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ORIGINAL ARTICLE

Parental risk perception of 0-3-year-old children exposure to household pesticides

Percepción del riesgo de toxicidad por exposición a plaguicidas domésticos en hogares con niños de 0 a 3 años

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What do we know about the subject matter of this study?

Repeated exposure to pesticides can cause growth and neurodevelopmental disorders in children. Parents' perception of danger in using household chemicals may influence the magnitude and frequency of their young children's exposure to hazardous substances.

What does this study contribute to what is already known?

In general, respondents from the Buenos Aires Metropolitan Area (AMBA) showed low concern for the health hazards of household pesticides and chemicals, except for a small group that was more sensitized. The information obtained may contribute to creating awareness programs on hazards and management of household chemical risks in cities of the South American region with demographic, biogeographic, and sociocultural characteristics comparable to AMBA.

Abstract

The objective of this work was to know the practices and risk perception of household pesticides (HPs) of mothers and fathers of children in early developmental stages. **Subjects and Method:** Qualitative research carried out in 2015. We conducted interviews in 18 homes with mothers and fathers of children aged 0 to 3 years registered in the General Health Insurance Plan of the *Hospital Italiano de Buenos Aires* (Metropolitan Area of Buenos Aires). The analytical categories were identified, interpre-

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tive analytical categories of higher-level abstraction were conceptualized, and finally, diagrams were constructed to represent and organize the findings. **Results:** The interviews showed that mothers and fathers: 1) used HPs regularly, 2) showed low concern for the health hazards of HPs and other household chemicals, except for a small, more sensitized group of parents, 3) they were more concerned regarding mosquito bites than exposure of their children to HPs, 4) relied on fumigation services and the normative framework that regulates them, and 5) expressed interest and willingness to receive more information and orientation from the pediatrician about the safe use of chemical products at home. Other analytical categories showed a constant parental adjustment between toxicity, pathogenicity, hygiene, and well-being. **Conclusions:** Since home exposures levels to HPs considered safe for adults may be toxicologically relevant for young children, government and health agencies should provide parents with tools to decode HPs marketing and publicity messages, as well as to conceptualize the relationship between HPs use and childhood health disorders.

Introduction

Household pest control is carried out with household pesticide products (HPPs) that have low or moderate hazards according to the international GHS classification[1]. The risk of acute or chronic toxicity due to exposure to HPPs is directly related to the probability of exposure to one or more of their components and the probability, frequency, and duration of the contact with HPPs increases if the person remains many hours per day at home. In the case of Argentina, the COVID-19 pandemic led almost the entire family to restrict their daily activities partially or totally to the intra-household environment for several consecutive months, which still continues in many cases.

It is postulated that, even if health capacities determine that the pandemic will subside, a proportion of the population will continue to work from home, which will also modify daily experiences with pests, attitudes and reactions to them, and practices in the use of HPPs. In this context, it is relevant to identify the determinants of hazard perception, education, and emotional and rational attitudes in parents or guardians of families with young children.

Low concentrations of various pesticides and/or their metabolites are detected in the general population in blood or urine[2,3] and in cord blood[4,5], which may act as endocrine disruptors[6], and they are also found in household dust[7,8]. Regardless of the assigned hazard level, repeated exposure to these products can cause growth[9,10] and neurodevelopmental disorders[11-13] in children.

The available toxicological-epidemiological information comes mainly from case studies of children living in agricultural areas with intensive use of pesticides[14] and, to a lesser extent, from the urban household setting[15]. The most used HPPs at the household level are pyrethroid insecticides (PIs). In addition, PIs are the active ingredients in numerous first-choice products used in residential-urban insect vector control campaigns for dengue and other tropical and subtropical diseases[16].

Epidemiological studies suggest that household exposure may be a relevant etiological pathway for adverse side effects of PIs and other household chemicals in children[3,17-19], even linked to childhood leukemia[20]. In laboratory animals, PIs can cause motor, sensory, neuromuscular, learning, and thermoregulatory disorders, and repeated exposure can also cause developmental disturbances and endocrine disorders[21,22].

