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Health surveillance of populations exposed to pesticides: analysis of reports from Paraíba State, Brazil

Vigilância em saúde de populações expostas a agrotóxicos: análise das notificações do Estado da Paraíba, Brasil

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Pesticides are chemical products used under the pretext of controlling pests and diseases, both in rural and urban environments. In this context, the objective of this study was to analyse the data from the notifications of the Panel of Surveillance on Health of Populations Exposed to Pesticides (VSPEA) by the Ministry of Health for the State of Paraíba, in the historical series from 2007 to 2022. The analysis included the incidence rate; prioritized municipalities for the implementation of surveillance programs; distribution of notifications by gender, age group, exposure location, circumstance, and type of agent. Paraíba has accumulated 2,793 notifications of exogenous intoxication by pesticides. Regarding gender and age group, there is a slight predominance in notifications for women (50.18%), with higher numbers for men aged 40 and older, and for women in the 10 to 29 age group. The vast majority of intoxications occur in homes (74.83%), as a result of suicide attempts (57.50%), with rodenticides being the most common agents (50.30%). Currently, there are 1,316 pesticides approved for commercialization and use in the state, with the majority classified as highly toxic products. It can be concluded that the significant number of notifications indicates that health units are effectively contributing to the systems, and/or cases of intoxication are increasing indiscriminately, mainly due to the easy acquisition of rodenticides. It is important to emphasize that VSPEA is an essential tool for the development and promotion of public policies against pesticide intoxication.
Keywords: intoxication, pesticides, .

Agrotóxicos são produtos químicos usados sob a justificativa de controlar pragas e doenças, tanto no ambiente rural quanto no urbano. Neste sentido, o objetivo deste trabalho foi analisar os dados das notificações do Painel da Vigilância em Saúde de Populações Expostas a Agrotóxicos - VSPEA, do Ministério da Saúde para o Estado da Paraíba, na série histórica de 2007 a 2022. Foram analisados o coeficiente de incidência; municípios prioritários para implantação dos programas de vigilância; distribuição de notificações por gênero, faixa etária, local de exposição, circunstância e tipo de agente. A Paraíba acumula 2.793 notificações de intoxicação exógena por agrotóxicos. Em relação ao gênero e a faixa etária, verifica-se uma leve superioridade nas notificações em mulheres (50,18%) e são superiores para os homens com 40 anos ou mais e, para as mulheres na faixa de 10 a 29 anos. A grande maioria das intoxicações ocorrem nas próprias residências (74,83%), por tentativa de suicídio (57,50%), tendo os raticidas como agente (50,30%). Atualmente existem 1.316 agrotóxicos aptos para comercialização e uso no Estado, onde a grande maioria são classificados como produtos altamente tóxicos. Conclui-se que, o expressivo número de notificações evidencia que as unidades de saúde estão efetivamente alimentando os sistemas e, ou os casos de intoxicação vêm aumentando indiscriminadamente, principalmente devido a fácil aquisição de raticidas. É importante destacar que a VSPEA é uma ferramenta imprescindível para a elaboração e promoção de políticas públicas contra a intoxicação por agrotóxicos.
Palavras-chave: intoxicação, agrotóxicos, saúde pública.

1. INTRODUCTION

Pesticides are synthetic chemical products used to eliminate insects and microorganisms, under the justification of controlling diseases caused by these vectors and regulating vegetation growth in rural and urban environments [1, 2]. These products were developed in the mid-19th century by the Austrian chemist Othmar Zeidler (1850-1911), and their use in agriculture began in the 1920s, a time when little was known about their toxicological effects. The industrial production of pesticides started during World War II, and their use became widespread, reaching two million tons of pesticides per year [3].

Pesticides are used as defoliants, desiccants, growth stimulants, and growth inhibitors, also considered agents in physical, chemical, or biological processes [4]. They are primarily used in agricultural activities related to the production, storage, and processing of products, as well as in pastures and planted forests. Additionally, they are used in non-agricultural activities when applied in native forests or other ecosystems, such as lakes and reservoirs [2].

Since 2008, Brazil has been the world's largest consumer of pesticides due to the development of the agricultural economic sector. However, issues arise regarding the permitted sale of pesticides unauthorized in other countries and the illegal sale of products already banned, especially in the European Union and China [5, 6].

The use of these agents involves different groups of people, such as workers in various fields of activities, residents near factories and farms, as well as the consumption of contaminated food. Pesticides are extensively used in the country's crops through ground and aerial spraying, impacting not only the air, crops, water, land, and biodiversity but also indigenous peoples, peasants, quilombolas, and traditional communities. All of this is associated with the current economic development model adopted by countries, where the production of primary goods for export is favored over other sustainable forms of production and the quality of life of individuals [5].

Despite the current knowledge about the toxicity of pesticides, Brazil approved the use of more than 2,182 of these products between 2019 and 2022, and approximately half of them pose risks to human health and the environment, constituting a significant public health problem [6, 7]. According to the World Health Organization [8], there were about 84,000 deaths in 2019 due to unintentional pesticide poisoning, and around 155,488 deaths in 2016 due to self-poisoning through avoidable ingestion of pesticides [9]. According to the study by Boedeker et al. [10], more than 740,000 cases of acute unintentional pesticide poisoning occurred annually between 2006 and 2018, with 7,446 cases resulting in death and 733,921 non-fatal cases.

