

Demographics, deaths and severity indicators in hospitalizations due to drug poisoning among children under age five in Brazil

Demografia, óbitos e indicadores de agravamento nas internações por intoxicações medicamentosas entre menores de 5 anos no Brasil

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ABSTRACT: *Introduction:* In Brazil, drugs are the main causative agents of poisonings, and children under age five are the group with the highest number of cases. The objective of the present study was to describe hospitalizations due to drug poisoning in this population regarding demographics, deaths and worsening indicators in hospitalizations. *Methods:* The frequency of hospitalizations for drug poisoning between 2003 and 2012 was verified using data from the Hospital Information System. The study variables were year, gender, age, place of residence and hospitalization, patient follow-up, main diagnosis, secondary diagnosis, nature of the health establishment and amount related to Intensive Care Unit expenses. *Results:* There were 17,725 hospitalizations due to drug poisoning in children under five, predominantly two-year-old male children. The hospitalizations outside the city of residence occurred in 25% of the cases, with predominance in the Northeastern region. The proportion of deaths in hospitalizations was 0.4%, with a higher number of deaths in the Southeastern region. *Conclusion:* Despite the decrease in the number of hospitalizations in the period, regional disparities remained, which could be attenuated with the provision of specialized attention to drug poisonings in municipalities, expanding the access to a more complex care.

Keywords: Hospitalization. Poisoning. Pharmaceutical Preparations. Infant. Children. Hospital Information Systems.

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RESUMO: Introdução: No Brasil, os medicamentos são os principais agentes causadores de intoxicação, e o maior número de casos desse problema envolve menores de 5 anos. Assim, o objetivo deste estudo foi descrever as internações por intoxicação medicamentosa nessa população quanto a sua demografia, óbitos e indicadores de agravamento. **Métodos:** Verificou-se a frequência das internações por intoxicação medicamentosa entre 2003 e 2012, utilizando os dados do Sistema de Informação Hospitalar. As variáveis utilizadas foram ano, sexo, idade, município de residência e de internação, evolução do paciente, diagnóstico principal, diagnóstico secundário, natureza do estabelecimento de saúde e valor referente aos gastos de unidade de terapia intensiva. **Resultados:** Ocorreram 17.725 internações por intoxicação medicamentosa em menores de 5 anos de idade, com o predomínio do sexo masculino e de crianças de 2 anos. As internações fora do município de residência deram-se em 25% dos casos, com predomínio da Região Nordeste. A proporção de óbitos nas internações foi de 0,4%, com maior número de óbitos na Região Sudeste. **Conclusão:** Apesar da diminuição do número de internações no período, permaneceram disparidades regionais que podem ser atenuadas com a oferta de atenção especializada às intoxicações medicamentosas nos municípios, ampliando o acesso a cuidados de maior complexidade.

Palavras-chave: Hospitalização. Intoxicação. Medicamentos. Lactente. Pré-escolar. Sistemas de Informação Hospitalar.

INTRODUCTION

Drugs are the main poisoning agents in many countries, including Brazil, the United States and the United Kingdom¹⁻³. Although they are used for prophylactic, curative, palliative or diagnostic purposes, they can cause harmful responses in various situations, especially when in doses higher than those usually employed, intentionally or unintentionally⁴.

Even though poisoning may occur at any time throughout a person's life, children between 1 and 4 years old in Brazil are the most affected by poisoning by this cause¹. In 2013, 34.4% of notifications and 4.3% of deaths from drug poisoning involved children under 4¹.

Drug poisonings reported in children under 5 mainly occur in accidental circumstances or due to medication errors⁵. Although the number of notifications is high, related mortality is low. Despite the lower severity of these poisonings, some cases still require care in health units or even hospitalizations. However, there is no information on the number or profile of hospitalizations caused by such poisonings.

In order to fill this gap, the objective of the present study was to assess hospital admissions due to drug poisonings in the country, involving children under 5, between 2003 and 2012, regarding demographic aspects, deaths and severity indicators.

METHODS

A retrospective descriptive study was conducted using data from the Hospital Information System of the Unified Health System (SIH-SUS) between 2003 and 2012, throughout the

country. The period was chosen because it represents the last ten years in which data were completely available at the time of research approval.

The study population consisted of hospitalized children under 5, and data were collected based on the reduced type files for Hospital Admissions Authorizations (*Autorizações de Internações Hospitalares - AIH*) available on the website of the Department of Informatics of SUS (DATASUS). Data files from all states and the Federal District were used. The collection was performed between April and June 2014.

