

Descriptive analysis of notifications of adverse events of cosmetic products registered in Notivisa, from 2006 to 2018

Análise descritiva das notificações de eventos adversos de produtos cosméticos registradas no Notivisa, no período de 2006 a 2018

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ABSTRACT

Introduction: The Brazilian Health Regulatory Agency (Anvisa) defines cosmetovigilance as the set of measures that allows assessing the risk of occurrence of undesirable events attributed to the use of cosmetic products, including the reception of adverse events (AE). In 2006 Anvisa began to receive EA notifications involving cosmetic products, with the implementation of the Sanitary Surveillance Notification System (Notivisa). **Objective:** This study analyzed the notifications of adverse effects related to the use of cosmetic products, registered in Notivisa, from 2006 to 2018. **Method:** This is a quantitative, descriptive and retrospective study which database was extracted from the Notivisa system, nationwide, from November 2006 to December 2018. **Results:** We identified 367 adverse events involving cosmetic products with an average of 31 notifications per year. Reports of adverse events came mostly from the Southeast (48.1%; 176) and South (25.1%; 92) regions of the country with a predominance of female subjects (66.2%; 243). It was observed that citizens are those who most report adverse events (58.0%; 213) related to cosmetic products, with more complaints regarding infant and geriatric diapers (15.0%; 26), facial / body creams (14.1%; 24), hair straighteners (17.8%; 35) and sunscreen lotions (14.8%; 29). The most common adverse events were irritation (46.0%; 17), allergy (30.5%; 11) and burning (30.5%; 11). The reported effects are mostly performed by female citizens from the richest regions of the country, attributed to products of daily use and characterized by the presence of irritation, allergy and burning. **Conclusions:** These results have demonstrated the need to improve Anvisa's Cosmetovigilance System, defining strategies for adherence to adverse event reports, as well as the adoption of a causality assessment method appropriate to the specificities of cosmetic products.

KEYWORDS: Brazilian Health Surveillance Agency; Brazil; Cosmetics; Adverse Effect; Health Surveillance; Cosmetovigilance

RESUMO

Introdução: A Agência Nacional de Vigilância Sanitária (Anvisa) define a cosmetovigilância como o conjunto de medidas que permite avaliar o risco de ocorrência de eventos indesejáveis atribuídos à utilização de produtos cosméticos, contemplando a captação dos eventos adversos (EA). A partir do ano de 2006 a Anvisa passou a receber as notificações de EA envolvendo produtos cosméticos, com a implementação do Sistema de Notificação para a Vigilância Sanitária (Notivisa). **Objetivo:** Este estudo analisou as notificações dos EA relacionados ao uso de produtos cosméticos, registradas no Notivisa, no período de 2006 a 2018. **Método:** Trata-se de um estudo quantitativo, descritivo e retrospectivo, cujo banco de dados foi extraído do sistema Notivisa, em âmbito nacional, no período de novembro de 2006 até dezembro de 2018. **Resultados:** Foram identificados 367 EA envolvendo produtos cosméticos com uma média de 31 notificações por ano. Os relatos dos EA foram provenientes, principalmente, das regiões Sudeste (48,1%; 176) e Sul (25,1%; 92) do país, com predominância do sexo feminino (66,2%; 243). Observou-se que o cidadão é quem mais notifica EA (58,0%; 213) relacionados a produtos cosméticos, com maior

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Received: Jun 24, 2019

Approved: Oct 8, 2019



queixa sobre: fraldas infantis e geriátricas (15,0%; 26), cremes facial/corporal (14,1%; 24), alisantes capilares (17,8%; 35) e protetores solares (14,8%; 29). Os EA mais frequentes foram: irritação (46,0%; 17), alergia (30,5%; 11) e ardor (30,5%; 11). Os eventos relatados são, em sua maioria, realizados por cidadãos do sexo feminino e oriundos das regiões mais ricas do país, atribuídos a produtos de uso diário e caracterizados pela presença de irritação, alergia e ardor. **Conclusões:** Tais resultados demonstraram a necessidade de aperfeiçoamento do Sistema de Cosmetovigilância da Anvisa, com definição de estratégias para adesão às notificações de EA, bem como, a adoção de um método de avaliação de causalidade adequado às especificidades de produtos cosméticos.