In Brazil, the growth in pesticide use has provided a competitive advantage due to weak regulation that persisted for a long time, causing environmental and human impacts still in the discovery phase [11]. This expansion has been both quantitative and qualitative, with increased efficiency and integration of various types of active ingredients, primarily offered in the form of "packages" covering the production cycles of crops, known as "phytosanitary packages" or "poison packages," as referred to by organizations advocating against indiscriminate use [12].

Due to the increased supply and growth in pesticide use, some social groups, especially rural populations, have become more vulnerable directly or indirectly. Some researchers point out that pesticide use is associated with an increase in suicide rates in rural populations [13, 14], an increase in harmful residues in water systems [15], and various forms of contamination of rural workers and the environment [16-19]. Furthermore, analyses conducted under the Pesticide Residue Analysis Program in Food revealed that pesticide residue limits exceeded the allowed levels in foods consumed in Brazil [20].

One strategy to reduce, control, or eliminate these problems, as well as the risks to health and the quality of life of these vulnerable populations, was the implementation and strengthening of Surveillance in Health of Populations Exposed to Pesticides - VSPEA, through prevention, surveillance, and comprehensive health care measures. Thus, the Interactive Indicators Panel was created, allowing monitoring of implementation, strengthening social control, and aiding the health sector and other stakeholders in planning actions by tracking data on exogenous pesticide intoxication nationwide [4, 21].

Based on this context, this study aimed to analyse the notification data from the Interactive Indicators Panel of VSPEA for the state of Paraíba.

2. MATERIALS AND METHODS

This study deals with descriptive analysis of important secondary data, referring to a serious problem that affects the population and which does not require submission and consequent authorization from the Research Ethics Committee. Data was collected between the months of August and September 2023.

As a means of organizing and writing this paper, information from official sources such as the Ministry of Health - MS, Brazilian Institute of Geography and Statistics - IBGE through IBGE Cities, and the State Secretariat of Agriculture and Fisheries Development - SEDAP, of the state of Paraíba, was utilized. To obtain information on intoxications, data from notifications of exogenous pesticide intoxications from the VSPEA/MS portal were used, accessed through the website (www.gov.br/saude/pt-br/composicao/svsa/saude-do-trabalhador/renast/vspea) [22], where the total number of notifications was verified, and information on the historical series of notifications from 2007 to 2022 was extracted. This included the incidence rate - CI (cases/100,000 inhabitants) per city, priority municipalities for the implementation of the surveillance program, and the distribution of notifications by gender, age group, exposure location, circumstance, and type of agent.

Information on the characterization and quantification of agricultural establishments and pesticide use was obtained by checking IBGE Cities data, accessed at https://cidades.ibge.gov.br through the 2017 Agricultural Census, under the section "Characterization of Agricultural Establishments," subsections "Number of Agricultural Establishments" and "Pesticide Use" [23].

Regarding the toxicological and environmental classification of pesticides approved for commercialization and use in the state of Paraíba, data were obtained through research in the System of Agriculture and Livestock Defense Report of Paraíba - SIDAP (http://sidap.sedap.pb.gov.br/application/index/login) [24].

The results will be presented in the form of graphs and tables, containing absolute and relative values, depending on the analysis performed.

3. RESULTS AND DISCUSSION

3.1 Incidence rate

According to IBGE, the population of the state of Paraíba totals 4,030,961 inhabitants, distributed across 223 municipalities, with 163,218 rural establishments/productive units [23]. Among these, 52,232 (32%) declared the use of pesticides, while 110,623 (67.78%) reported not using pesticides.

As per the VSPEA historical series from 2007 to 2022 (Figure 1), Paraíba has accumulated 2,793 notifications of exogenous pesticide intoxication, with an average of 14.18 notifications per month and an increase of 9.78 times [22]. The incidence rate (IR) rose from 0.63/100,000 inhabitants in 2007 to 6.16/100,000 inhabitants in 2022. The state ranks 14th in exogenous pesticide intoxication IR in Brazil, with a coefficient of 68.79/100,000 inhabitants. The top-ranking state is Espírito Santo, with an IR of 314.81/100,000 inhabitants, accumulating 13 thousand notifications in the same period.

There is an upward trend in exogenous pesticide intoxication cases in the years 2010 and 2012, with an increase in reports from 14 to 163, remaining high in subsequent years. This trend could be a result of public policy compliance, such as Ordinance No. 104/2011 [25], which mandates notifications of diseases and public health issues, and Ordinance No. 2,938/2012 [26], authorizing a transfer of R$22.7 million to Brazil, with R$800,000 allocated to Paraíba to strengthen the VSPEA. The high record of exogenous pesticide poisoning also coincided with an increase in the consumption of pesticides, with Brazil being one of the countries with the highest consumption of these chemicals since 2008. Although for the state of Paraíba there was a drop in 2016, a trend that also occurred in Brazil, probably due to the combination of intensification of campaigns against the use of pesticides and underreporting of cases that were still quite common [5, 11].

