



## Original Article

# Transport accidents among children and adolescents at the emergency service of a teaching hospital in the southern zone of the city of São Paulo<sup>☆,☆☆</sup>

Carlos Gorios\*, Renata Maia de Souza, Viviane Gerolla, Bruno Maso, Cintia Leci Rodrigues, Jane de Eston Armond

Universidade de Santo Amaro, São Paulo, SP, Brazil

### ARTICLE INFO

#### Article history:

Received 1 May 2013

Accepted 10 October 2013

Available online 14 May 2014

#### Keywords:

Accident prevention

Traffic accidents

Accidents

### ABSTRACT

**Objective:** to describe the victim profile and circumstances of transport accidents involving children and adolescents who were attended at a teaching hospital in the southern zone of the city of São Paulo.

**Methods:** this was an individual observational case series study among patients up to the age of 19 years who were attended at a hospital in the southern zone of the city of São Paulo, state of São Paulo, Brazil, due to traffic accidents. The files notifying suspected or confirmed cases of violence and accidents (SIVVA files) covering January to December 2012 were analyzed.

**Results:** among the 149 cases notified, 64.4% related to males and 35.6% to females. The transport accidents were predominantly among males, irrespective of age. The main injury diagnoses were superficial head trauma (24.8%) followed by multiple non-specified trauma (36.4%), in both sexes.

**Conclusion:** transport accidents among children and adolescents occurred more often among males. The main transport accidents among the children and adolescents attended as emergency cases were caused by motor vehicles and motorcycles. Among the accident victims, the largest proportion was attended because of being run over.

© 2014 Sociedade Brasileira de Ortopedia e Traumatologia. Published by Elsevier Editora Ltda. All rights reserved.

### Acidentes de transporte de crianças e adolescentes em serviço de emergência de hospital de ensino, Zona Sul da cidade de São Paulo

### RESUMO

**Objetivo:** descrever o perfil das vítimas e as circunstâncias dos acidentes de transporte ocorridos com crianças e adolescentes atendidos em hospital-escola na Zona Sul da cidade de São Paulo.

#### Palavras-chave:

Prevenção de acidentes

Acidentes de trânsito

Acidentes

<sup>☆</sup> Please cite this article as: Gorios C, de Souza RM, Gerolla V, Maso B, Rodrigues CL, Armond JE. Acidentes de transporte de crianças e adolescentes em serviço de emergência de hospital de ensino, Zona Sul da cidade de São Paulo. 2014;49:391-395.

<sup>☆☆</sup> Work performed at Grajaú General Hospital, São Paulo, SP, Brazil.

\* Corresponding author.

E-mail: [gorios@terra.com.br](mailto:gorios@terra.com.br) (C. Gorios).

2255-4971/\$ – see front matter © 2014 Sociedade Brasileira de Ortopedia e Traumatologia. Published by Elsevier Editora Ltda. All rights reserved. <http://dx.doi.org/10.1016/j.rboe.2014.04.019>

**Métodos:** trata-se de um estudo individuado observacional de tipo levantamento de casos, com pacientes até 19 anos, que foram atendidos por acidentes de trânsito em hospital na Zona Sul da cidade de São Paulo, estado de São Paulo, Brasil. Foram analisadas as Fichas de Notificação de Casos Suspeitos ou Confirmados de Violência e Acidentes (SIVVA), de janeiro a dezembro de 2012.

**Resultados:** entre os 149 casos notificados, 64,4% correspondem ao sexo masculino e 35,6% ao feminino. Os acidentes de transporte são predominantes no sexo masculino, independentemente da idade. Os principais diagnósticos de lesão foram o trauma superficial da cabeça (24,8%), seguido por trauma múltiplo não especificado (36,4%) em ambos os sexos.

**Conclusão:** os acidentes de transporte entre crianças e adolescentes foram maiores no sexo masculino. Os principais acidentes de transporte entre as crianças e os adolescentes atendidos na urgência foram ocasionados por automóveis e motocicletas. Entre as vítimas de acidentes a maior parte foi atendida por atropelamento.

