

Main Causes of Violent Deaths in Children in Brazil: A Descriptive Study of 277 Cases

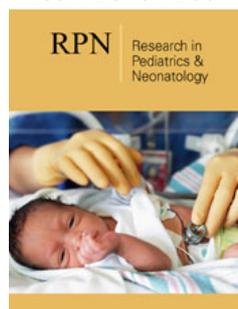
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Abstract

Background: Mortality due to external causes in children under 12 years of age is an important topic that has been little studied in Brazil. Children are often exposed to the risk of accidents. In addition, due to his immaturity, curiosity, and intense growth and development, the child is often prone to accidents and defenseless and vulnerable to violence. This study aims to research and individualize the violent causes of death of children under 12 years of age in the State of São Paulo in 2016. And to specify which type of violence, which type of external cause, in this age group.

Methods: A retrospective study (descriptive cross-sectional document) was developed through reports of autopsy exams performed at the Legal Medical Institutes (IML) of the State of São Paulo in 2016. The Institute only allows access to the data five (5) years after the facts occurred.

Results: Two hundred seventy-seven (277) cases of children aged 0 to 12 years with violent deaths in the State of São Paulo were analyzed. Through the binomial test with $p < 0.001$, boys (62%) had more violent deaths than girls (38%). The most frequent causes of death in our series were Mechanical Asphyxia (48.4%), followed by Head Trauma (27.1%). Violent deaths occurred more frequently in male children, with 1-year-old children being the most affected. Unlike the Health Information System for Notifiable Diseases (SINAN) of the Ministry of Health, the highest number of notifications of Cases of Domestic, Sexual, and other forms of violence in 2016 occurred in females. The female sex stood out more at the ages of 0 and 6 years old, while the male one stood out at the ages of 4 and 9 years old.

Conclusion: The findings of our study are relevant, as they demonstrate that the violent deaths of children under 12 years of age are primarily accidental (choking, being run over, drowning) and can be prevented, provided that public policies for prevention and education are indeed implemented.

Keywords: Cause of death; Child; External causes

Introduction

Few studies concerning mortality from external causes in children under 12 years of age in Brazil. However, according to Jorge MH et al. [1], "due to their inexperience, children are often exposed to the risk of accidents [1]. Furthermore, according to Martins CBD et al. [2], "the child, due to his immaturity, curiosity and intense growth and development, is often prone to accidents, and defenseless and vulnerable to violence" [2]. Recently, Lu C et al. [3] described that 18,673 children annually are victims of tip-over injuries caused by Clothing Storage Units (CSUs) and flat-screen Televisions (TVs) in the US. Most of these children were < 6 years old accounted for 69.9% of furniture and TV tip-over injuries overall [3]. Also, according to Martins CBD et al [4], "accidents and violence in childhood penalize our children and adolescents in the middle of their growth and development stages" [4]. Murakami GF et al [5], for their turn, states that "many basic causes of death in childhood are considered totally or partially preventable by the effective action of health services [5]. The Notifiable Diseases Information System (SINAN) of the Ministry of Health of Brazil, in 2016, showed 12,385 confirmed reports of Domestic, Sexual, and other violence in the State of São Paulo

against children aged 0 to 14 years [6]. 21.26% of all violence notifications occurred in the State of São Paulo in 2016. These numbers are considerably different from the numbers found in developed countries. The rates of violent deaths among children aged 1-14 years, aged 1-14, and 15-19 in England and Wales fell between 1974 and 2008. Among children aged 1-14, the rates fell from 0.6 to 0.2 per 100,000 population between 1974 and 2008. The highest rates are higher in males than in females among all ages [7].