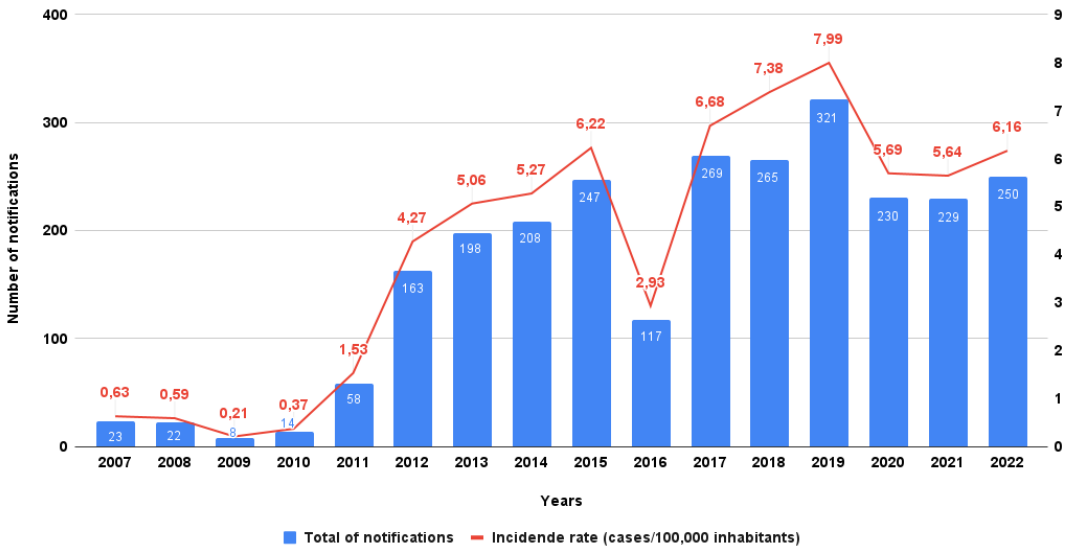

Figure 1: Total notifications and Incidence rate (IR) per year, in the historical series from 2007 to 2022 in the state of Paraíba. Source: adapted from VSPEA.

Pesticide intoxications are considered pathological processes with varied manifestations according to the class of chemical substances, occurring acutely or chronically, at mild, moderate, or severe levels [27]. In this regard, Table 1 shows that 58 (26%) of the 223 municipalities in Paraíba reported intoxication notifications between 2007 and 2022. Among the municipalities with a CI above 100 cases/100,000 inhabitants (n = 8), five are located in the Mesoregion of Sertão Paraibano (Princesa Isabel, Piancó, Itaporanga, Bom Jesus, and Cajazeiras), two in the Mesoregion of Agreste Paraibano (Campina Grande and Guarabira), and one in the Mesoregion of Mata Paraibana (João Pessoa).

However, the municipalities with the highest numbers of intoxication notifications were not prioritized in the selection of the National Health Plan - PNS and the State Health Secretariat - SES for the priority implementation of the VSPEA. Only six cities were prioritized: Mamanguape, Pedras de Fogo, Rio Tinto, Santa Rita, and Sapé, located in the Mesoregion of Mata Paraibana, and Cuité, located in the Agreste Paraibano. It is noteworthy that these prioritized municipalities have not yet effectively implemented the VSPEA because they are in the process of developing the implementation plan (e.g., Mamanguape, Pedras de Fogo, Santa Rita, and Sapé), forming a technical group (e.g., Sapé), and/or reporting cases of exogenous pesticide intoxication from 2021 onwards (e.g., Cuité, Rio Tinto, and Sapé).

Analyzing the aforementioned information, it is understood that the criterion of checking the concentration of exogenous intoxication cases was not indicative of the selection of priority municipalities for the implementation of the VSPEA. This is evident since Cuité, Sapé, and Rio Tinto had no cases of intoxication reported in the VSPEA between 2007 and 2022; Mamanguape had one case in 2022; Pedras de Fogo had three records in 2022, and Santa Rita reported 48 cases between 2014 and 2021. Brazil [21] reports that among the prioritized Brazilian municipalities, only 64.6% (n = 425) began reporting cases of exogenous pesticide intoxication in the Information System for Notifiable Diseases - Sinan in 2021, even though this function has been available since 2007 [28]. Therefore, it is understood that the main criteria for choosing these municipalities were likely the intensive use of agricultural pesticides, the presence of workers in agricultural activities, and cases of underreporting of pesticide intoxication [29].

Table 1: Incidence rate (IR - cases/100,000 inhabitants) of notifications for pesticide intoxication in the municipalities of Paraíba.