Children are up to 10 times more susceptible than adults to pesticide exposure[23,24] due to immature metabolic pathways and renal function[24], and because the primary target tissue of many pesticides is the nervous system whose alterations can lead to persistent neurodevelopmental disorders[25]. In addition, direct ingestion by hand-mouth behavior can occur in early childhood[26,27].

Historically, in Latin America, governmental preventive programs for urban, suburban, and rural exposure to pesticides have developed much more slowly than in countries with high epidemiological surveillance, and there are still several areas that require optimization[28].

International and local studies show that most HPPs are stored in environments frequented by children and within their reach[29,30]. In this regard, it has been suggested that better education of the population would allow more adequate protection of pregnant women and infants, especially during susceptibility windows, and that pediatricians and obstetricians would be the best professionals to perform these actions[31]. The Ministry of Health of Argentina identified the presence of HPP containers in homes and highlighted the need to raise public awareness and generate policies to minimize the use of pesticides in residential settings, with emphasis on the exposure sources of vulnerable populations such as children[29].

In Argentina, information on practices and beliefs that condition household exposure to HPPs is scarce. Qualitative methods, such as in-depth interviews, can contribute to a better understanding of the perceptions and beliefs of the interest groups within the community[32]. These approaches can offer a complementary perspective to the most used methods in the Public Health sphere. The objective of this research was to know the perceptions of parents of children aged 0-3 years about the risks and toxicity of HPPs, the criteria that determine which HPPs they use, and the practices of use.

Subjects and Method

Exploratory qualitative study based on semi-structured home interviews. The analysis and subsequent construction of categories, subcategories, and components were done following the constant comparative method of the grounded theory[33,34]. A multidisciplinary triangulation[35] was carried out through an independent analysis by each professional collective member of the research team: medicine (SBF; SA), environmental sciences (AF; MGC), biology (PCKG; MGR; MJW), and sociology (ARD; NP), and a subsequent collective and iterative discussion at each stage of analysis. Discussions were moderated by one of the team sociologists (ARD).

Home interviews were conducted with parents of children aged 0-3 years living in the Metropolitan Area of Buenos Aires, which includes the Autonomous City of Buenos Aires (CABA) and the 1st-2nd suburban cordon of Greater Buenos Aires (GBA), beneficiaries from the Health Insurance of the *Hospital Italiano de Buenos Aires* (HIBA). HIBA is a university hospital with a highly complex healthcare network, with 23 healthcare centers distributed in different neighborhoods of CABA and GBA. Most of the beneficiaries are of middle socioeconomic status. Of the population covered by this insurance, 12% are women aged 20-40.

To select the units to be interviewed, at the beginning of the research process[36], family group profiles were purposively designed, according to the previous assumptions of expected diversity, which included: place of residence (CABA/GBA), type of housing (apartment/flat; house), educational level (both parents professionals; one or none professional), and age segment (≤ 30; > 30). To interview families of this diversity, pediatricians selected patients under 4 years of age whose parents matched one of these hypothesized profiles. In agreement with the pediatric team, parents were invited to participate on behalf of the attending pediatrician by a letter from the research team. The inclusion of family groups was carried out sequentially[(36)] until the new interviews carried out no longer provided new data ("category saturation")[35,38] according to the iterative analysis carried out synchronously with the fieldwork.

The interview script (Table 1) was developed through discussion by the interdisciplinary research team. Each interview was conducted with the simultaneous presence of two researchers (August 2015 - January 2016) and included socio-environmental observation of the household.

The interviews were audio-recorded. For the analysis of the textual transcripts, the interviews were segmented according to the guiding categories of the script. Then, each segment was analyzed line by line[33,34] to identify emerging open categories. These categories were discussed in successive team meetings. In these meetings, relevant categories were selected according to the group perspective or according to the theory of one of the professional groups. Subsequently, the segments of all the interviews were re-analyzed focusing on the selected emerging subcategories, following this same process of transdisciplinary triangulation[35].

