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Chapter

Analysis of Exogenous Poisoning by Pesticide in the State of Bahia-Brazil during the Period from 2007 to 2017

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Abstract

Brazil is one of the main exporters of agricultural products and is one of the largest consumers of pesticides in the world. Bahia stands out in irrigated agriculture, with growth at the national and international level exports. The aim of this study is to describe and analyze the spatial distribution, and the epidemiological profile of the population with confirmed cases of pesticides intoxication in the state of Bahia-Brazil, from 2007 to 2017. It is an ecological and retrospective study of a series, with secondary data collected at the Department of Informatics of the System Of Health (DATASUS), on notifications and confirmed cases of pesticide poisoning in the state in 2007 to 2017. In Bahia, about 1,632 notifications of exogenous pesticide poisoning in the investigated period, confirming about 1137 cases. The main age group affected by these intoxications were related to 20-39 years of age. The results of this study show the increase in the number of notified and confirmed cases in Bahia during years from 2007 to 2017, thus suggesting the carrying out of research on the subject in this and other Brazilian states, in order to monitor and evaluate the causes of these pesticide poisoning, and improve health promotion.

Keywords: agriculture, notifications, healthy

1. Introduction

Brazil is one of the main countries in the world in the production and export of products from the agricultural sector. It uses fertilizers and standing out as the main world consumer of pesticides [1]. This fact is due to its extensive planting area, which

results in large areas dedicated to monocultures. In turn, it results in increasing pests in plantations, cultivation of transgenics, the imposition of the policy of the green revolution, and the absence of reduction policies and monitoring the use of pesticides and encouraging ecological agriculture [2].

The use of pesticides started to become popular during the Second World War when it emerged as a revolution in pest control. This product is classified as efficient and with an advantageous cost/benefit ratio, which caused new organosynthetic compounds to be produced, thus strengthening the agrochemical industry until today. The use of these chemical products added to the process of developing modern varieties with a high capacity to use these inputs became known as “the Green Revolution”. Recently, the increase in the consumption of pesticides is closely related to the use of transgenic cultivars [1, 3, 4].

This process, linked to the modernization of agriculture, inserted pesticides and fertilizers into the country’s technological package, where the expansion of capital in the countryside forced small producers and farmers to enter the new model of agricultural production. In this perspective, the use of chemical pesticides and fertilizers has become a constant, since the land was forced to produce more in less time, paying attention only to market needs, exponentially increasing productivity per hectare and the frequency of harvests [5, 6].

Pesticides interfere with the physiological mechanisms of human beings and, therefore, are harmful to health. According to the World Health Organization (WHO), there are three to five million acute poisonings in the world each year, with approximately 200 thousand deaths annually, mainly in developing countries. The high toxicity of some products, the ease of access, and the increase in the number of products containing these substances are factors related to pesticide poisoning, causing serious public health [7–11]. Exogenous autointoxications are directly involved (about 70%) with pesticides and medications, since hospital admissions, according to the Sistema Único de Saúde (SUS), is related to self-inflicted violence, by pesticides, chemicals, and medicines [12].

In agricultural terms, the state of Bahia stands out nationally and internationally, mainly in irrigated agriculture, showing an increase in exports and favoring population growth. However, with this highlight, it was also possible to observe an increase in the number of notifications for poisoning with pesticides [13]. Therefore, this study aimed to describe and analyze the spatial distribution and epidemiological profile of confirmed cases of pesticide poisoning in the state of Bahia - Brazil, from 2007 to 2017.

2. Methodology

This is an ecological and retrospective study of a time series, based on secondary data collected through SINAN (Sistema de Informação de Agravos de Notificação) linked to DATASUS. For this purpose, an analysis of confirmed cases of pesticide poisoning was carried out and data collection of estimates and projections of the population of the state of Bahia in the period from 2007 to 2017. To search for the data, we used the option of Disease and Notifiable grievances from SINAN: Exogenous pesticide infection, with the following variables: sex, age group, education, and area of residence. Data processing was performed using Excel software, in which the calculations of absolute and relative frequencies were performed, in addition to the arithmetic mean.

This research follows the rules of the National Ethics Council of Resolution no. 466/2012, using data available to the public through the DATASUS digital platform.

Therefore, authorization from the Research Ethics Committee was not required, as no identification data was used for individuals.

3. Results

In Bahia, there recorded about 1671 notifications of exogenous poisoning by agricultural pesticides between 2007 and 2017. Where, there confirmed about 1155, of which 96 died. Of the investigated periods, the year 2013 had the highest number of reported cases (240), unlike in the year 2008, where the lowest number was registered (59). The average number of cases during the analyzed period was also verified, which was 151.9 notifications. Regarding the number of confirmed cases (1155) of pesticide poisoning, 2013 had the highest number (195) and 2008 the lowest (42). Also, the investigated period showed an average of 105 confirmed cases (**Table 1**).