Municipalities	IR	*Municipalities*	IR	*Municipalities*	IR
Princesa Isabel	324,22	Patos	32,18	Taperoá	12,90
Piancó	309,66	Serra da Raíz	32,11	Cubati	12,71
Campina Grande	226,42	Santa Rita*	31,14	Sumé	11,70
Itaporanga	181,85	Cajazeirinhas	31,08	Baía da Traição	10,87
Guarabira	184,29	Dona Inês	28,92	Pocinhos	10,61
João Pessoa	137,93	Alagoa Grande	28,18	Pedras de Fogo*	10,49
Bom Jesus	115,92	Pedra Lavrada	25,14	Umbuzeiro	10,09
Cajazeiras	107,07	Caraúbas	23,78	Alhandra	10,07
Monteiro	98,10	Logradouro	22,70	Cachoeira dos Índios	9,65
Picuí	90,73	São José de Espinharas	21,59	Natuba	9,57
Itabaiana	90,30	Esperança	20,97	Manaíra	9,10
Santa Luzia	84,03	Nova Palmeira	19,96	Caaporã	9,06
Pombal	79,26	Pirpirituba	18,89	Alagoinha	6,84
Catolé do Rocha	71,38	Nova Floresta	18,84	Ingá	5,50
Cabedelo	65,93	Santa Helena	17,09	Araruna	4,85
Coremas	58,30	Olho d'Água	15,63	Mari	4,57
São Bentinho	43,46	São Bento	14,43	Conde	3,95
Livramento	41,24	Alagoa Nova	14,29	Mamanguape*	2,20
Juru	40,69	Caiçara	13,92		
Sousa	32,86	Teixeira	13,04		

*Municipalities in Paraíba considered priorities for the implementation of VSPEA. Source: VSPEA Panel.

3.2 Distribution of notifications

The data feeding the VSPEA Panel are obtained through the Information System for Notifiable Diseases, which is updated weekly with the completion of a specific form for exogenous intoxication investigation. This form is available in health establishments and provided by the Ministry of Health. The Ministry of Health defines a suspected case as any individual exposed to chemical substances exhibiting signs, symptoms, and/or laboratory changes compatible with intoxication [29, 30].

As previously mentioned, in this historical series, Paraíba recorded 2,793 notifications of exogenous pesticide intoxications, which will be analyzed by gender and age group, exposure location, circumstances, and agents involved.

3.2.1 Gender and age group

Analyzing VSPEA data regarding gender and age group (Figure 2) reveals a slight difference in the incidence of intoxications between women (50.18%) and men (49.82%). The female gender shows higher rates of intoxication compared to the male gender in the age groups of 10-19 years (9.90% versus 5.27%) and 20-29 years (12.45% versus 11.69%). Meanwhile, the male gender has higher rates of intoxication in the age groups of 0-4 years (7.03%), 40-49 years (7.03%), 50-59 years (4.41%), and 60 years or older (3.77%). Generally, the highest rates of exogenous intoxication among women occur in the age group of 10 to 29 years and among men in the age group of 40 to 60 years or older.

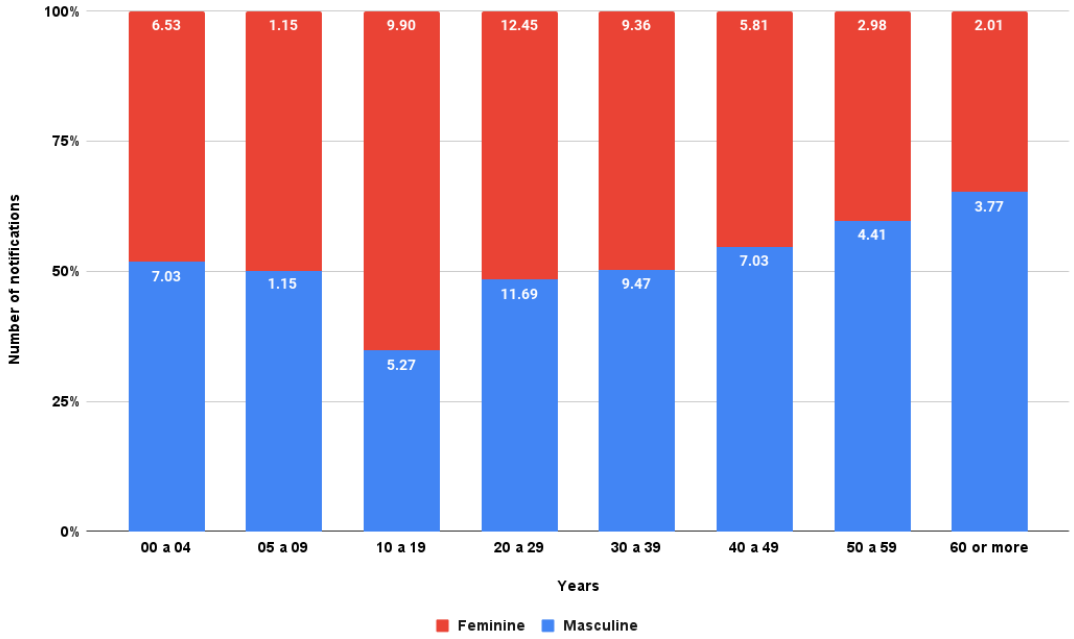

Figure 2: Distribution of notifications of exogenous intoxication by age group and gender in the State of Paraíba. Source: adapted from VSPEA.