The reflective analysis was carried out following the theoretical framework of Althabe & Hernández[37]. For this purpose, in all the iterative cycles, the implications of the summoning method used were discussed and incorporated into the categorization process, considering that it was carried out on behalf of the attending pediatrician who belongs to the health insurance of the interviewees. In this process, the interpretative analytical categories with the highest level of abstraction were conceptualize[34,39]. No member check was performed.

The protocol was approved by the HIBA Ethics Committee, complies with current international ethical guidelines for conducting studies involving human subjects (Declaration of Helsinki, 2013), and complies with the current legal regulations of the Argentine National Law on Personal Data Protection N° 25.326. Verbal consent was obtained as recommended by the Committee.

Results

Household interviews were conducted in 18 households. Figures 1 and 2 show their sociodemographic and family characteristics. Several interviewees (nine) had reorganized their work activities to devote themselves to raising children. Three different profiles of families were conceptualized in terms of attitudes toward HPPs and household chemicals. One group did not express concern about HPPs, used them frequently, and associated their use with hygiene and cleanliness. Another group took many precautions in buying and using HPPs and considered them to be poisoning. A

Table 1. Dimensions, categories and subcategories of the interview guide.

Dimension to analyze	Guiding categories	Subcategories
Risk perception: positioning as a buyer, use and storage of insecticides and risk repellents	Household pesticides	Practices and products used to repel or combat insects and arachnids (including lice). Place of purchase, type and frequency of application of household insecticides. Reasons for use of household insecticides Opinions and experiences about insects (including lice) and arachnids (including ticks).
Risk perception: Contracting fumigation services for home pest control (for both indoor and outdoor spaces).	Fumigation performed by others	Contracting of fumigation services, by consortiums or individually. Type and frequency of visits for home pest control. Warnings and advice from fumigators. Precautions taken due to fumigations. Knowledge and opinions about fumigation in parks, schools and clubs.
Risk perception: knowledge and use of chemical products for pets and plants	Products for pets and house plants	Products used, place of purchase and practices of use of products for the care of pets and plants of the home and garden. Type and frequency of fumigation practicesapplication. Reasons for use.
Risk perception: cleaning products	Cleaning products	Cleaning products used at home and storage places. Practices and reasons for use of Lysoform® and Espadol®
Needs and habits to learn about insecticides used in the home	Sources of information for the purchase and use of products	Information search habits. Perceived need for information. Habit of reading product labels. Alternative sources of information (pediatrician, referents, documentaries, etc.).
Pesticides	Questions common to all dimensions	Recognition of discomfort, irritation, etc., after the use of a product. Knowledge, opinions and ideas about insecticides and pesticides. Alternative (non-chemical) products.
Additional questions to facilitate the flow of the interview	Fruits and vegetables	Practices for washing fruits and vegetable. Place of purchase of fruits and vegetables. Purchase of organic products.

*Pediatricians selected 1 child under 4 years of age per family, and sociodemographic data were collected from parents and cohabitants.

third group, which was the largest, showed some degree of concern about HPPs, although they used them regularly. We could consider that this last group was sensitized by the interviewers' questions since at the end of the interview some of this group requested that the research team send them information on HPPs.

Household pesticides

All interviewees reported having HPPs in their households. Table 2 shows the different analytical categories considered. One of these was the naturalization of the use of HPPs; some interviewees occasionally used environmental sprays "*just in case*" when they detected insects or spiders. On the other hand, in summer, the use of HPPs vaporizers in the rooms was frequent. They had repellents and used them frequently, and the use of moth repellents was mentioned following family traditions "*even if there are no moths, it's tradition*".

Another emerging analytical category is that, in general, they did not weigh the health hazards of using insecticides versus the harm that can be caused by bites. For example, they did not report taking care after the application, such as washing their hands or cleaning the application site. Parents were concerned about mosquito-borne diseases, such as dengue, and food. They were also concerned about mosquito bites and skin lesions (Table 2).