The eligible cases were hospitalizations involving children under 5, for which the main and/or secondary diagnosis presented one of the codes defined for drug poisoning in the 10th International Statistical Classification of Diseases and Related Health Problems (ICD-10): F11.0, F13.0, F15.0, F19.0, F55, P93, T36, T37, T38, T39, T40.2, T40.3, T40.4, T41, T42, T43, T44, T45, T46, T47, T48, T49, T50, T96, X40, X41, X43, X44, X60, X61, X63, X64, X85, Y10, Y11, Y13, Y14.

Codes X42, X62 and Y12 were deleted to avoid ICD-10 codes that did not allow differentiating the conditions related to the use of medicines from those linked to the use of licit and illicit drugs, according to Lessa and Bochner⁶. The method used to construct the database was described in Maior et al.⁷.

The AIH variables used were year, gender, age, place of residence and hospitalization, death, primary diagnosis, secondary diagnosis and nature of the health facility. The variable *amount related to Intensive Care Unit (ICU) expenses* was used to identify ICU use, because the variable *total ICU days during hospitalization* reports zero days both for non-hospitalization and for hospitalization for less than 24 hours.

Absolute and relative frequencies of the qualitative variables were calculated using the softwares Windows Tabulator (TabWin32), Statistical Analysis System (SAS) 9.3 and Statistical Package for the Social Sciences (SPSS) 20, for data extraction and analysis.

The present study was approved by the Ethics Committee of Escola Nacional de Saúde Pública Sérgio Arouca (CEP/ENSP), according to Opinion No. 01/2014.

RESULTS

Between 2003 and 2012, there were 17,725 hospitalizations for drug poisoning in children under 5 (Table 1). This figure decreased over the period (Figure 1). 2-year-old (24.3%) and male children (52.9%) presented the largest number of hospitalizations. ICU was used in 7.3% of cases. Hospitalizations in public facilities (46.3%) and of residents from the Southeastern region (46.7%) occurred in greater numbers. Death/hospitalization ratio was 0.4% (Table 2).

The proportion of hospitalizations outside the place of residence was 25.3% in the country, ranging from 30.8% in the Northeast to 18.7% in the North. Of the 4,492 hospitalizations outside the place of residence, 488 cases involved the ICU (10.9%) (Table 3).

Table 1. Proportion of the number of hospitalizations for drug poisoning in children under 5, per year. Unified Health System (SUS), Brazil, 2003–2012.

Year	Hospitalizations for poisoning (total)	Hospitalizations for poisoning (children under 5)	Percentage of children under 5 hospitalized for poisoning (%)
2003	18,559	2,134	11.5
2004	18,207	1,944	10.7
2005	18,928	1,833	9.7
2006	19,573	1,713	8.8
2007	21,823	1,721	7.9
2008	27,270	1,912	7.0
2009	25,335	1,810	7.1
2010	22,374	1,608	7.2
2011	21,952	1,482	6.8
2012	21,936	1,568	7.1
Total	215,957	17,725	8.2

Source: adapted from the Hospital Information System of the Unified Health System (SIH/SUS).

Figure 1. Evolution in hospitalization periods for drug poisoning among children under 5, Unified Health System (SUS), Brazil, 2003–2012.



Source: adapted from the Hospital Information System of the Unified Health System (SIH/SUS).

Table 2. Percentage distribution of hospitalizations for drug poisoning in children under 5, according to sociodemographic characteristics and the use of Intensive Care Units (ICU), Unified Health System (SUS), Brazil, 2003–2012.

	Frequency	Percentage (%)
Age		
0 day	313	1.8
1 to 28 days	395	2.2
29 to 364 days	2,270	12.8
1 year	3,665	20.7
2 year	4,302	24.3
3 year	3,891	22.0
4 year	2,889	16.3
Gender		
Male	9,384	52.9
Female	8,341	47.1
Use of ICU		
Yes	1,291	7.3
No	16,434	92.7
Legal nature		
Private	2,486	14.0
Public	8,206	46.3
Affiliated institution	7,033	39.7
Evolution		
No death	17,650	99.6
Death	75	0.4
Place of residence		
North	835	4.7
Northeast	3,726	21.0
Southeast	8,283	46.7
South	3,086	17.4
Midwest	1,795	10.1
Site of care		
Same municipality	13,233	74.7
Different municipality	4,492	25.3
Total	17,725	100.0

Source: adapted from the Hospital Information System of the Unified Health System (SIH/SUS).