Several studies assessing cases of exogenous intoxication in Paraíba [31, 32], Ceará [33], Bahia [34], Alagoas [35], and Sergipe [36, 37] support the VSPEA Panel data. Young women, aged 20 to 41, are more prone to exogenous self-intoxication from household pesticides (e.g., rodenticides) or other toxic agents, with clinical resolution in most cases [30, 33]. Meanwhile, men commit suicide by fatal methods or are more exposed to agricultural pesticides [32, 33, 34].

At this point, we can analyse this problem from two different perspectives. The first is where children, out of curiosity, end up accidentally ingesting or inhaling pesticides or other chemical substances, which are mostly stored inside homes, in easily accessible places. And the second, as already indicated in some studies, is the increase in the suicide rate among young people aged 10 to 19, which has been growing constantly. These individuals always use the easiest means at their disposal to attack their own lives, which is no different from the agricultural environment, where, equally from the previous perspective, they have access to products stored in their own homes [38].

3.2.2 Notification by exposure location

Analyzing VSPEA data regarding the location of exogenous pesticide intoxications (Figure 3), the vast majority occur in the victims' own homes, accounting for about 74.83% of cases. In agreement, Oliveira et al. (2015) [33] found that over 86% of suicide cases in the Northern zone of the State of Ceará due to toxic substance use or other agents occurred in the victims' homes. Following this, there is a higher incidence of pesticide intoxication in unknown locations (10.42%), the workplace (5.91%), unidentified locations (5.01%), outdoor environments (1.97%), others (1.25%), schools and daycares (0.36%), health services (0.18%), and the commute to work (0.07%). It is worth mentioning that notifications recorded as "unknown location" are cases where the intoxicated person or accompanying individual does not want to disclose where the contact with the agents occurred, unlike unidentified locations, where both genuinely do not know where the contact took place.

Buralli et al. (2021) [38], in a study evaluating the knowledge and practices of Brazilian farmers in the state of Rio de Janeiro, show that despite recognizing the risks of pesticide exposure, farmers adopt inappropriate practices that favor contact with chemicals, especially inappropriate storage in their homes, not complying with the legislation on the distance between the crop and the residence, and not using Personal Protective Equipment - PPE.

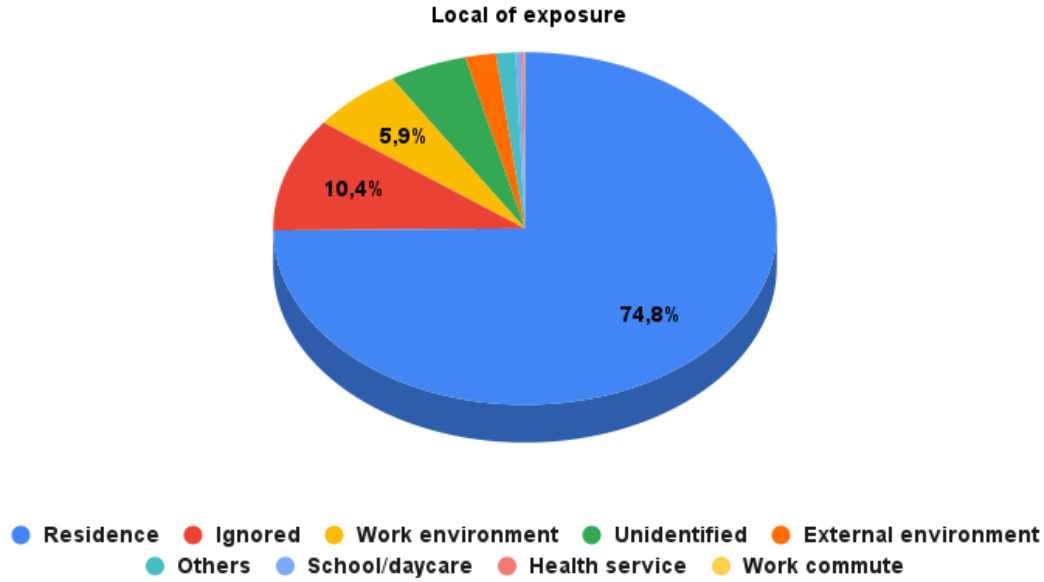

Figure 3: Percentage of notifications for exogenous intoxication by exposure location in the state of Paraíba. Source: adapted from VSPEA.

Studies conducted in other regions also mention homes as the main locations of intoxication, stating that the closer to the residence, the higher the likelihood of intoxication. High social, economic, and environmental vulnerability poses barriers to risk minimization actions and resistance to adopting more sustainable production practices, such as low levels of education and a lack of financial resources for constructing appropriate storage facilities [39, 40].

3.2.3 Notification by Circumstance

Analyzing VSPEA data regarding the circumstances of exogenous pesticide intoxications (Figure 4), it is observed that the majority of cases (57.50%) occurred due to suicide attempts, followed by accidents (26.92%), habitual use (3.62%), unknown (2.90%), environmental (2.58%), blank (1.93%), other (1.29%), violence/homicide (1.00%), ingestion of food or drinks (0.68%), administration error (0.61%), self-medication (0.29%), abuse and attempted abortion (both 0.21%), therapeutic use (0.14%), and inappropriate medical prescription (0.11%).