In Wisconsin, between 2000-2002, there were 262 homicides, firearms were the most common method of violent death, and suffocation was the most common unarmed form of violent death in children aged 0-13 years. And males are the most affected [8]. In the United States, in 2015, homicide deaths were the 16th cause of death. It was the third leading cause of death for children aged 1-4 years and the fourth leading cause of death for children aged 5-14 years, with a predominance of male homicide deaths, 4x higher than females. Death from the homicide of children under one year was 2.5 times greater than children aged 1-4 years. With a lower rate of people aged 5-14 years. Being a firearm (70%) is the most common means of homicide [9]. Unintentional firearm deaths declined across the United States of America, for all ages, from 2000 to 2012 [10]. Data on violent causes of death in Brazil are vague, especially those related to death due to violence and the causative agent. It has been challenging to establish the circumstances of occurrences related to violence. It is due to the lack of uniformity and integration of records. A better study of the causes would improve health policies to prevent these violent deaths from recurring [11]. This study aimed to research and individualized the violent causes of death of children under 12 years old in the State of São Paulo in 2016. And to specify which type of violence, which type of external cause, in this age group. Unfortunately, due to the legal norms of the Medicolegal Institute (IML) of São Paulo State, any author can only use the autopsy examinations data after five years of the death.

Method

Retrospective study (documental cross-sectional description) through reports of autopsy examinations at the Medicolegal Institute (IML) of the State of São Paulo in 2016. The medico-legal reports of autopsies were our data source. The study was approved by the Ethics Committee of São Paulo University, and informed consent was waived as the nature of the study. The variables surveyed were: age, sex, place of examination (city/IML), date of death, Police Station responsible for drawing up the OR, the underlying cause of death (identification of the first event, including the agent/instrument that triggered the process of death), the immediate cause of death.

Inclusion criteria

Children of both sexes, under the age of 12 years, 11 months, and 29 days, who were victims of violent deaths, and who were submitted to autopsy at the IML of the State of São Paulo in 2016 [12].

Exclusion criteria

Cases of natural death, deaths of undetermined cause, reports not located in the search program of the IML of the State of SP, and incomplete reports awaiting examinations. In the end, we excluded 132 reports.

Sample size

Two hundred seventy-seven (277) reports met the criteria for the research.

Statistical treatment

All results obtained were tabulated in Microsoft Excel® and quantified for analysis. The choice of measures of central tendency and dispersion of the values that make up the samples, as well as the statistical tests for comparison between them, were based on the types of distribution, defined as non-parametric by the Kolmogorov-Smirnov test according to the SPSS® statistical program version 17.0 (SPSS® Inc; Illinois, USA). Comparisons were made using the Mann-Whitney test, the Binomial test (comparison by gender), Chi-Square test (comparison between vulnerable agents and between most frequent causes of death). The confidence interval established was 95% (significance level of 0.05). In addition, variables like sex, age, agents responsible for the death, and cause of death were studied.

Results

The analysis consisted of 277 children aged 0 to 12 years with violent deaths in the State of São Paulo in 2016. When comparing the incidence of violent deaths between boys and girls, there was a statistical difference between genders through the binomial test. Boys (62%) have more violent deaths than girls (38%) with $p < 0,001$ (Figure 1). Concerning the agents responsible for the deaths, the most frequent were the physicochemical agent (e.g., asphyxia-48.4%) and blunt force trauma (47.7%). This difference was statistically significant ($p < 0,001$ -Chi-Square Test). Our series found that 1,1% of the agents responsible for the deaths were firearms projectiles. Children victims of gunshot wounds were aged above nine years old.

The most frequent causes of death in our series were Mechanical Asphyxia (48.4%), followed by Head Trauma (27.1%). This prevalence was statistically significant ($p < 0,001$ -Chi-Square Test), as shown in Figure 2. It is important to note that the mechanical asphyxia occurred in the age under 3,8 years old ($p < 0,001$ -Kruskal-Wallis test), and it was due to choking by food (milk) when the child was sleeping. All the causes of death are shown in Figure 2. On the other hand, the age distribution of the children was not normal ($p < 0,001$ -Kolmogorov-Smirnov Test), showing: Mean=4.993 years; Standard Deviation=4.11; Fashion=1.0 year (17%), as shown in Figure 3. Regarding gender, there was no difference in the distribution of the causative agent ($p = 0,617$ -Chi-Square Test), as shown in Table 1. There was no difference in the distribution of the cause of death concerning sex (p -value=0.920-Chi-Square Test), as shown in Table 2.