ICU beds were used more in the Southeastern region and less in the Northern region. The highest absolute number of deaths was seen in the Southeast, although the highest death/hospitalization ratio was in the North (Table 4).

Among the hospitalizations followed by death, 70.7% occurred in public facilities, 28% in affiliated institutions; and 1.3%, in private institutions (non-tabulated data).

Table 3. Percentage distribution of hospitalizations for drug poisoning in children under 5, according to displacement and use of an Intensive Care Unit (ICU), Unified Health System (SUS), Brazil, 2003–2012.

Variable	Site of care				Total	
	Same municipality		Different municipality			
	N	%	N	%	N	%
Place of residence						
North	679	81.3	156	18.7	835	100
Northeast	2,577	69.2	1,149	30.8	3,726	100
Southeast	6,429	77.6	1,854	22.4	8,283	100
South	2,270	73.5	816	26.5	3,086	100
Midwest	1,278	71.2	517	28.8	1,795	100
Brazil	13,233	74.7	4,492	25.3	17,725	100
Use of ICU						
Yes	803	62.2	488	37.8	1,291	100
No	12,430	75.6	4,004	24.4	16,434	100
Total	13,233	74.7	4,492	25.3	17,725	100

Source: adapted from the Hospital Information System of the Unified Health System (SIH/SUS).

Table 4. Percentage distribution of the use of an Intensive Care Unit (ICU) and deaths in hospitalizations for drug poisoning, involving children under 5, by place of residence of each patient, Unified Health System (SUS), Brazil, 2003–2012.

Place of residence	Use of ICU		Hospitalizations		Use of ICU/ number of hospitalizations	Deaths		Death/hospitalization ratio
	n	%	%	n	%	n	%	%
North	52	4	835	4.7	6.2	9	12	1.1
Northeast	158	12.2	3,726	21	4.2	23	30.5	0.6
Southeast	509	39.4	8,283	47	6.1	29	38.5	0.6
South	429	33.2	3,086	17	13.9	7	9.5	0.2
Midwest	143	11.1	1,795	10	8	7	9.5	0.4
Brazil	1,291	100	17,725	100	7.3	75	100	0.4

Source: adapted from the Hospital Information System of the Unified Health System (SIH/SUS).

DISCUSSION

Between 2003 and 2012, SUS registered 17,725 hospitalizations due to drug poisoning in children under 5, decreasing 26.5% from the first to the last year. In the same period and age group, the Brazilian population decreased by 14.1%⁸, and the notifications of drug poisonings increased¹. The reduction in these hospitalizations may reflect the decrease in population and in the severity of poisonings, justifying fewer hospitalizations.

The largest number of hospitalizations involved children between 2 and 3 years old, which is close to that observed by Matos et al.⁹. As children are able to move more independently at this age, these intoxications may be accidental¹⁰ or a consequence of the greater use of medicines in this age group¹¹.

Given that population criterion defines the distribution of AIH, the Southeastern and Northeastern regions were expected to present a greater number of hospitalizations. Besides that, 46.3% of hospitalizations occurred in public facilities, and 39.7% in affiliated institutions, according to the proportion of pediatric beds available linked to SUS¹².

The possibility of patients commuting to other municipalities in search of hospitalization depends on their geographic and social conditions. Such displacement happened in 25.3% of hospitalizations, similar to what was found in the literature¹³, and in greater proportion in the Northeastern region and lower in the North. Because the regionalization of health services can cause this displacement, the results possibly indicate a favored regionalization process in the Northeast, and the opposite in the North. Nonetheless, between 2007 and 2010, Lima et al.¹⁴ found that the historical/structural, political/institutional overall context disfavored the regionalization process in the North and Northeast, unlike in other Brazilian regions.

Another hypothesis for greater migration may be the lack of care in the municipality of origin in the Northeast, either due to the smaller structure of health units, or failures in health care in smaller municipalities. In the North, natural barriers would make this travel difficult. The precariousness of care in the Northeast and the impossibility of travel in the North could aggravate the clinical condition of children, who would seek more complex care in other municipalities, lengthening the route taken by patients, as already identified by the Brazilian Institute of Geography and Statistics (IBGE)¹⁵.