The Brazilian Ministry of Health states that the main forms of exposure to pesticides can be accidental, occupational or environmental, due to suicide and homicide attempts, among others [27]. Oliveira et al. (2015) [33] and Oliveira et al. (2020) [35] reported that women aged 21 to 41 and those under 18 are more prone to suicide using toxic agents, a fact that coincides with the higher rates of exogenous pesticide intoxication in women aged 20 to 29 (Figure 2).

Accidental pesticide intoxications in Brazil mainly occur among rural workers and professionals in agriculture, producing and formulating industries, pest control professionals, and pesticide applicators in public health campaigns [27]. Medeiros et al. (2022) [41] interviewed 148 farmers residing in five municipalities in the Sertão Paraibano (Santa Luzia, São José do Sabugi, Várzea, Mãe D'Água, and Imaculada), where 129 reported using pesticides in crops influenced by neighbours', family members, or media. Most interviewees do not agree to use personal protective equipment during pesticide handling and report improper disposal of packaging in the trash, burning, burying, or washing and reusing the packaging.

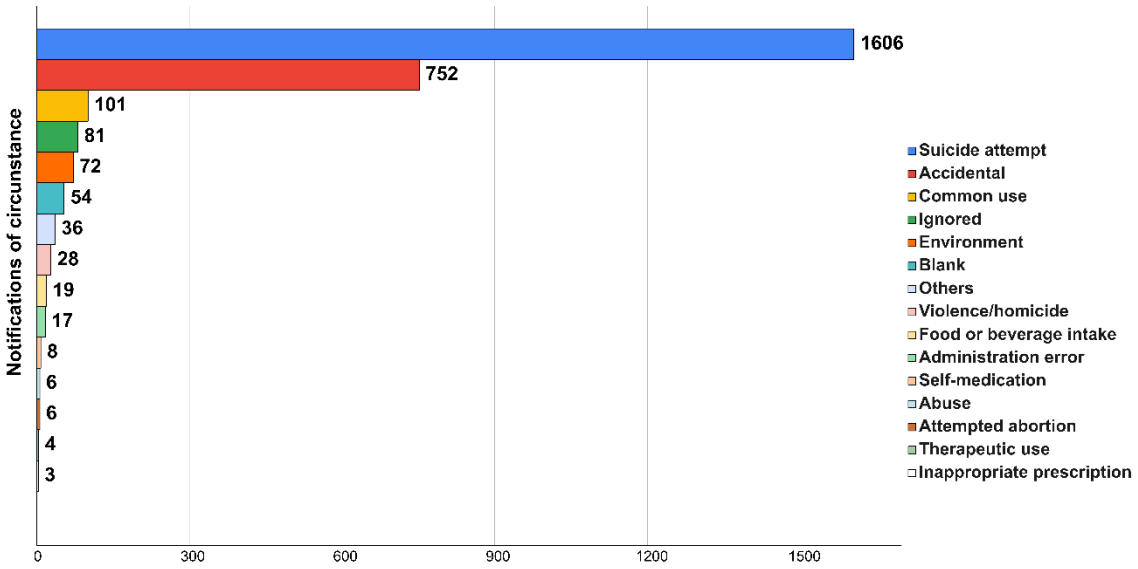

Figure 4: Number of notifications of exogenous intoxication by circumstance in the state of Paraíba. Source: adapted from VSPEA.

3.2.4 Notification by exogenous agent

Analyzing VSPEA data regarding the agents causing exogenous intoxications (Figure 5), 50.30% of notified cases were caused by rodenticides, 20.19% by agricultural pesticides, 17.69% by household pesticides, 9.17% by veterinary products, and 2.65% by pesticides for public health use.