Those who reported recent moves often mentioned the presence of new insects, new pest control routines (e.g., pest control services), and other changes, which they associated with the need to adapt. Respondents from GBA applied sprays only when they detected a considerable number of insects, showing greater tolerance to the presence of insects, and described different precautionary measures to protect children from possible unwanted consequences of using HPPs. For example, they discontinued the use of pet flea pipettes in the first months of an infant's life, ventilated the room after applying insecticides, placed vaporizers away from the crib, and avoided applying repellent to children's hands so that they would not ingest it.

Some interviewees also reported the use of non-toxic

alternatives such as citronella-based repellents; and for lice and nits, they used vinegar, fine comb, or *Quassia Amara* (bitter-wood) preparations. Regarding repellents, several mentioned that "*children's skin is very sensitive*". They were also concerned about respiratory tract irritation with the use of insecticide sprays; however, they were not as concerned about insecticide contact with their children's skin, except for infants (Table 2).

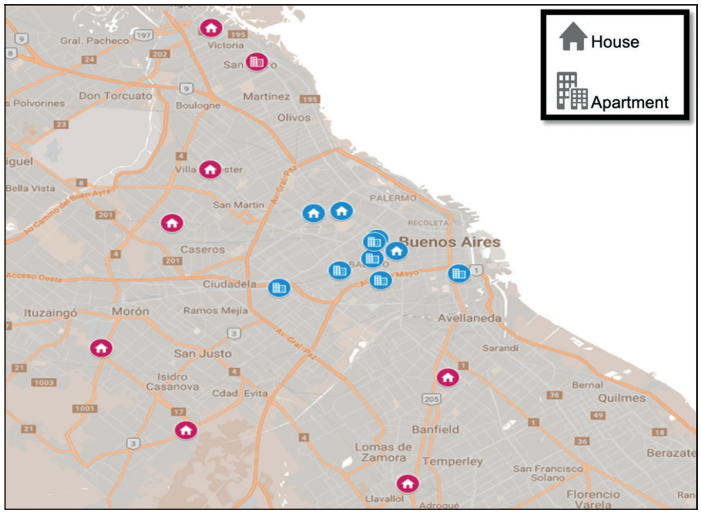

Figure 1. Buenos Aires Metropolitan Area map showing the living places of the interviewees. Interviewees' home addresses are georeferenced. The icons marking families living in Buenos Aires City are colored in blue, and those living in the suburbs, in red. The type of dwelling is visually distinguished using the codes shown in the top right corner.

Pest control services

In CABA households, buildings had a pest control service. In general, they did not ask the fumigator about the identity of the products used, but some mentioned the term "*poison*". In several cases, they ventilated the area after fumigation, and some asked the fumigator about precautions to take in the presence of infants. Except for one household with a newborn, where the fumigator decided to replace the aerosol with a syringe gel, the interviewees stated that the fumigators did not spontaneously warn them about toxicity or precautions. In some cases, when consulted by parents, the applicators recommended to them leave the house for 3 hours and ventilate upon their return (Table 2). The interviewees did not refer to unpleasant physical sensations that would alert them to the danger of the applications. Only one respondent stated that he did not allow the fumigator to enter the house.

Pet products

Parents did not express particular concern about pesticides applied to pets. In households with a garden, respondents mentioned that they regularly used flea and tick pipettes for dogs ("*it lives outside, it always brings bugs*"). Pet owners used gloves and/or washed their hands after application and considered it better for their children not to touch the animals after application. In one case they discontinued the pipette when the baby was born "*because that's poison*". In contrast, there was one household where flea pesticide was frequently applied to mattresses. Instructions on precau-