PALAVRAS-CHAVE: Agência Nacional de Vigilância Sanitária; Brasil; Cosméticos; Efeitos Adversos; Vigilância Sanitária; Cosmetovigilância

INTRODUCTION

At the beginning of 2006 Collegiate Board Resolution - RDC number 332, of December 1st 2005, came into force in Brazil. It deals with the implementation of a cosmetovigilance system in all companies that manufacture and/or import personal care products, cosmetics and fragrances. This regulation determines that manufacturers and/or importers of these products established in Brazil should implement a Cosmetovigilance System as from December 31st 2005¹.

Vigan (2014), quoted by Toklu et al.², defines cosmetovigilance as a set of activities of collection, assessment and monitoring of undesirable events arising from the use of cosmetic products, which may occur during or after their use. The Brazilian Health Regulatory Agency (Anvisa) defines cosmetovigilance as the set of measures that enables the assessment of the risk of occurrence of undesirable events attributed to the use of cosmetic products, including the survey of adverse events (AEs). AEs are unwanted effects, always related to human health, arising from the normal or expected use of a product³.

Although it was established in 2005, it was not until 2006 that Anvisa began to receive reports involving cosmetic products, with the implementation of the Sanitary Surveillance Notification System (Notivisa), the Agency's web based system for receiving and monitoring reports of AEs involving products subject to health surveillance.

Reported data is used to help the National Health Surveillance System (SNVS) detect product quality deviations, AEs or unwanted effects, raise awareness of their effects, change recommendations on their use and care when indicated, regulate products marketed in the country and, in overall, promote actions to protect public health⁴.

Post-marketing surveillance is critical because cosmetic products are considered harmless. They are usually low-risk and over-the-counter products available at pharmacies, supermarkets and specialized stores. Thus, the population has free access to a wide range of products, which favors their consumption, the concomitant use of different products and increasingly early use.

Furthermore, these products have extensive formulations that often contain more than 50 chemicals, some of which have already been associated with reproductive, developmental or other health effects. The list includes phthalates, formaldehyde,

methylene chloride, acetone, acetonitrile, methacrylates, toluene, xylene, ethyl ether, and lead⁵.

This is a growing market that has been favored by our beauty-oriented culture and the late aging of the population. It is a competitive, dynamic market that needs new technologies and the constant launching of new products to meet the increasing demands of the population. Moreover, this is the industrial sector that most invests in advertising and the second that most invests in innovation in Brazil⁶.

Given the wide supply of cosmetic products on the market, the use of 13,000 substances corresponding to more than 30,000 different commercial presentations by the cosmetics industry, in addition to the fact that, every day, almost the entire population uses some form of cosmetics, from soap and toothpaste to more elaborate products, it is important to know what AEs these products can cause⁷.

In view of the absence of studies previously published in scientific journals, we analyzed AE reports of cosmetics retrieved from the Brazilian national database. This study was therefore designed to analyze the AE reports related to the use of cosmetic products submitted to the Notivisa, from 2006 to 2018, and to contribute to further studies on the subject.

METHOD

We conducted a quantitative, descriptive and retrospective study of AE reports related to cosmetic products and submitted to the national database of the Notivisa system.

The database was retrieved from the Notivisa system during January 2019 and comprised AE reports from 2006 to 2018. Data were tabulated using Microsoft® 2013 Excel, with tables and graphs for descriptive and exploratory data analysis. The database was further submitted to two steps: 1) Initial exploration and 2) Data standardization.

Initial exploration

This step was used to eliminate reports that had duplicate records in the system, incomplete data, as well as exclusion of reports of products that do not qualify as cosmetics, although described as such by the reporting party.