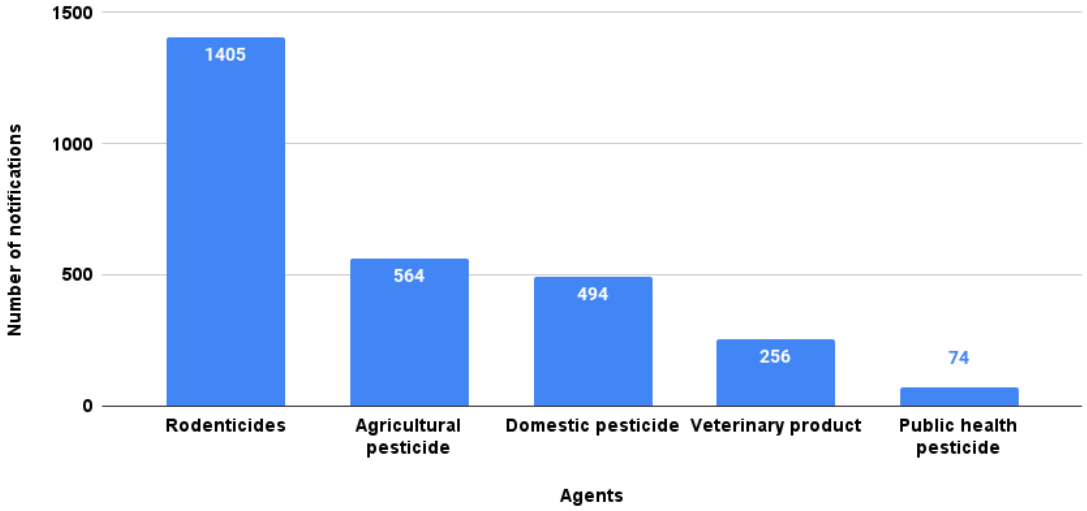

Figure 5: Number of notifications by exogenous agents in the state of Paraíba. Source: adapted from VSPEA.

Silva et al. (2011) [31], when evaluating cases of exogenous intoxication treated by the Toxicological Assistance Center of Paraíba (CEATOX) in João Pessoa, found that the main exogenous agents were carbamate (insecticide) > coumarin rodenticides > pyrethroids (insecticide). In agreement with VSPEA data, Luz et al. (2023) [37] and Nery et al. (2020) [42] stated that the main exogenous agents associated with cases of self-intoxication in Sergipe (2007 to 2021) and deaths in Bahia (2007 to 2017) were rodenticides > agricultural pesticides > household and sanitary pesticides (Sergipe) or medications (Bahia).

The easy acquisition of rodenticides, especially the clandestine product Aldicard known as "chumbinho," in local markets may justify the higher use of these exogenous agents in cases of pesticide intoxication [31, 43].

3.3 Pesticides in Paraíba

According to the results of the SIDAP report, consulted on 10/07/2023, there are currently 1,316 pesticides authorized for commercialization and use in the state of Paraíba, and consequently approved by the Ministry of Agriculture, Livestock, and Supply - MAPA and IBAMA, as they have updated registration status and approval. According to the old classification, pesticides were divided into four toxicological classes [44, 45]. Analyzing the SIDAP report results, the vast majority (n = 642) fall into Class II - Highly Toxic Products (Figure 6).

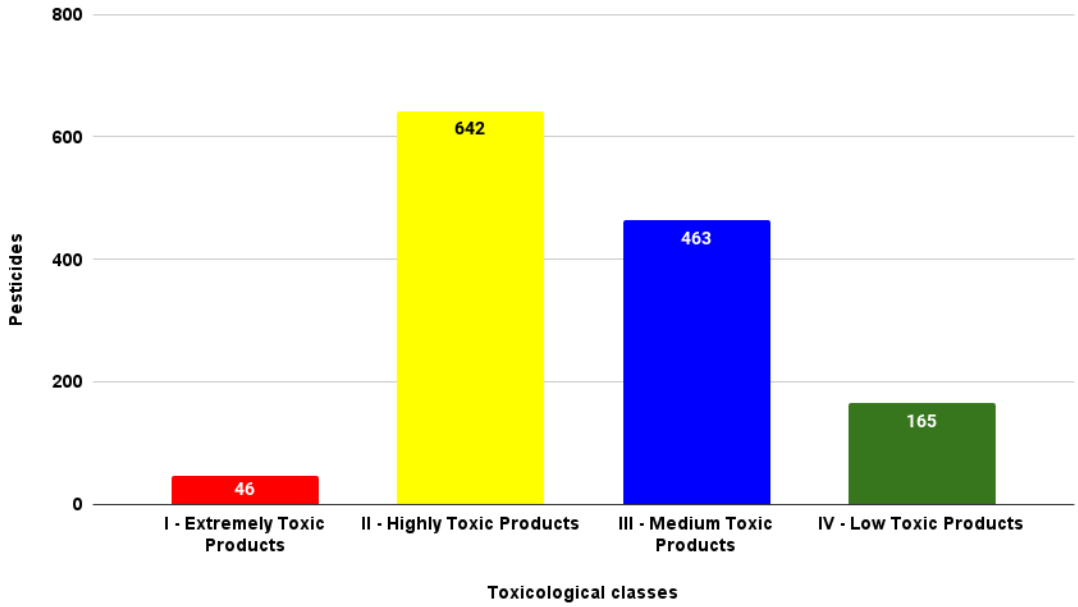

Figure 6: Quantity of pesticides approved for use in the state of Paraíba, divided into toxicological classes. Source: SIDAP Report.

In 2019, a reclassification of these products occurred, where, with the new regulatory framework for the sector, Brazil adopted the parameters of toxicological classification of pesticides based on the standards of the Globally Harmonized System of Classification and Labelling of Chemicals - GHS, to comply with the European Union and Asia [4, 6]. The GHS expanded the categories of pesticides from four to five, moving from toxicological classes to environmental classification and including the item "not classified" for products of biological origin, representing very low potential for harm to people and the environment (Figure 7).