The need for commute for care is reflected in the increased time for assistance. Assessing the patient's clinical condition and the choice of approach to be adopted are directly linked to the period between exposure and care in poisoning cases¹⁶. Therefore, the delay in care can lead to clinical worsening of patients.

Although 25.3% of hospitalizations occurred outside the place of residence, 37.8% of ICU beds were used in these hospitalizations. This may indicate that children in a more serious condition either did not find appropriate care in their municipality and needed to travel, or a deterioration in their condition occurred caused by commuting for care. As there is a high technological concentration in pediatric ICU beds, they are usually offered only in more populous municipalities. Therefore, the supply of these beds is expected to attract users from nearby municipalities.

There was a marked difference between the death/hospitalization ratio observed in Brazil (0.4%) and in the North (1.1%), Northeast and Southeast (0.6%) and South (0.2%), so that the Southern region was the only one in which the ratio was inferior to the national one. The delay in care and treatment, due to the precariousness of health services in areas of lower socioeconomic status, increases the probability of patient death¹⁷. Thus, both the barriers to travel in the Northern region and the need of commuting for care in the Northeast make it difficult to provide necessary timely hospital care, increasing the chances of death.

Belon et al.¹⁸ also reported the predominance of care in public health units for accident victims in emergencies. As to deaths, Gomes et al.¹⁹ also highlighted the predominance of this indicator in the public sector in Rio Grande do Sul State, when analyzing adult hospitalizations. These findings may indicate that more serious cases are referred to public facilities because they are reference units and/or are complex-care facilities.

Regarding the use of ICU beds, although the South has comparatively fewer neonatal and pediatric complementary beds than the Southeast and the Northeast, there was greater use of ICUs and a lower ratio of deaths/hospitalization in this region, suggesting that more severe patients had greater access to needed care¹². However, as most establishments in the region are affiliated to SUS, an exarcebated use of ICU beds may have occurred due to the providers' choice to meet more specialized and profitable demands over others to increase their revenues²⁰. On the other hand, the lower death/hospitalization ratio suggests that affiliated services may offer better care in complex situations.

The North used, proportionally, more ICU beds than the Southeast, reinforcing the hypothesis that the difficulty of traveling to the health unit aggravates the patient's condition. The Northeast, which had the highest proportion of hospitalizations outside the place of residence, also shows the lowest use of ICU beds.

The regional difference in hospitalizations also reflects the asymmetry regarding the number and distribution of Toxicological Information and Assistance Centers (CIATox) in the national territory. Considering data from the National Toxicological and Pharmacological Information System (SINITOX) and the Brazilian Association of Toxicological Information and Assistance Centers, the Northern Region has only two CIAToxs, whereas São Paulo State has 11. Thus, the size of the region covered by centers varies significantly, which may compromise patient care.

According to SINITOX data, there was no reduction in the number of notifications for drug poisoning in children under 5 during the study period. Therefore, the number of hospitalizations for this cause would be expected to remain constant. However, there was a decrease in the number of hospitalizations for drug poisoning in this population. Although the decrease in hospitalizations may not reflect a reduction in the occurrence of poisonings, it may be related to the decrease in the most serious cases. We highlight the regional differences found regarding hospitalizations outside the place of residence, the use of ICUs and the death/hospitalization ratio.

Further observations are due to other SIH variables. The variable *total ICU days during hospitalization* could not be used, because it did not discriminate one-day hospitalizations. Thus, the measure *amount of hospitalization* proved to be more reliable. Another issue concerns

the death/hospitalization ratio. Although the literature shows lower coverage of death records reported in the SIH in relation to the Mortality Information System²¹, the level of completeness of the variable 'death' was 100%, which made it possible to use it in this study.

As the study involved data from SIH, only hospitalizations within the scope of SUS were considered. The narrow inclusion criteria depended on the completion of AIH, limiting the study. Because it is a descriptive study, it was not possible to establish a causal correlation between the data, but the study allowed detailing of the profile of hospitalizations from drug poisonings among children under 5 and formulating hypotheses on the phenomenon.

CONCLUSION

Given the results, specialized attention for drug poisonings in municipalities is recommended, mapping those that can assist poisoned patients, even offering ICU beds. This planning seems to be essential and determinant for the survival of poisoned children, since it shortens the waiting times and favors the appropriate use of more complex care.

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