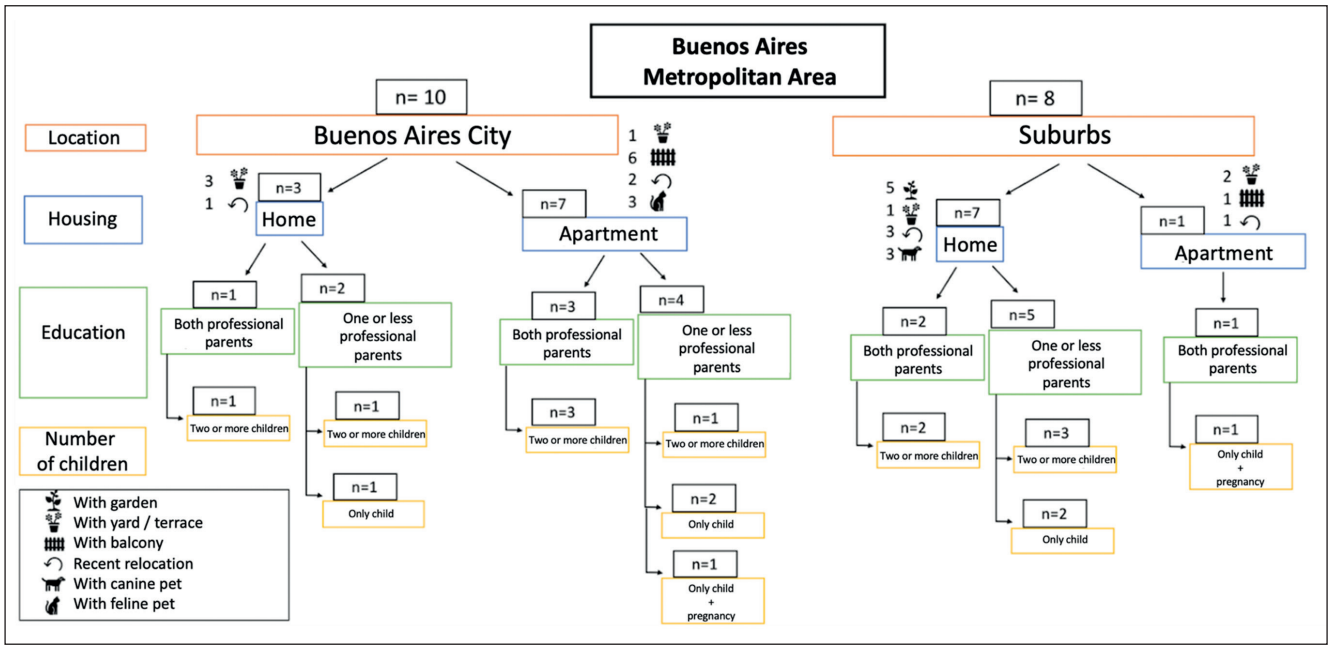

Figure 2. Interviewee profiles and types of houses included in the sample.

tions and operation of the pipettes were provided by veterinarians; however, in general, these instructions did not provide information on the associated dangers.

For example, a veterinarian recommended to a mother clean the yard with an environmental dewormer containing chlorpyrifos and cypermethrin. When the mom asked about the components, the veterinarian named only cypermethrin, which she assumed was nontoxic because she mistook it for the permethrin she used as a pediculicide. Although the product label had the name of these HPPs, it did not mention anything about their toxicity, which can be interpreted as a missed opportunity to provide information about the toxicity of the HPPs. Cypermethrin is known to have up to 20 times more toxicity than permethrin[1,24,25]. In this case, incomplete veterinary and label information led the mother to use them despite her interest in avoiding unwanted effects on her children (Table 2).

Products for houseplants

Respondents living in GBA considered it necessary and regular to use pesticides in their gardens, as a "*precaution*" or "*maintenance*". Some hired spraying services periodically. The interviewees had limited information on the content and toxicity of the products, they selected them based on recommendations from family members or nursery staff, none knew the active ingredients, and some confused fertilizers with pesticides (Table 2).