For double checking, the database was organized by report date, including day, month, year, reporting party and AE description. Records with blank fields for the “reported product” and “adverse event” variables were also excluded from the study.

Data standardization

After completion of the initial exploration, data were regrouped by year. Products were classified according to risk in Grade 1 and Grade 2 and standardized according to the product types listed in RDC n. 7 of February 10th 2015⁸.

For this study, Grade 1 includes the cosmetic products that are characterized by having basic or elementary properties, the proof of which is not initially necessary, and products that do not require detailed information on their way and restrictions of use, due to their intrinsic characteristics. Grade 2 products have specific indications, the characteristics of which require evidence of safety and/or efficacy, as well as information and precautions, way and restrictions of use⁸.

The study assessed the characteristics of reports according to gender, regions, state, reporting party category, report status regarding Anvisa’s final assessment, risk grades and types of AEs. Statistical results were expressed as absolute and relative frequencies, and the mean was used as a measure of central tendency.

The database used for the study was built in the context of health surveillance actions, excluding the names of reporting parties, patients and trade names of products, a situation in which consideration by the Research Ethics Committee is not required. The recommendations of the National Health Council were followed, pursuant to Resolution n. 510 of April 7th 2016.

RESULTS

A total of 379 AE reports related to cosmetic products were found from 2006 to 2018. Of this amount, 12 reports were excluded

after initial data exploration. We found that six were related to repeated reports and other six were related to products not described in the legislation as cosmetics, namely, solution with chlorhexidine and plant-based products.

After treatment, 367 AE-related reports derived from the use of cosmetic products were accounted for. The Figure shows the quantity by year of reporting. It is noteworthy that there were no reports of AEs in 2006.

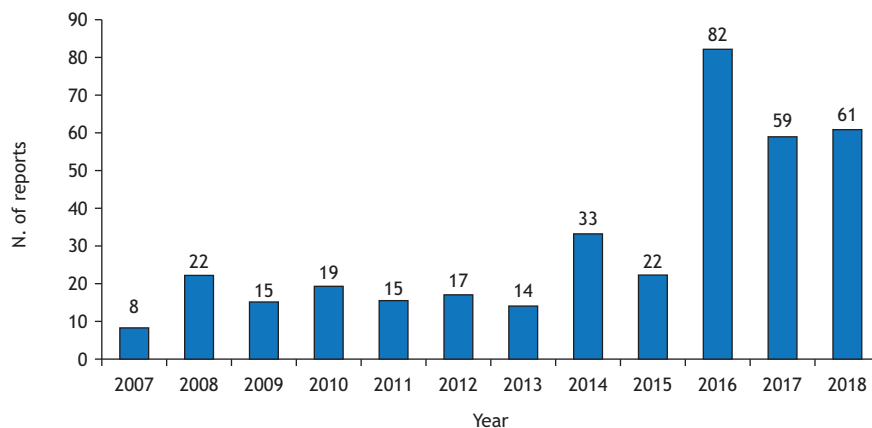
From 2007 to 2018, an average of 31 AE reports per year was recorded. In the last three years of this study, the number of reports grew significantly. There were 82 reports of events in 2016, 59 in 2017, and 61 in 2018, which account for approximately 60% of the total AE reports in Brazil over the studied period.

Table 1 shows the distribution of reports by state and large regions of Brazil. AE reports came mostly from the Southeast (48.1%; 176) and South (25.1%; 92) regions of the country, which together represent more than half of the event reports. The North is the region with the lowest amount of reported cases, with only 4.6% (17) of the total. Of the 23 states, São Paulo is responsible for 27.5% (101) of the reports. Amazonas and Rondônia are the states with the fewest reported events, with only one report each.

Table 2 presents the distribution of reports received by gender of users with suspected adverse reactions. There is a predominance of female subjects (66.2%; 243).

Table 3 shows the distribution of reporting party categories over the studied period. Citizens represent the category with the highest percentage of reports (58.0%; 213), followed by companies (15.0%; 55) and sentinel hospitals (9.8%; 36).