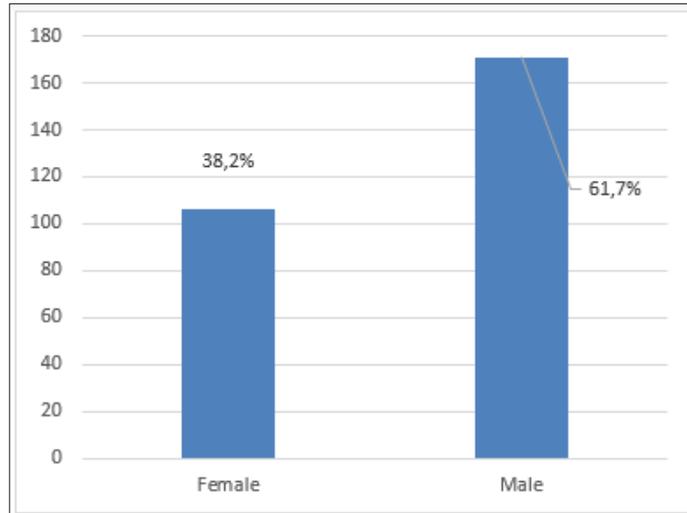


Figure 1: Comparison of violent deaths between boys and girls.

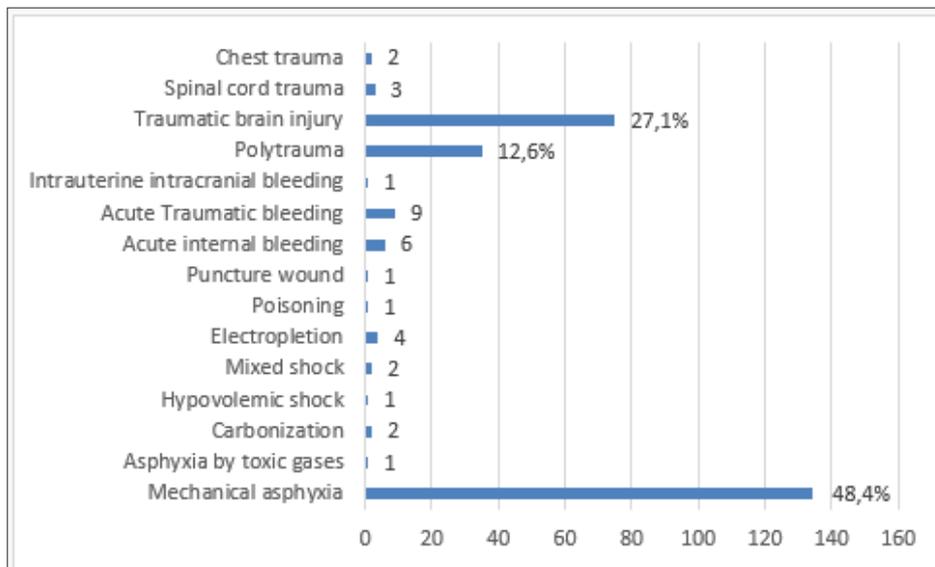


Figure 2: Causes of death.

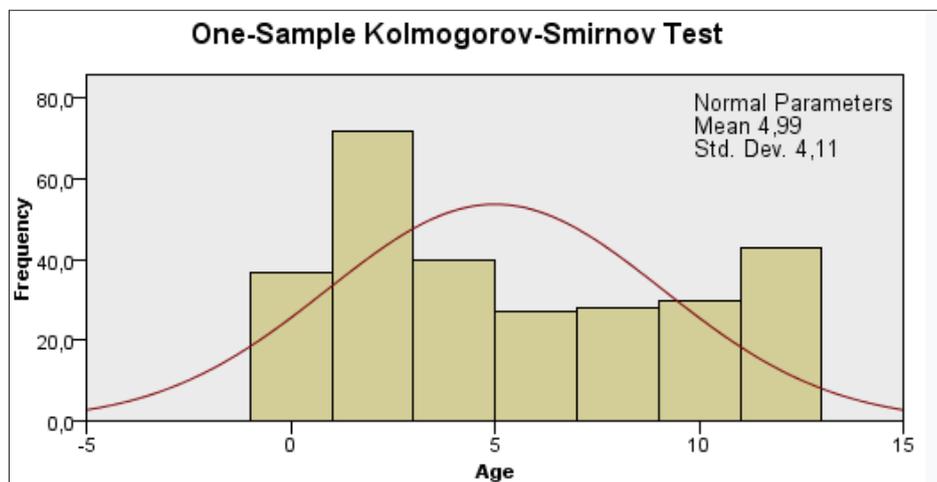


Figure 3: Distribution age of 277 children.