Regardless of the classification system used, both are mandatory on product packaging to draw attention to those handling them. According to Savoy (2011) [46], regarding the mode of action of the active ingredient in the target organism or the nature of the combated pest, pesticides are classified as insecticides, fungicides, herbicides, rodenticides and/or raticides, acaricides, nematicides, fumigants, molluscicides, etc. [47, 48].

Following this reclassification, the vast majority of products became considered low-toxic or unlikely to cause acute damage, representing approximately 80% of approved products in Paraíba. This can be considered highly detrimental to vulnerable populations, as this legal loosening represents a setback from a health and environmental perspective. Easier access to products and fewer criteria for storage and use can lead to higher rates of exogenous intoxications, whether intentional or not.

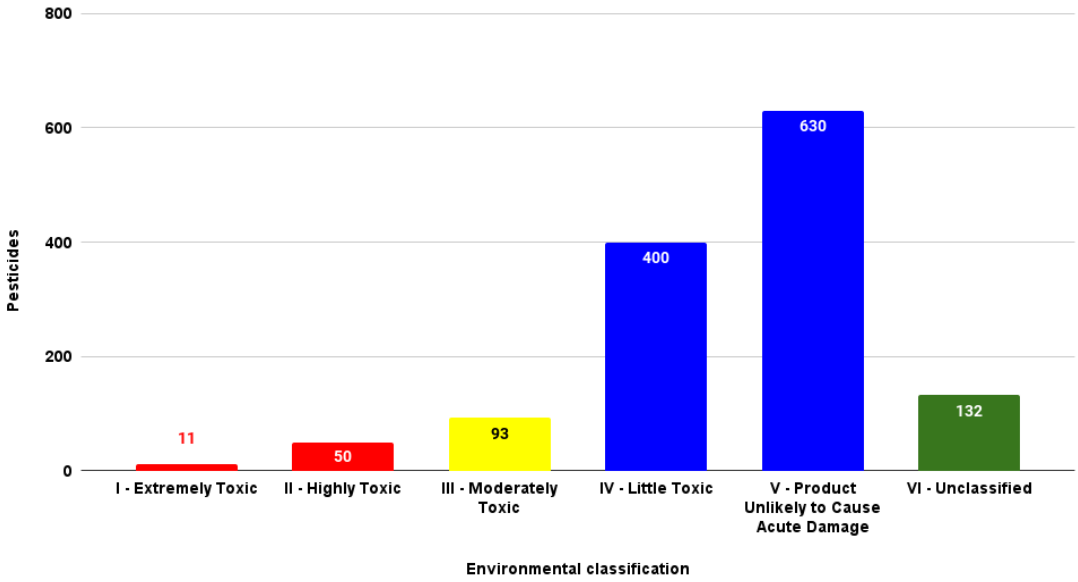

Figure 7: Quantity of pesticides approved for use in the state of Paraíba, divided into environmental classes. Source: SIDAP Report.

To prevent or minimize all these risks of intoxication raised in this study, promoting health, well-being, and sustainability in agriculture, it is essential to have access to quality education, technical assistance, and training for farmers. This would transform knowledge, attitudes, and practices regarding the impacts of pesticides on health and the environment.

It is also of utmost importance to have studies that directly impact legislation, prohibiting when necessary, and always updating information about the toxicity of pesticides, as well as ways to produce using fewer or even more sustainable methods. For this, surveillance actions, such as VSPEA, promotion and health assistance, strengthening health in rural areas, as well as specific policies and programs, awareness, and even psychosocial support, especially for vulnerable populations, should be strengthened [38].

4. CONCLUSION

In the historical series assessed (2007 to 2022), Paraíba experienced a significant increase in the number of notifications of pesticide intoxication, indicating that: health units are indeed feeding the systems with data related to the care of these cases; and/or intoxication cases are increasing indiscriminately due to the vast quantity of available products and ease of access, especially rodenticides, which can be purchased without agronomic and veterinary prescriptions, found in supermarkets and small markets; and agricultural pesticides sold in phytosanitary packages, but stored in households, used without technical criteria, and irregularly discarded, as well as the reuse of some packaging.

It became evident through this study that the priority municipalities for the implementation of the Surveillance Program in the state of Paraíba should be reviewed, as only three of the six municipalities considered priorities by SES and PNE are on the list of 58 with notifications, and with relatively low numbers of notifications. This study suggests that the municipalities of Princesa Isabel, Piancó, Campina Grande, Itaporanga, Guarabira, João Pessoa, Bom Jesus, and Cajazeiras be analyzed as possible priority cases, as they showed high incidence rates and are regions that concentrate pesticide-related businesses and consumers, including from smaller neighboring municipalities that intensify agricultural activities at some times of the year.

This study also highlighted that in the state of Paraíba, public policies are already needed to minimize attempts at self-intoxication among women aged 10 to 29 and men over 40, as these groups are the most vulnerable according to pesticide notification rates.

The VSPEA is an important tool for Health Surveillance, especially for the segment of the population most vulnerable to various forms of pesticides causing intoxication. More in-depth studies like this and data cross-referencing with other national panels can assist in promoting

public policies to reduce the incidence of these notifications of exogenous intoxication, ensuring a higher quality of life.

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