Table 4 shows the distribution of reports according to the status of the situation in the Notivisa system. Concluded reports were predominant (53.9%; 198), whereas those with the submitted status (0.5%; 2) were those with the lowest distribution.



Source: Notivisa system.

Figure. Annual amount of adverse event reports for cosmetic products. Brazil, period from 2007 to 2018 (N = 367).

**Table 1.** Distribution of reports by Brazilian region and state. Brazil, 2007 to 2018 (N = 367).

Region	State	Number of reports	%
North			
	Acre	6	1.6
	Amapá	2	0.5
	Amazonas	1	0.3
	Pará	7	1.9
	Rondônia	1	0.3
Northeast			
	Alagoas	5	1.4
	Bahia	18	4.9
	Ceará	7	1.9
	Paraíba	2	0.5
	Maranhão	6	1.6
	Pernambuco	8	2.2
	Piauí	2	0.5
Center-West			
	Federal District	19	5.3
	Goiás	11	3.0
	Mato Grosso do Sul	2	0.5
	Mato Grosso	2	0.5
Southeast			
	Espírito Santo	4	1.1
	Minas Gerais	44	12.0
	Rio de Janeiro	27	7.4
	São Paulo	101	27.5
South			
	Paraná	49	13.4
	Rio Grande do Sul	21	5.7
	Santa Catarina	22	6.0
Total		367	100.0

Source: Notivisa system.

Table 2. Distribution of reports by users' gender. Brazil, 2007 to 2018 (N = 367).

Gender	Number of reports	%
Female	243	66.2
Male	68	18.5
Unknown	56	15.3
Total	367	100.0

Source: Notivisa system.

Tables 5 and 6 show the distribution of the number of reports by year, by reported product and the grade in which the product is classified. It is noted that 47.0% (173) of the reports refer to the Grade 1 product category and 53.0% (194) to the Grade 2 product

Table 3. Distribution of reports by reporting party category. Brazil, 2007 to 2018 (N = 367).

Category	Number of reports	%
Citizen	213	58.0
Company	55	15.0
Sentinel Hospital	36	9.8
Patient Safety Core	30	8.2
Healthcare professional	28	7.6
Hospital	2	0.5
Universities/Research Centers	2	0.5
Municipal Department of Health	1	0.4
Total	367	100.0

Source: Notivisa system.

Table 4. Distribution of reports according to situation in the Notivisa system. Brazil, 2007 to 2018 (N = 367).

Situation	Number of reports	%
Concluded	198	53.9
Grouped	106	28.9
Under investigation	34	9.3
Under analysis	27	7.4
Submitted	2	0.5

Source: Notivisa system.

category. Grade 1 products with the highest quantity of AEs are diapers (15.0%; 26), then facial/body creams (14.5%; 25), hair masks (11.6%; 20) and soaps (9.8%; 17).

For diapers, both for children and adults, we verified an initial decrease in reports, followed by oscillations until the year 2016. However, in 2017 there was an increase in the reports involving this type of product.

Reports involving other hair products, like hair masks, hair gel and conditioners (26.0%; 45) are significant when compared to the total reports for Grade 1.

Among Grade 2 cosmetics, hair straightening products had the highest percentage of reports (18.0%; 35), followed by mouthwashes (16%; 31) and sunscreen lotions (13.9%; 27).

It is also verified that the number of AE reports involving hair straightening products remained steady over the years, and it was the only category reported in all years of the study period. With regard to mouthwash, it is possible to notice that after a clear growth in 2016, the product did not appear among the categories reported in the last two years of the study.

It is observed that sunscreens had reports in nine of the 13 years that comprise the study period. In the last three years, these products maintained an average of four reports per year. Repellent products had five (11.0%) reports in 2016 and one (3.3%) in 2018, with no reports in other years.



Table 5. Reported products in adverse event reports, Grade 1. Brazil, 2007 to 2018 (N = 173).