Table 1: Causative agents of death concerning gender.

Female n(%)		Gender		Total
		Male		
		n(%)	n(%)	
Causative Agent (p=0,617 Chi- Square Test)	Blunt force	53(50)	79(46,2)	132(47,7)
	Physical	1(0,9)	5(2,9)	6(2,2)
	Physicochemical	51(48,1)	83(48,5)	134(48,4)
	Firearm projectil	1(0,9)	2(1,2)	3(1,1)
	Chimical	0(0)	2(1,2)	2(0,7)
Total		106	171	277

Table 2: Cause of death concerning sex.

Female n(%)		Gender		Total
		Male		
		n(%)	n(%)	
Cause of death (p=0,920 Chi-Square Test)	Mechanical Asphyxia (direct suffocation and drowning)	51(48,1)	83(48,5)	134(48,4)
	Asphyxia by toxic gases (Carbon Monoxide)	0(0)	1(0,6)	1(0,4)
	Carbonization	0(0)	2(1,2)	2(0,7)
	Hypovolemic shock	0(0)	1(0,6)	1(0,4)
	Mixed shock	1(0,9)	1(0,6)	2(0,7)
	Electricity	1(0,9)	3(1,8)	4(1,4)
	Poisoning	0(0)	1(0,6)	1(0,4)
	Gunshot wound	1(0,9)	0(0)	1(0,4)
	Acute internal bleeding	2(1,9)	4(2,3)	6(2,2)
	Traumatic acute bleeding	3(2,8)	6(3,5)	9(3,2)
	Intracranial hemorrhage	1(0,9)	0(0)	1(0,4)
	Polytrauma	13(12,3)	22(12,9)	35(12,6)
	Traumatic brain injury	31(29,2)	44(25,7)	75(27,1)
	Spinal cord trauma	1(0,9)	2(1,2)	3(1,1)
Chest trauma	1(0,9)	1(0,6)	2(0,7)	
Total		106	171	277

The age distribution was not the same between the sexes (p=0.029-Mann Whitney Test), with ages between 0 and 6 years old having a higher significant frequency of girls and periods between 4 and 9 years old being boys. Besides, the age distribution was also not the same among the causative agents (p<0.001-Kruskal-Wallis test). The agents being significantly more common at the ages are Blunt trauma-3, 9, 11, and 12 years; Physical-11 and 12 years old; Physical-Chemical-0 and 1 year; Punching Perforation-7 years; Chemical-5 years, as shown in Figure 4. Besides, the age distribution was not the same concerning the causes of death [p<0.001-Kruskal-Wallis test], and it was related to the causative agents [p<0.001-

Chi-Square Test], in which the agents have significantly related the following causes of death:

- Blunt Force Trauma (more common in the age range between two and ten years) and consequent acute traumatic bleeding;
- Physical Agent (more common in the age range between seven and eleven years), include electric lesion and carbonization;
- Physicochemical (more common between two and seven years, mainly accidental): Mechanical Asphyxia (direct suffocation and drowning);

- d. Perforation by sharp instrument (more common between ten and eleven years); Perforation Injury; and
- e. Chemical agent (poisoning, more common between four and seven years); primarily due to asphyxia by toxic gases (e.g., carbon monoxide).