In **Table 2**, it is possible to observe the overview of cases of exogenous poisoning by pesticides in cities (health regions) in the state of Bahia, during the years 2007 to 2017. The highest percentage of notifications and confirmed cases were in the city of Salvador, in which there were 268 notifications and about 238 confirmed cases, followed by Juazeiro with 234 notifications and 165 confirmed cases, Feira de Santana with 155 notifications and 140 confirmed cases, and Paulo Afonso with 114 notifications and 93 confirmed cases. The other health regions can also be seen in **Table 2**.

The epidemiological profile of intoxication confirmed by pesticides in the state of Bahia (2007 to 2017) was divided according to the following criteria: sex (Male and female), age group (<1 to 9 years, 10 to 19 years, 20 to 39 years, 40 to 59 years, > 60 years and white/ignored), area of residence (Urban, Rural, peri-urban, and ignored), and education (Illiterate, complete/incomplete elementary school, complete/incomplete high school, complete/incomplete higher education,

Years	Population	Notified cases	Confirmed case
2007	14.080.670	103	71
2008	14.502.575	59	42
2009	14.637.364	89	66
2010	14.021.432	107	62
2011	14.097.534	149	106
2012	14.175.341	181	138
2013	15.044.137	240	195
2014	15.126.371	234	158
2015	15.203.934	203	136
2016	15.276.566	168	109
2017	15.344.447	138	72
TOTAL	—	1.671	1.155
MEAN¹	—	151,9	105

¹Calculated arithmetic mean. Source: Authors based on data from DATASUS (2019).

Table 1.
Distribution in the period from 2007 to 2017 of notified and confirmed cases in the state of Bahia.

Notification health regions	Total of notifications	Total of confirmed cases
Alagoinhas	18	7
Barreiras	101	53
Brumado	81	46
Camaçari	2	1
Cruz das Almas	11	7
Feira de Santana	155	140
Guanambi	92	68
Ibotirama	1	—
Ilhéus	13	9
Irecê	57	33
Itaberaba	27	17
Itabuna	29	20
Itapetinga	7	2
Jacobina	29	11
Jequié	80	37
Juazeiro	234	165
Paulo Afonso	114	93
Porto Seguro	51	29
Ribeira do Pombal	23	17
Salvador	268	238
Santa Maria da Vitória	78	55
Santo Antônio de Jesus	35	16
Seabra	8	6
Senhor do Bonfim	24	20
Serrinha	21	11
Teixeira de Freitas	56	21
Valença	38	26
Vitória da Conquista	18	7
TOTAL	1.671	1.155

Table 2.

Distribution of cases of exogenous poisoning by pesticides in the state of Bahia, during the period from 2007 to 2017.

white/ignored and does not applied). Of the confirmed cases, the male sex had the highest number of cases, about 756 (65%), when compared to the female sex who presented 399 (35%) (**Figure 1**).

The age range with the highest number of confirmed cases was between aged individuals 20 to 39 years old, which represented 588 cases, following by the age range 40 to 59 years old (279) and the age range 10 to 19 years (148). For those aged >60 years, there identified 78 cases, and the age range < 1 to 9 years (61), lastly, the ignored cases presented only one confirmed case. **Figure 2** shows the percentages by age range of cases confirmed by pesticide poisoning.

According to the area of residence of individuals with confirmed cases of pesticide poisoning in the state of Bahia from 2007 to 2017, the urban area had the highest number, approximately 647 confirmed cases, followed by the rural area (473) and ignored (27), lastly, the peri-urban area (8). **Figure 3** shows the percentages by area of residence.

The last epidemiological profile observed was education. For this parameter, the ignored criterion was the one that had the highest number of confirmed cases (622),