© 2014 Sociedade Brasileira de Ortopedia e Traumatologia. Publicado por Elsevier Editora Ltda. Todos os direitos reservados.

## Introduction

In Brazil, accidents form the so-called external causes of morbidity and mortality and are the main problem in this regard among children over the age of one year and among adolescents. Accidents are becoming an increasingly important public health problem and therefore greater depth of study on their characteristics, magnitude and impact on people's lives is required.<sup>1,2</sup>

It has to be recognized that hospital morbidity and mortality data present limitations in characterizing the epidemiological profile of accidents and acts of violence. Accidents that do not end in death or hospitalization are not picked up.<sup>3</sup>

From birth until the end of adolescence, the injury mechanisms relating to traffic accidents may vary greatly, either through the gradual increase in the body's resistance, or because of the many types of impact that children may be subjected to at different ages. Being run over is not a risk during the first year of life, just as falling off a motorcycle is not typical at school age.<sup>4</sup>

The term "accidents" is little used internationally in the literature, because of the mistaken interpretation that these are something that is random or unpredictable, and therefore unavoidable or impossible to prevent. Terms like "crash" and "injury" have been used in the English language since they seem not to transmit this connotation. In Brazil, the concept of transport accidents is used as an unintentional but avoidable event. This concept is important because it translates the non-randomness of the event and the possibility of identifying factors that provide conditions for and determinants of intervention and prevention.<sup>5</sup>

According to the definition of the Brazilian Ministry of Health (2001), unintentional and avoidable events cause physical injuries and/or emotional distress within the domestic setting or in other social environments such as work, traffic, school, sports or leisure activities.<sup>3</sup>

Data on hospitalization and death due to injuries in the age group up to 19 years have shown that the highest frequency is in relation to transport accidents. Safety issues in traffic have become a public health problem and they also

involve other sectors, which need to have a commitment toward prevention.<sup>6</sup>

The current view regarding physical injuries is that both intentional and unintentional injuries are considered to be preventable. Their frequency is variable, according to age, gender, social group and geographical region.<sup>6</sup>

The implementation of the information system for surveillance of violence and accidents (SIVVA) in the municipal healthcare network of São Paulo, Brazil, has made it possible to gather data on the locations of occurrence of violence and accidents and to reveal the groups that are more vulnerable and the consequences stemming from these events, so as to establish criteria for interventions that take into account this diversity. The system also enables construction of information on the nature of accidents and for characterizing them.<sup>3</sup>

In 2010, the United Nations Organization (UNO) proclaimed that the period from 2011 to 2020 would be the decade of action for traffic safety and asked countries to reach the target of stabilizing and reducing deaths caused by traffic, through implementing a plan of action aimed toward five intervention pillars: strengthening of management; investment in road infrastructure; vehicle safety; safety behavior among transport users; and pre-hospital and hospital attendance for trauma cases.<sup>7</sup>

In 2012, there were 2238 notified transport accidents among children and adolescents (up to 19 years of age) in the city of São Paulo: 49.1% involved pedestrians, 47.3% involved vehicle occupants and 3.7% were unknown. In the same year, in the southern zone of the city of São Paulo, where our teaching hospital is located, 149 cases of transport accidents involving children and adolescents were notified: 55.8% among pedestrians and 44.2% among motor vehicle occupants. Among cases of being run over in the city of São Paulo, 55.9% were caused by motor vehicles. In our teaching hospital, among the cases of being run over that were attended, 51.2% were due to motor vehicles.

With regard to accidents, according to the characterization of the victim, 46.1% were drivers; while according to the type of vehicle, 43.6% were motorcyclists and 48.2% were on bicycles.

It was not possible to assess the use of helmets and seat belts, or the location of the victim (front or rear seats) in motor

vehicles because of poor filling out of the notification forms. This has resulted in a limitation of this study.

It is known that the majority of emergencies attended in hospitals, especially those resulting from accidental causes, could have been avoided if certain preventive measures had been used. Within this context, studying the causes and circumstances of these adverse events among the children and adolescent population becomes essential for developing strategies for health promotion and for prevention of these events.