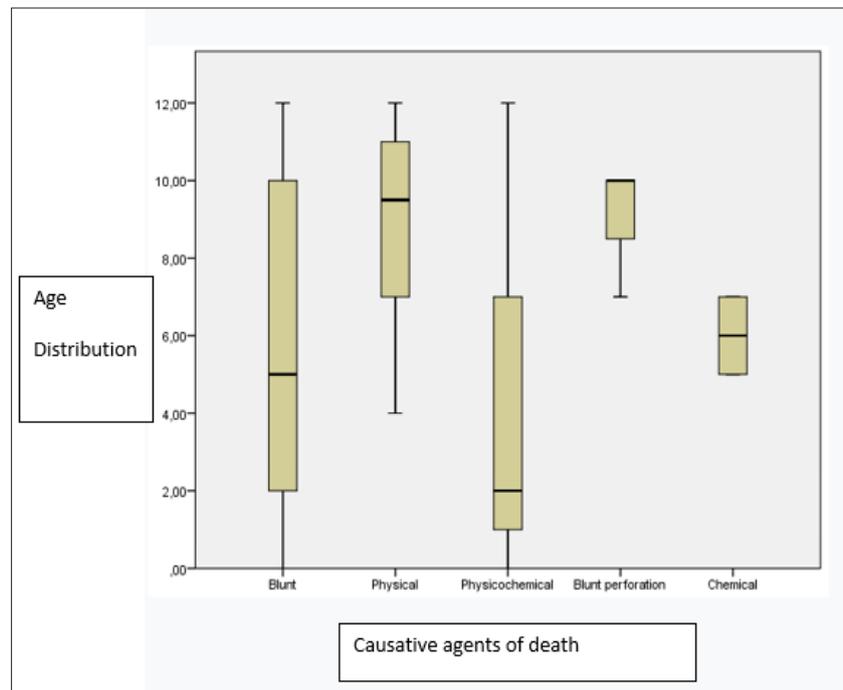


Figure 4: Age distribution concerning causative agents.

Finally, we analyzed the occurrences by region of the State of Sao Paulo, as shown in Figure 5. The capital and most populous city of the state (Sao Paulo City) showed the most significant percentage of the cases (36,76%), followed by the towns of the interior of the state as Campinas (18,01%), Sorocaba (11,39%), São José dos Campos (8,82%) and Ribeirão Preto (6,98%).

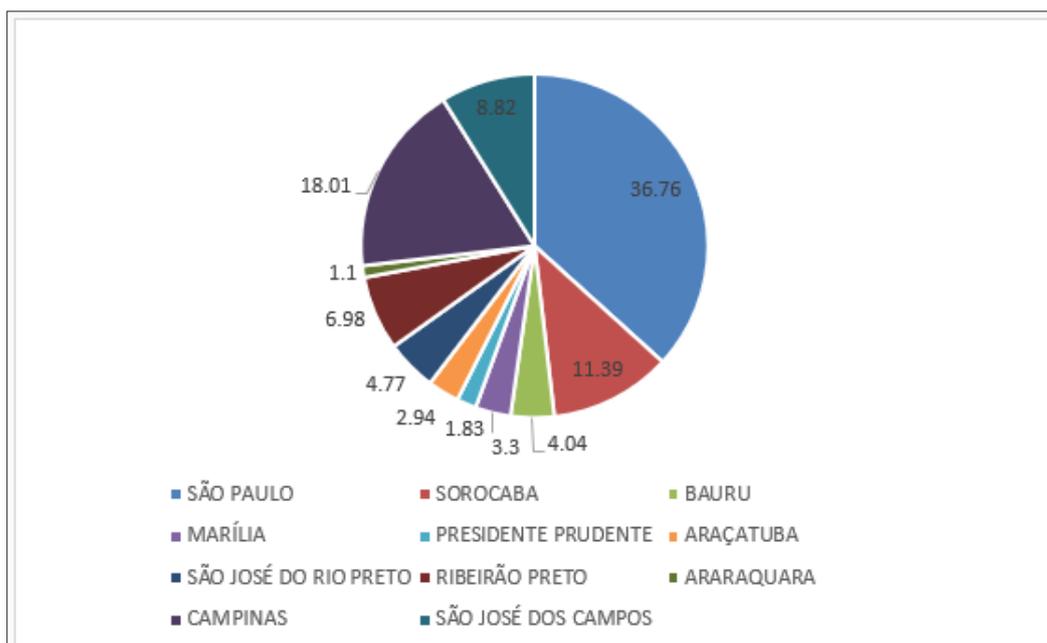


Figure 5: Number of violent deaths registered in each Intermediate Region of the State of São Paulo.