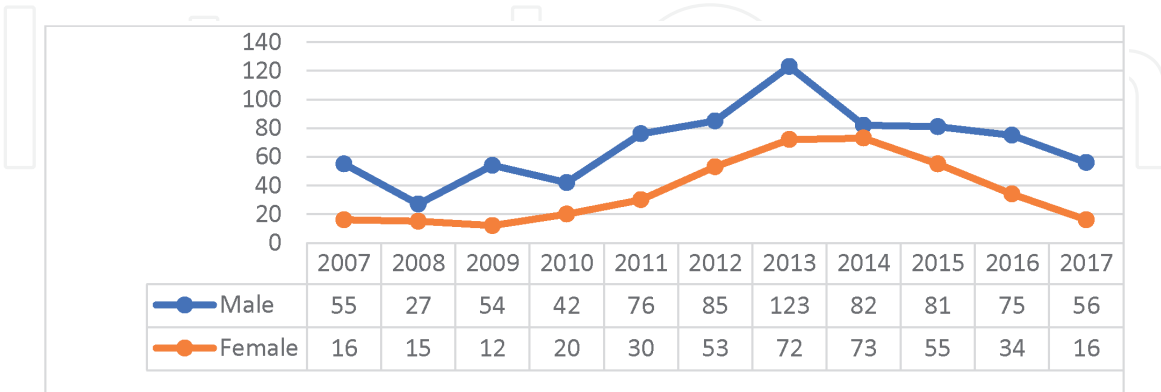


Figure 1.
 Epidemiological profile of pesticide poisoning distributed by sex in the state of Bahia from 2007 to 2017.

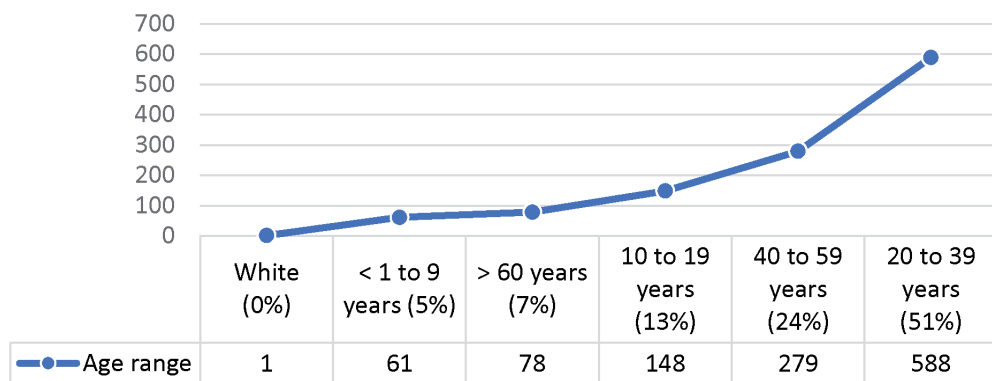


Figure 2.
 Epidemiological profile of pesticide poisoning distributed by age group in the state of Bahia from 2007 to 2017.

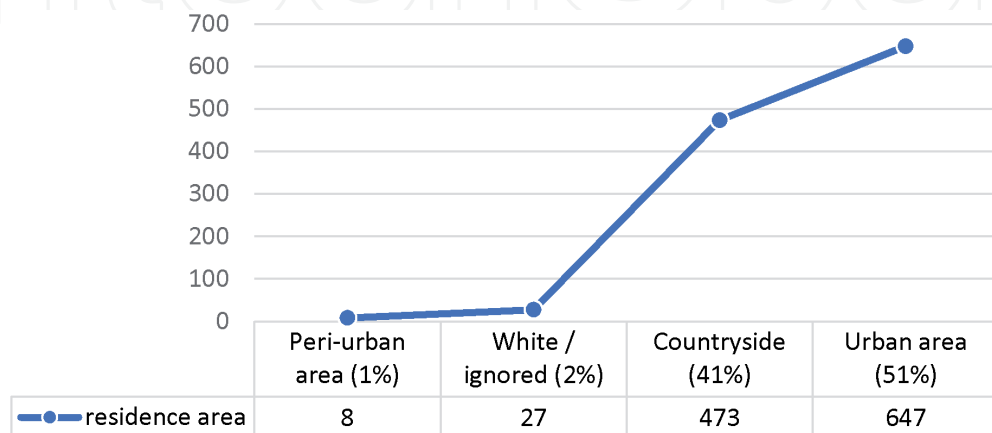


Figure 3.
 Epidemiological profile of pesticide poisoning distributed by area of residence in the state of Bahia from 2007 to 2017.

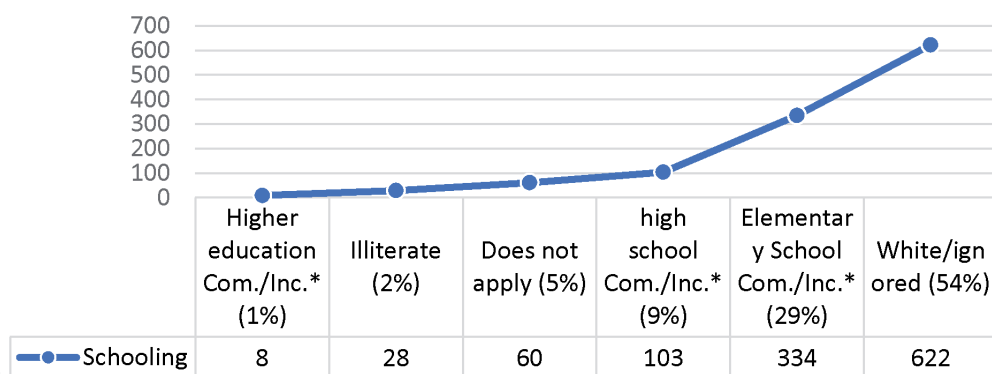


Figure 4. Percentage by schooling of confirmed cases by pesticides poisoning in the state of Bahia from 2007 to 2017. Complete/incomplete.

