulations on the publication of patient data.

Rights to privacy and informed consent: The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the correspondence author.

Conflicts of Interest

Authors declare no conflict of interest regarding the present study.

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