They mentioned that they avoided using powder insecticides to protect pets "*because it's not liquid, and the dog is so stupid that it licks it*". One respondent mentioned that they hired pest control services during vacations when they were away from home. The responses suggest that the simple fact of repeatedly using a product gave them a sense of security, relaxing their sense and actions of precaution: "*maybe the second time I didn't wear the mask, I put on the gloves*". In addition, in the apartments/flats, it was not common to use pesticides on plants except when they saw them "*covered in bugs*" or "*with a plague*". Two interviewees reported using mixtures of natural substances or products for edible plants (e.g., garlic with alcohol).

Cleaning products and disinfectants

Respondents who lived in apartments/flats looked for a home that "*smells good*", without microorganisms, and "*disinfected*" the floor to avoid contact with germs from children wandering around and playing with toys they put in their mouths. Cleaning products promoted as disinfectants (with slogans such as "*kills everything*", "*hygienic*", and "*hospital*") were frequently used. Aerosols were used on mattresses and armchairs. In short, they could recognize the risk of damage caused by contact with microorganisms in crawling and wandering children, thus prioritizing hygiene (Table 2). However, they said nothing about the health disorders that can be caused by repeated skin, hand-to-mouth, and toy-to-mouth contact with chemical residues, which can remain for weeks or months in the home environment after application.

In all households, cleaning products were stored together with insecticide sprays in places accessible to small children; in contrast, medicines were stored under lock and key. Some mentioned that they would like to be able to use natural cleaning products. One interviewee had stopped using disinfectants because he read that they were bad for them.

Sources of information for the purchase and use of products

The presence of unpleasant odors was the most sensitive alert signal that parents had regarding the toxicity of HPPs, and which evoked in them the idea of imminent danger. For example, with respect to fumigation, they mentioned: "*it has a little smell and it's poison; I open the windows, so I don't breathe it in*". On the contrary, the smell of perfume in the HPPs could induce the purchase and preferential use of certain products. Many reported choosing odorless HPPs because "*smelling the odor makes me feel sick*", thus masking the toxicity indicators (Table 2). Labels were not read by the interviewees. In general, they did not seek information to decide on which products to use, since there was trust or legitimacy in the brand used "*since always*", generally associated with family traditions (Table 2). When they did seek information, they turned first to their mothers and, to a lesser extent, to their friends' network. The minority reported they looked for information on the Internet. Respondents also stated that they would like their pediatrician, whom they trust, to provide them with information about products used daily at home.

Discussion

As previously reported[29,40], this research shows that the use of HPPs in households with little children is considered a natural habit by parents. In general, they perceived themselves as attentive parents, and the precautions described by them allow us to assume that they recognized the harmful properties of HPPs, particularly those related to inhalation or oral routes of entry.

Regarding the pesticide products used by pest control services, parents seemed to recognize that toxic substances are involved. However, they did not question this service, even among those who took more precautions. This can be interpreted as that most had implicit trust in the pest control services and/or legi-

Table 2. Guiding, emerging and analytical categories. The guiding categories were defined a priori by the researchers, the emerging ones resulted from the line-by-line analysis of the interviews, and the analytical ones were conceptualized during the focused coding process