Grade 1 Category	Number of reports per year												
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Soap (except for children, antiseptic and intimate)	-	-	1	-	2	5	-	-	-	3	3	3	17
Shampoo (with no benefits that justify prior proof)	-	-	-	-	-	-	-	2	1	4	3	4	14
Face/body cream	3	5	3	-	-	-	-	-	1	2	4	7	25
Hair mask	-	-	-	2	2	2	-	-	-	7	3	4	20
Deodorant (except with antiperspirant or intimate action)	-	2	1	-	-	-	-	1	-	-	1	2	7
Hair gel	-	-	-	1	-	-	-	1	1	9	1	2	15
Hair conditioner (with no benefits that justify prior proof)	-	1	-	-	-	-	-	2	-	1	3	3	10
Mechanical hair removal product	-	-	-	1	-	-	-	-	-	1	-	-	2
Body lotion	-	3	-	-	1	-	2	-	1	4	1	-	12
Nail product (with no protective purpose)	-	-	-	1	1	-	-	-	-	1	3	1	7
Eye and eyebrow pencils (with no photoprotective purpose)	-	-	-	-	-	-	-	-	-	1	-	-	1
Makeup (without photoprotection)	-	-	-	-	-	-	-	-	-	-	-	1	1
Fragrance	-	1	1	-	-	-	-	-	-	-	-	-	2
Eyebrow product	-	-	-	-	-	-	-	-	-	-	2	-	2
Diaper (children and adult)	1	2	-	-	-	-	2	4	5	1	8	3	26
Toothbrush/dental floss	-	-	-	-	-	-	4	1	2	1	1	1	10
Air freshener	-	-	-	-	-	1	-	-	-	-	-	-	1
Menstrual pad	1	-	-	-	-	-	-	-	-	-	-	-	1

Source: Notivisa system.

Table 6. Reported products in adverse event reports, Grade 2. Brazil, 2007 to 2018 (N = 194).

Grade 2 Category	Number of reports per year												
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Straightening product	1	2	1	4	1	2	1	4	4	6	4	5	35
Shampoo (with benefits that justify prior proof)	1	2	-	4	1	-	-	1	-	2	5	-	16
Sunscreen	1	1	5	2	2	-	-	3	-	3	5	5	27
Deodorant (with antiperspirant or intimate action)	-	1	1	-	-	-	-	3	-	1	-	5	11
Hair dye	-	1	1	-	2	3	-	2	1	2	1	2	15
Hair conditioner (with benefits that justify prior proof)	-	-	-	-	1	1	-	-	-	-	1	-	3
Chemical hair removal	-	-	-	-	1	-	1	3	1	-	1	3	10
Nail product (for children or with protective purpose)	-	-	-	-	-	-	-	-	1	-	-	-	1
Hair tonic	-	-	-	-	-	-	-	-	-	-	2	-	2
Repellent	-	-	-	-	-	-	-	-	-	5	-	1	6
Makeup (with photoprotection)	-	-	-	-	-	-	-	1	-	-	-	-	1
Hydrogen peroxide	-	-	-	-	-	2	-	-	-	-	-	-	2
Baby powder (for children or antiseptic)	-	-	-	-	-	-	-	-	-	-	1	-	1
Soap for children, antiseptic and intimate use	-	1	1	-	-	1	-	1	-	2	4	7	17
Mouthwash for children, with antiseptic and antiplaque purposes	-	-	-	3	1	-	1	3	2	21	-	-	31
Antidecay, antiplaque, antitartar, tooth whitening toothpaste or tooth whitening chemical for sensitive teeth and children	-	-	-	1	-	-	3	1	2	4	1	2	14
Antiseptic solution	-	-	-	-	-	-	-	-	-	1	1	-	2

Source: Notivisa system.



In the Table we described the suspicions of AEs reported in the Notivisa computer system by the reporting party, according to the reported product and the product's risk grade.

Among the main suspicions of AE reports for the 35 reported products described in the Table, irritation stands out as the most reported symptom, observed in 45.7% (16) of the cosmetics, followed by allergy and burning, both with 31.4% (11).