The aim of this study was to describe the profile of victims and the circumstances of transport accidents with victims aged up to 19 years who were attended at a teaching hospital in the southern zone of the city of São Paulo.

## Method

This was an individualized descriptive observational study in which cases involving transport accident victims aged up to 19 years were surveyed. These individuals were attended at a hospital in the southern zone of the city of São Paulo, state of São Paulo, Brazil.

The notification forms for suspected or confirmed cases of violence or accidents (SIVVA) relating from January to December 2012 were analyzed at the Medical Attendance and Statistics Service (SAME) of this hospital. The analysis focused on notifications of patients who had been transport accident victims, coded as V01-V99 in the International Classification of Diseases (ICD-10).

In this study, 149 records were analyzed. The inclusion criteria used were the age group and notification of the accidents attended. Subjects who did not meet these criteria were excluded from the study.

The variables selected for the study were: age, sex, origin and diagnoses presented by the patients.

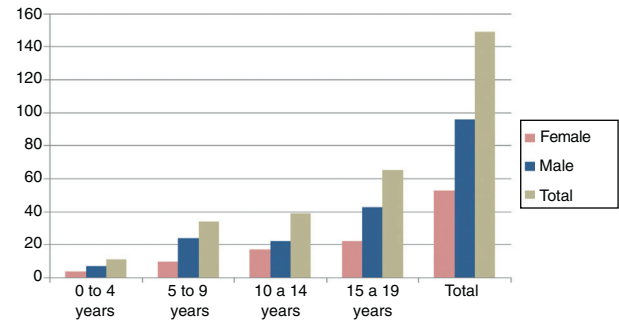
This study conformed to Resolution 196/96 of the National Research Ethics Committee (CONEP) and the National Health Council (CNS) of the Ministry of Health. Moreover, with regard to research ethics issues, the study was submitted to the research ethics committee of Grajaú General Hospital and was approved in accordance with decision report no. 122/2010 of November 17, 2010, with exemption from the need for a free and informed consent statement because the study consisted of surveying information in the SIVVA.

## Results

Among the 149 cases notified, 64.4% were male patients and 35.6% were female patients. Transport accidents predominated among males, independent of age (Fig. 1).

With regard to ethnicity, 32.2% of the victims were whites, 63.8% were of mixed skin color and 4% were black.

According to information on the type of vehicle involved, 42.8% were cars, 40.1% motorcycles, 13.6% bicycles, 2.7% buses and 1.4% were unknown vehicles. Thus, cars and motorcycles were involved most often. Car accidents predominated in the age group from 15 to 19 years (32.3%), as did motorcycle accidents (59.3%) (Fig. 2).



**Fig. 1 – Notified transport accident cases among children and adolescents (up to 19 years of age), according to sex, who were attended at a teaching hospital in the southern zone of the city of São Paulo, in 2012.**

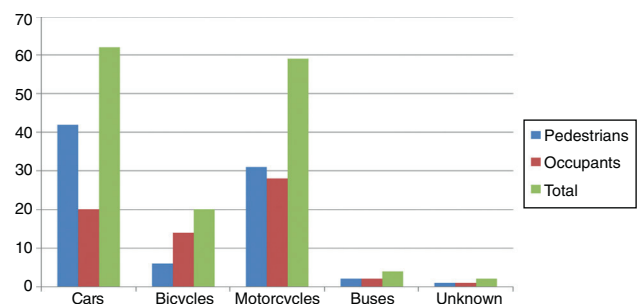
The times at which the accidents occurred were mostly in the afternoons (13:00 to 18:00 h; 38.7%) and in the evening (19:00 to 24:00 h; 26.1%).

The main transport accidents among the children and adolescents attended as emergency cases were caused by cars and motorcycles. Among the victims of accidents due to cars, 55.8% were pedestrians and 44.2% were occupants. Among the accidents due to motorcycles, 52.5% related to pedestrians who were run over.