Guiding category	Open emerging categories	Analytical categories (AC)	Description of the AC	Phrases to illustrate the AC
Household pesticides	- Practices of use - Criteria for using insecticides - Use of thermovaporizers - Fumigation service in buildings - Transmission of diseases - Precautions of application in the presence of children	Naturalization of the use of pesticides.	The idea of toxicity is present, but the insecticide is still used because it is a built-in habit	*"Many of the things that we consume, eat or use daily seem toxic to me, (...) but I am so used to them that it would be difficult for me to think of other options."* *"[The fumigation] leaves smell but not so strong, and does not last all day long. He leaves as soon as he applies it. [referring to the fumigator]."*
	- Precautions with fumigation - Use of repellents in houses with garden - Smell of the insecticide as a toxicity criterion	Bites	The use of the insecticide is aimed to protect children from mosquito bites and the skin lesions produced, because the skin of children is considered "very sensitive"	"*The truth is that one prefers that there are no mosquitoes and that they don't bite you.*"
	- Knowledge of alternatives - Inherited customs	Self-perception of attention	Parents perceive that they pay attention to the products that are in contact with their children, particularly the very young ones	"*We try not to touch anything that is toxic and we try that she (their daughter) is not close.*"
		Non-toxic alternatives	The existence and knowledge of non-toxic alternatives gives rise to new protective practices	*"... regarding how to clean her (their baby), we received no information. Beyond neutral soap or soap with glycerin, we don't know which product to use or which not to use. We had no information or it was not available."*
		Legitimacy granted by the regulations	Belief in the existence of regulations and qualification processes that regulate marketing and practices, and trust in the technicians who apply the products	"*I don't think they've thought so much about it [referring to the fu-migation contracted by the building admin-istration] ... the fumi-gation company is sent by the building admin-istration.*"
		Relativization of the toxicity	Unlike poison, a toxic product is a product you can live with. The precautions taken, for example, opening the windows when smell after fumigating is perceived, seem to be sufficient for proper handling	"*We hired a fumiga-tion company, which uses fumigants that are suitable to live with.*" *"Many of the things that we consume, eat or use daily seem toxic to me, (...) but I am so used to them that it would be difficult for me to think of other options."*
		Constant adjustment between toxicity, pathogenicity, hygiene and well-being	Parents weigh the use and the way to use pesticides, balancing the toxic effects with the other care linked to the upbringing of children	*"She (her daughter) plays freely. The pe-diatrician told me to try to avoid the sand-box. The truth is that I let her go the same, because it is the only sector with games. I only take baby wipes or disinfectants, like those of Espadol® or similar products, be-cause she (her daugh-ter) likes cleaning her hands. But I try not to use a lot of disinfect-ant; I just use wet wipes, so that she doesn't have dirt on her hands."*

Products for pets	- Spot-on pipettes against ticks and fleas - Dogs as pets in contact with the outside; cats inside the house - The authorized voice of the veterinarian - Warning/caution signs on product labels (tox-icity)	Legitimacy granted by the professional	Confidence in the recommendations of veterinarians and plant shops or nurseries	*"[The veterinarian] is a woman who has been the owner for many years."*
Products for house plants	- Care practices of balcony plants - Use of natural products for "edible herbs" - Decrease in precautionary practices with the use of products - Familiarity with products for plants in houses with garden - Meanings of the products recommended in the plant nursery	Barriers to knowledge about the toxicity of products	Fragmentary, incomplete and incorrect information that conveys ideas of safety and discourages attitudes towards seeking information and adopting precautionary measures	*"... it's permethrin... cypermethrin… for lice we use permethrin, so this is a derivative (...) may be it is stronger, I don't know… for human scabies you use the same, but you concentrate it…* *for lice is number 1, for scabies is number 5, well, it must be a derivative."*
		Relaxation of precautionary measures	The repeated use of a product generated a sense of security, that is, they stopped taking precautions to use them	*"as I read there, gloves, mask, (...) maybe the second time I didn't put on the mask, I put on my gloves."*
Cleaning products	- Disinfection of floors - Use of disinfectants as insecticides - Storage of cleaning products - Attributes sought in cleaning products - Differentiation be-tween the toxicity of cleaning products and that of pesticides: which products are considered toxic	Preponderance of hygiene in attitudinal positioning	Families look for a home free of microorganisms, mainly pathogens	*"I think it's not good (using insecticides and disinfectants) in excess because it is toxic, but the truth is that you can't live with cockroaches either. Somehow you have to prevent or kill them in case they appear. Not with the flip-flop.*
Sources of information for the purchase and use of products	- No label reading - Smell as a criterion for purchase and use of a product	Masking of toxicity indicators	Deficient information on products and in product advertising to guide on the toxicity of products. Prominent signs in products about attributes that connote low toxicity	*"Lysoform® has something like a very hospitable image; it seems an institutional product, not only marketing as this other that puts dead cockroaches and stuff on the label or advertising; it gives you a certain feeling of guarantee."*
		Legitimacy granted by the brand		*"El Lysoform® tiene algo como una imagen muy hospitalaria, viste, como que te da algo muy institucional, no como tanto de marketing como este que te pone las cucarachas muertas y esas cosas, entonces eso te da como cierta garantía".*