It is important to note that systemic reactions like headache, fainting, dyspnea, hallucinations and paresthesia account for 22.0% (eight) of the reports of suspected AEs related to reported products, whereas skin reactions are related to 78.0% (28) of the reports. It is noteworthy that systemic events are accompanied by localized skin reactions.

Regarding specific symptoms by reported product, contact dermatitis and skin lesion are among the main suspected AEs with diapers for children and adults.

DISCUSSION

This study presented descriptive information from the Brazilian cosmetovigilance database, covering 367 AE reports related to the use of cosmetic products, with an average of 31 reports of events per year. The study has shown a higher number of reports from the Southeast and South regions of the country, with female predominance among users with suspected adverse reactions. Citizens represented the category with the highest proportion of reports. Among the products with the highest amount of suspected AEs are hair straightening products, sunscreens, diapers, and facial/body creams.

The study also verified the incompleteness of the database, which hinders the establishment of relationships involving variables like ethnicity/color, age and occupation. Only five variables could be analyzed (gender, geographic region, city, report status, and AE report description).

As a limiting factor, we highlight the difficulty of establishing a causal relationship between the reported product products and the reactions described by the users. In Notivisa's history, reports are closed as concluded or grouped analysis. The reports for which investigative proceedings have been closed are considered concluded, with the publication of a specific resolution with an enforcement action (suspension, interdiction, recall) and the motivation of the action, if applicable. The other reports are grouped when the description does not have enough data to proceed or when it is difficult to determine the existence of a causal link between the event and the use of the product, since several factors may be associated with AEs commonly found in reports, like inappropriate or concomitant use of various cosmetic products, individual allergies, and reactions may be caused by other types of products, such as food and medicines.

The results of the assessments of the Brazilian database have shown discrepancies when compared to other countries with established cosmetovigilance systems. Despite the increase in AE

reports in recent years, our number is still small when compared to other international health authorities. Brazil had 367 reports over a 13-year study period, while the French system had 1,121 reports over a seven-year period⁹. In the United States, there were 5,661 reports of AEs regarding cosmetic products over a two-year period¹⁰.

Although there are some aspects that may generate this under-reporting, such as the fact that AEs involving cosmetic products are not normally severe, it should be considered that Brazil occupies a prominent position in the global ranking of cosmetic consumption. According to the Brazilian Association of Personal Hygiene, Perfumery and Cosmetics Industry (ABIHPEC), Brazil ranks 4th in the world ranking of consumption of cosmetics, it is the 2nd largest consumer of deodorants, fragrances and men's products, the 3rd place in the consumption of children's and sun protection products and 4th place in the consumption of bath, hair and oral hygiene products⁶.

Regarding the category of the reporting party, Brazil differs from Italy and France, where healthcare professionals account for the highest percentage of reports, followed by other professionals and manufacturers^{11,12}. The small number of reports made by manufacturers and healthcare professionals stands out in Brazil, where the largest contribution is made by citizens.

Among the similarities with other countries, we noticed the description of AEs by gender. Brazil follows the same pattern of countries like France, India and Italy, which have also shown a higher percentage of reports from female users than male users^{11,12,13}.

When it comes to the reported symptoms, the results are comparable to those found by Di Giovanni et al.¹⁴, who found higher percentages of AEs related to skin events, whereas systemic reactions represented an approximate amount of only 5%. Some of the most common skin reactions are allergy, itching and flaking, which can be grouped together as dermatitis. Among the systemic events, there were more reports for headache and dyspnea. The data from this study are comparable to the results found in Brazil.

When assessing the reported AEs for the diaper product category, both for children and adults, we found that, in most cases, these events were associated with a technical complaint probably related to some quality deviation, like poor absorption capacity, adhesive tapes with poor adhesion or inadequate diaper size. Quality-deviating diapers allow leakage of urine and consequently cause contact dermatitis in the wearer. This is the so-called diaper dermatitis or diaper erythema, which are the generic terms that encompass a set of inflammatory dermatoses that affect the body area that stays in contact with the product¹⁵.