Discussion

In our series, violent deaths happened more frequently in male children, with 1-year-olds most affected. This fact is essential, mainly when comparing these data with other statistics in our country. For example, according to the Notifiable Diseases Information System (SINAN) of the Ministry of Health of Brazil, the highest number of notifications of Cases of Domestic, Sexual, and other forms of violence in 2016 occurred in adult females [13]. However, regarding violent deaths in children concerning other countries [7,9,14,15], the rates of violent deaths in children were more prevalent in males, as we presented in our series. Furthermore, females stood out more at ages 0 and 6, while males stood out at ages 4 and 9. These results were also similar to ours. In our series, the mean age of the victims was 4.9 years, with a statistically significant predominance of males. The most frequent agents were Physical-Chemical, Blunt Force Trauma, and Physical agents (such as electricity), and the most frequent causes of death were mechanical asphyxia (suffocation), Traumatic Brain Injury (TBI), and polytrauma. There was no relationship between sex and the causative agent or cause of death. Blunt agents are significantly more critical at ages 3, 9, 11, and 12 years, in which TBI polytrauma primarily causes death and acute internal bleeding, respectively.

Physical agents were significantly more critical at ages 11 and 12, where electric lesion and carbonization primarily caused death. Physicochemical agents were considerably more harmful at ages 0 and 1 year, in which mechanical asphyxia (choking) mainly caused death. Perforating blunt agents were significantly more important at the age of 7 years, in which perforating injury primarily caused death. Finally, chemical agents were considerably more important at age 5, where asphyxia primarily caused toxic gases and poisoning death. A relevant and worrisome fact was the incidence of firearm-related deaths in the age group between 7 and 9 years of age. Although the number of cases was negligible in our series, preventive measures that limit children's access to firearms must be implemented as a public health policy. On the other hand (and no less worrying) was the high incidence of deaths from mechanical asphyxia (choking by food, usually milk) in young children in our series. These accidental deaths were probably due to some lack of knowledge of parents or guardians. Mainly regarding the physiology of the child. They put the child to sleep after being breastfed. Thus, the child regurgitates and sucks the milk with a terrible result. Of 134 deaths due to mechanical asphyxia, 21 were direct suffocation and milk aspiration. The majority (20 cases) were under one year of age. The other 10 cases were due to drowning in the sea. So, according to age, mechanical asphyxia tends to decrease with age, multiple trauma tends to increase, and traumatic brain injury tends to decrease. Most of these causes of death occurred in older children and were run over by motor vehicles regarding multiple concussions. In these cases, the children played in the street when they were run over. Therefore, public policies to guide drivers must be implemented to be careful, especially when driving in areas with a high concentration of children.

Regarding the deaths by region of the state, the Intermediate Region of São Paulo (cities of São Paulo and Santos) has the highest rates of violent deaths registered. Such a rate may be associated with high demographic concentration, easy access to water in the case of Santos, and its relation with drowning. According to federal statistics in Brazil, the division between Intermediate Regions is made according to the heterogeneity of the territory, requiring a review of Mesoregional units (12). Thus, for example, the Intermediate Region of São Paulo City has the highest rates of violent deaths registered in the State of São Paulo (36.76%), followed by the Intermediate Region of Campinas (18.01%) and the Intermediate Region of Sorocaba (11.39%), as shown in Figure 5. This fact, as we said, is expected considering that these are the most populous regions in the state, and, therefore, the incidence of this type of violent death follows the population density.

Conclusion

The findings of our study were relevant, as they demonstrated that the violent deaths of children under 12 years of age were primarily accidental (choking, being run over, drowning), and they were caused by physical-chemical agents, blunt force trauma, and electricity. These forms of death are preventable, provided that public policies for prevention and education are indeed implemented.

Acknowledgment

Instituto Médico Legal do Estado de São Paulo, Brazil

Conflict of Interest

The authors declare they do not have conflict of interest

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