followed by complete/incomplete elementary school (334), complete/incomplete high school (103), illiteracy (28), and higher education (8). **Figure 4** addresses the percentage by the education of the aforementioned data.

4. Discussion

The use of pesticides is a serious problem for human health and the environment. Brazil, in turn, increased the consumption of pesticides in agricultural sectors and insect vector control programs. With these determining factors, the number of records of human poisoning by pesticides is increasing [3, 14]. The release of pesticides in 2019 by the government of Brazil totaled, until July, 290 active ingredients. Despite these alarming decisions, the present study refers to a retrospective study in the state of Bahia (2007 to 2017). At the time, there was still such a large number of licenses to use these compounds. However, this information does not make it any less relevant, as the number of pesticides released and cases of reported poisoning were already alarming.

According to data from the main cities in the state of Bahia, the largest number of cases of pesticide poisoning occurred in Salvador, Juazeiro, Feira de Santana, and Paulo Afonso. The findings of the present study suggest that males are the main victims of pesticide poisoning in the state of Bahia, with about 65% of cases confirmed in the period studied, which corroborates those of Rebelo et al., (2011) and Matos, (2013), who found that males represented a higher percentage of pesticide poisoning.

This data is directly linked to the figure of the man in the handling and use of pesticides in agricultural work, thus being more exposed to these chemicals [8, 10, 11]. Regarding the age range, the most affected are concentrated mainly between 20 and 39 years (51%), followed by aged 40 to 59 years (24%). According to these data, the number of pesticide poisonings is increasing mainly in individuals of economically active age groups, as previously described [14, 15].

The results referring to the area of residence (urban, rural, peri-urban, and ignored) in the state of Bahia, demonstrate an important aspect mainly between the rural and urban areas, in which the urban obtained a percentage of 56% of confirmed cases and the rural (41%). It is worth mentioning that the number of confirmed cases in agricultural (rural) regions can be even higher. However, structural problems in health services hamper the efficiency of services, actions, and even the notifications of these individuals. According to LONDON, (2012), these problems have been previously reported, which reappear in the present work demonstrating that they persist, and that is necessary more effective administrative action by the health sectors to change and prevent this situation.

The data resulting from schooling address mainly that white/ignored had a higher percentage (54%) of confirmed cases, and complete/incomplete elementary education (29%). Complete/incomplete higher education have a smaller number of individuals affected by pesticide poisoning, since this data is possibly related to the age of education, since, individuals with low education do not have the habit of using Personal Protective Equipments (PPEs) [16].

It is important to address the limitations of the present study of a large number of ignored, mainly in the epidemiological profile by education, which produces a possible bias regarding the notifications of confirmed cases of pesticide poisoning. Also, notifications must be made insightfully and correctly when diagnosing these individuals, since, the WHO makes the following estimate that for each case record of exogenous poisoning by pesticides, there are about 50 other unregistered cases [14].

5. Conclusion

The results of the present study of exogenous poisoning by pesticides show that there was an increase in reported and confirmed cases in the state of Bahia from 2007 to 2017, mainly from the year 2011. The health regions most affected were Salvador, Feira de Santana, Juazeiro, and Paulo Afonso that cover other respective municipalities in which the affected individuals reside. According to the epidemiological profile of the risk group with the highest percentages of confirmed cases, the male sex, the age groups of 20 to 39 and 40 to 59 years old, individuals with low schooling, and individuals living in the urban area are the most expressive. However, it is worth mentioning that these data are directly related to deficiencies in the structuring of the health system and the registration of notifications in the rural area when compared to the urban area.

Finally, it is suggested to expand research on the topic in the investigated state, as well as in other states in the region, in order to assess the causes of these pesticide poisonings, besides to encouraging the training of health professionals to carry out the diagnosis, clinical notification, and treatment of the individual affected by pesticide poisoning. Also, it is extremely important to develop and strengthen public policies with surveillance actions to reduce the indiscriminate use of pesticides and, thus, improve the health promotion of the population and the environment.

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