It should be kept in mind that the absence of standardization and indication of diaper use also contributed as determining factors for the presence of the events found in the Chart¹⁶.

With regard to soaps, it is important to note that this category of cosmetic products is used daily and often many times



Chart. List of suspected adverse events submitted to Notivisa according to cosmetic products category. Brazil, 2007 to 2018.

	Category	Adverse event described in Notivisa
Grade 1 Product Types	Soap (except for children, antiseptic and intimate use)	Itching, dermatitis, edema
	Shampoo (with no benefits that justify prior proof)	Hair loss, hallucinations, irritation
	Face/body cream	Allergy, itching, edema
	Hair mask	Burning, irritation, hair loss
	Deodorant (except with antiperspirant or intimate action)	Allergy, irritation, blistering
	Hair gel	Irritation, burning, hair loss
	Hair conditioner (with no benefits that justify prior proof)	Burning, itching, erythema
	Mechanical hair removal product	Irritation, burning, tingling sensation
	Body lotion	Edema, burning, injury
	Nail product (with no protective purpose)	Hypersensitivity, nail color fading, discomfort
	Eye and eyebrow pencils (with no photoprotective purpose)	Itching, irritation
	Makeup (without photoprotection)	Swelling, allergy, itching
	Fragrance	Burning, irritation
	Eyebrow product	Dermatitis, blistering, burns
	Diaper (children and adult)	Dermatitis, injury, allergy
	Toothbrush/dental floss	Discomfort, injury, nausea
	Menstrual pad	Irritation
Air freshener	Dyspnea	
Grade 2 Product Types	Straightening product	Hair loss, irritation, burning
	Shampoo (with benefits that justify prior proof)	Burning, irritation, headache
	Sunscreen	Irritation, allergy, burning
	Deodorant (with antiperspirant or intimate action)	Irritation, allergy, burning
	Hair dye	Hair loss, irritation, allergy
	Hair conditioner (with benefits that justify prior proof)	Hair loss, swelling, burning
	Chemical hair removal	Burning, paraesthesia, burning
	Nail product (for children or with protective purpose)	Inflammation, flaking, allergy
	Hair tonic	Hair loss, itching, hives
	Repellent	Discomfort, fainting, headache, irritation
	Makeup (with photoprotection)	Burning
	Hydrogen peroxide	Allergy, burning, itching
	Baby powder (for children or antiseptic)	Cancer
	Soap for children, antiseptic and intimate use	Burning, allergy, flaking
	Mouthwash for children, with antiseptic and antiplaque purposes	Dyspnea, irritation, swelling, outbreak of <i>Burkholderia cepacia</i> in adult and pediatric ICU
	Antidecay, antiplaque, antitartar, tooth whitening toothpaste or tooth whitening chemical for sensitive teeth and children	Allergy, irritation, injury
	Antiseptic solution	Infection, hives

Source: Notivisa system.
ICU: Intensive Care Unit.

throughout the day. Thus, the quantity of AE reports may be directly related to the time and frequency of consumer exposure to this product category. Among the main reported events are: itching, dermatitis and edema. These reactions confirm the observations of studies that have shown that the pH (ranging from neutral to alkaline) of a soap (solid or bar) can have an impact on skin, causing changes in bacterial flora, moisture

content and pH, and also irritation in some cases. In addition to pH, surfactants in soaps can also damage the skin's protective barrier. Most products in this category have surfactants for their cleansing action, however, the same characteristics that make them so useful for cleaning also enable them to damage the *stratum corneum*, which is the protective barrier of skin¹⁷.



For reports involving Grade 1 hair products like hair masks, hair gel and conditioners, we observed that the characteristics of AEs involving these products were equivalent to the effects caused by formaldehyde, such as skin, eye, and nose irritation, headache, hair loss¹⁸. This leads to the suspicion of irregular addition of the formaldehyde chemical substance to these products, which characterizes, consequently, cosmetic tampering, a fact that is considered a sanitary violation by Law n. 6.437, of August 20, 1977¹⁹.