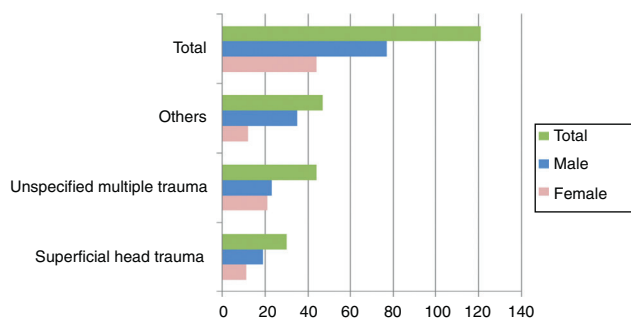
Among the children and adolescents attended at the emergency service, 65.3% were released from hospital, 32.2% were kept under observation and 1.7% were transferred to another service.

The main injuries diagnosed were superficial head trauma (24.8%), followed by unspecified multiple trauma (36.4%), in both sexes (Fig. 3).

The places where the victims lived were: 53.7% in Grajaú and 25.6% in Cidade Dutra, i.e. within the hospital's coverage area; 9.9% in Parelheiros, i.e. within the hospital's area of influence; 0.8% in Capão Redondo; 0.8% in Cachoeirinha; and 9.1% in unknown places.



**Fig. 2 – Notified transport accident cases among children and adolescents (up to 19 years of age), according to type of vehicle involved, who were attended at a teaching hospital in the southern zone of the city of São Paulo, in 2012.**



**Fig. 3 – Injuries diagnosed in transport accidents among children and adolescents (up to 19 years of age), according to sex, who were attended at a teaching hospital in the southern zone of the city of São Paulo, in 2012.**

## Discussion

The teaching hospital is located in the southern zone of the city of São Paulo and covers the area of the city's regional authority of Capela do Socorro.

The region of Capela do Socorro is composed of three administrative districts: Grajaú, Cidade Dutra and Socorro. Its population in 2011 was estimated to be 598,039 inhabitants, i.e. 5.3% of the total population of the city of São Paulo. One characteristic of this region is that it is composed of a young population; 32.9% are children and adolescents (up to 19 years of age). The most populous administrative district is Grajaú, which accounts for 60.8% of the population of Capela do Socorro.<sup>8</sup>

Among the children and adolescents attended by the hospital's emergency service, 53.7% lived in Grajaú, the most populous district of the region and the one that also presents the greatest number of children and adolescents (35.5%).

Studies on mortality in traffic in developed countries have identified that during economic growth there are increases in the vehicle fleet and in mortality rates. According to Moraes Neto et al.,<sup>7</sup> Brazil is among the countries with the highest numbers of deaths in traffic. This is the primary cause of death in the group of patients with injuries due to external causes for the age group from 10 to 14 years, and males predominate in hospital admissions and deaths due to traffic accidents.

In the present study, transport accidents with victims who were children or adolescents affected males more frequently. Studies by Caixeta et al.<sup>9</sup> and Almeida et al.<sup>10</sup> presented results relating to predominance of males among the young victims of transport accidents, which corroborate other studies.

Traffic accidents are an important public health problem because of their great impact on morbidity and mortality, particularly among the young male population.<sup>11</sup>

The main types of vehicles were cars and motorcycles, and the victims were pedestrians. With regard to projects aimed toward prevention of being run over, which is the main problem in the case of children and adolescents, some measures are directed specifically to these groups and other measures benefit all users of public roads, covering educational actions, policing, urban design and landscaping.<sup>12</sup>

Education relating to traffic, especially for the infant and child population, is one of the instruments that may contribute in the medium and long terms toward reducing the alarming traffic accident rates. Traffic that really is safe will only be achieved when citizens are more aware of their individual responsibilities and more respectful of the rights of others. A society in which its citizens more readily develop these values may be attained if, from an early age, children and adolescents are educated such that, when they reach adulthood, they become pedestrians and, especially, drivers who have greater awareness.<sup>12</sup>

As shown in this study, the accidents occurred during the afternoons or evenings. The age group most affected was between six and ten years of age. From the observed times of the accidents, the victims may have been coming out of school or doing leisure activities on public roads.