timized the regulatory framework that governs them. They also trusted the legitimacy of the veterinary professional in the choice and use of pet products and seemed to relate the presence of insects and/or arachnids to a lack of hygiene. However, the way household chemicals were stored suggests that fewer precautions were taken to avoid accidents with HPPs and cleaning products than with medicines.

The results suggest that, in the interviewees, the notion of hazardousness is fundamentally constructed based on their knowledge of acute effects. They would question whether there is a causal relationship between the use of HPPs and health damage if the effects appeared soon after the applications, but they are unaware that repeated exposure to individually subtoxic doses of HPPs can potentially cause chronic effects in children, even long after the last application.

Parents do not have reliable information readily available. In addition, advertisements, which emphasize disinfestation and disinfection, often make toxicity invisible. Although in Argentina the National Administration of Drugs, Food, and Technology (ANMAT) prohibits the use of terms such as *aroma* or similar on labels and limits the use of odor masking agents[41] to avoid confusion, the labels and odor of HPPs are not effective in communicating the degree of warning that their use requires[29]. On the contrary, they discourage rational purchasing and use habits and contribute to what has been called a true "information confusion"[42] about HPPs. Veterinarians, pest control service personnel, and nurserymen, who could contribute as opinion makers, do not yet seem to play a clarifying role in this informative chaos. In this sense, active intervention by regulatory, academic, and official educational bodies is required, as well as permanent monitoring of the metamessages of advertising[43,44].

As a strength, this study includes the knowledge and views of various professional groups, implemented through the transdisciplinary triangulation methodology[35], which encouraged the creation of categories from a comprehensive perspective[35], on the logical structures guiding the home use of chemical products that physicians, environmentalists, and biologists of the research team consider toxic to health.

As a limitation of our study, we cannot exclude a conditioning factor in the interview since parents were interviewed on behalf of the family physician and were beneficiaries of different family health insurance plans. This would have implied a conditioning by the idea that each interviewee has of the family doctor's role and the health insurance for her/his family and by the perceived consequences of accepting to participate in the interview[37], which would have given the interviewer the place of judge of the family organization and the children's upbringing.

Morbidity attributable to repeated exposure to household chemicals has re-emerged as a point of concern in the context of unsafe practices in the use of sanitizers, cleansers, and disinfectants during the ongoing COVID-19 pandemic[45,46]. Consistently, interviewees reported a more elaborate discourse toward germs and insects rather than the health risks of HPPs. They trusted the brands of household disinfectants and constructed practices of constant fine-tuning between toxicity, hygiene, infection prevention, recreation, and well-being, which made them feel protected from both insects and possible toxic effects of HPPs.

Conclusion

There was a low understanding of HPPs in terms of childhood hazards, risks, and vulnerability. Infectious diseases and the presence of insects were more relevant factors to parents' attitudes and behaviors compared with the potential harm of inappropriate selection and use of HPPs. In addition, there were some differences in the responses between families living in houses and those living in apartments/flats In general, there appeared to be a passive attitude and limited use of critical judgment to what labels, advertisements, retailers, neighbors, family members, and pediatricians recommended. The pediatrician appeared as a possible relevant actor in communicating the differential health risks of HPPs use compared with other household chemicals. In the case of families with little children, the adverse effects after repeated exposure to HPPs may result in reversible or irreversible functional alterations of the nervous and endocrine systems[40]. Although household exposures to chemical products are often considered safe for adults, these may be toxicologically relevant for developing individuals. Through its legal regulations, Public Health authorities could provide parents with sufficient knowledge to decode marketing messages and conceptualize the relationship between contact with toxic chemicals and the potential early or delayed occurrence of health disorders.

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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