During the study period, the highest number of reports were related to hair straightening products. Sodium hydroxide, a type of active ingredient used in hair straightening products in high concentrations, can cause burns and brittle hair, which, in turn, can lead to hair loss¹⁸. This situation was present in the descriptions of the most reported events by consumers for this category of product.

According to data retrieved from Notivisa, reports of AEs involving mouthwashes were restricted to allergic conditions (dyspnea, irritation and swelling). However, in 2016 mouthwash products suspected of contamination by *Burkholderia cepacia* were added to these cases. It is noteworthy that mouthwashes are widely used to care for the oral hygiene of hospitalized patients. The possibility of contamination of these products by *B. cepacia*, due to improper handling or contamination of the product in the manufacturer itself, may be the reason for the outbreaks in hospitals. Studies carried out in hospitals in Lisbon and Spain have shown that hospital infections were caused by the use of mouthwash contaminated with *B. cepacia*²⁰.

Another relevant aspect observed from the analysis of report data concerns the increase in the number of AE reports related to sunscreen lotions. As with diapers, most of the reactions resulting from the use of the product were associated with poor performance of the sunscreen during exposure to the sun. This led to burns at the product application sites, even when the manufacturer's instructions for use were followed. It is noteworthy that, for this product category, RDC n. 30, of June 1st 2012, establishes exactly what methodology should be used to determine the sun protection factor (both UVA and UVB), in addition to defining how the information about sun protection should be made available on the label and other arrangements²¹. Despite the implementation of the standard, it is observed that some products have a poorer performance than what is stated on the label, according to consumer reports. This issue reinforces what has been shown in scientific literature: because of the ability of sunscreens to absorb ultraviolet (UV) light and because their formulations contain more than one UV filter and other fillers, it would be important to determine the photostability of

formulation to ensure optimal efficacy of the products available on the market. However, although these products are regulated in most countries, photostability testing is not mandatory²².

For Grade 1 and Grade 2 shampoos, the reported problems may be related to the large amount of ingredients present in the formulas, as well as the interaction between them, since shampoos may contain 10 to 30 ingredients, which combine benefits of hair cosmetic products with their efficacy and may lead to greater allergenic potential²³.

Regarding insect repellents, it was observed that, only in 2016, there were a significant number of reports. AE reports for this category referred to the inefficacy of the product. It is worth remembering that, in 2016, Brazil, especially the Northeast region, recorded thousands of probable cases of acute Zika virus disease²⁴ and that was considered the epidemic year of the disease in the country. In this sense, the data have shown a greater concern of consumers regarding the efficacy of insect repellents, since the transmission was made primarily by the *Aedes aegypti* mosquito.

It was found that, in 2016, there was a significant increase in AEs reported in Notivisa when compared to previous years. These data can be warranted by the internal restructuring process carried out at Anvisa in 2016, which made it possible to discipline the procedures for the cosmetovigilance system and create a website for this work process in Anvisa's portal, improving the dissemination of post-marketing surveillance of cosmetics for consumers and healthcare professionals. The reduction in the number of reports in the following years may have occurred due to the discontinuation of advertising and promotion initiatives.

CONCLUSIONS

Most of the reported events were reported by female citizens from the wealthiest regions of the country. These reports were mainly related to daily use products and characterized by the presence of skin irritation, allergy and burning.

Although descriptive, the results found in this study demonstrate the need to improve the Anvisa Cosmetovigilance System. This should include setting strategies to encourage adherence to AE reporting by citizens, healthcare professionals and manufacturing companies, as well as to improve the quality of the information entered by the reporting parties. The Cosmetovigilance System should also adopt a causality assessment method that addresses the particularities of cosmetic products. This should enable the estimate of the degree of cause and effect relationship between the cosmetic product and the reported AE.

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Conflict of Interest

Authors have no potential conflict of interest to declare, related to this study's political or financial peers and institutions.



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