The greater proportion of males in transport accidents may be related to the greater freedom granted to boys, to play on the streets and close to highways. Boys also start to go to school on their own at an earlier age than girls, which gives rise to greater rates of being run over than among girls. Thus, more continuous surveillance over females would perhaps contribute toward lower exposure among children and adolescents of this sex.<sup>13</sup>

It was not possible to assess whether the children and adolescents were involved in accidents at the time of coming out of school or whether they were playing in the streets. This information was not found in the accident notification files.

According to Sallum and Koizumi,<sup>14</sup> the frequency with which limbs and the head are injured among accident victims is widely described in the literature. Our findings confirmed the previous data, and also the high frequency of head injuries among pedestrians. These data are extremely important in relation to prevention and for attending the victims.

In this study, the main victims were pedestrians and the main injury diagnosis was superficial head trauma.

A study conducted by Anjos et al.<sup>15</sup> in São Paulo in 2007 found that in 60% of the deaths due to traffic accidents, the victim was a pedestrian. The percentage rose to 75% when only the deaths among children under the age of 15 years were taken into consideration.

Another interesting point demonstrated in this study is that motorcyclists were the group that most frequently had accidents, and that pedestrians were in second position. This shows and proves the vulnerability that these groups have on public roads. On a daily basis, they are exposed to higher risks, as proclaimed by mass-circulation newspapers. The motorcycle couriers interviewed already had records in their medical files at Hospital das Clínicas of several occurrences of health problems, thereby giving rise to high-cost treatments with the implication of significant expenditure for the public health-care services.<sup>15</sup>

The major motorcycle manufacturing companies and the vehicle insurance companies do not bear the costs that these patients produce in hospitals. The companies keep on making it easier to buy motorcycles, through low cost and various installment plans. They should invest more in these motorcyclists' safety and in education regarding traffic, given that in the accidents due to motorcycles seen in this study, 71% of the victims were pedestrians.<sup>15</sup>

Occurrences of pedestrians being run over by cars and motorcycles, especially in younger age groups, reveals that there is a need to stimulate drivers and motorcyclists to be more attentive to traffic and to the movements of nearby children, given that children often are unable to gauge the time that a vehicle takes to travel a certain distance. Moreover, there is a fundamental need to expand appropriate leisure areas, so that having children playing and running in the streets can be avoided.<sup>13</sup>

In relation to children who are pedestrian victims of transport accidents, the head trauma and multiple trauma suffered show their total exposure and lack of protection. Thus, it can be affirmed that the only measure for reducing these injuries would really be to avoid occurrences of this type of accidents.<sup>13,16,17</sup>

## Conclusions

Transport accidents involving children and adolescents occurred more often among males.

The main transport accidents among children and adolescents who were attended as emergency cases were caused by cars and motorcycles. Among the accident victims, the largest proportion was attended due to being run over.

The main injuries diagnosed were superficial head trauma, followed by unspecified multiple trauma, in both sexes.

## Conflicts of interest

The authors declare no conflicts of interest.

## REFERENCES

1. Malta DC, Mascarenhas MDM, Silva MMA, Macário EM. Perfil dos atendimentos de emergência por acidentes envolvendo crianças menores de dez anos – Brasil, 2006 a 2007. *Ciênc Saúde Colet.* 2009;14(5):1669–79.
2. Gawryszewski VP, Coelho HM, Scarpelini S, Zan R, Jorge MH, Rodrigues EM. Land transport injuries among emergency department visits in the state of São Paulo, in 2005. *Rev Saude Publica.* 2009;43(2):275–82.
3. Prefeitura Municipal de São Paulo. Secretaria Municipal de Saúde. Coordenação de Vigilância em Saúde. Sistema de Informação para a Vigilância de Violências e Acidentes (SIVVA). São Paulo, 2007. Disponível em: [portal.saude.gov.br/portal/arquivos/pdf/viva\\_2006\\_2007.pdf](http://portal.saude.gov.br/portal/arquivos/pdf/viva_2006_2007.pdf).
4. Wasksman R, Pirito RM. O pediatra e a segurança no trânsito. *J Pediatría.* 2005;81(5):181–8.
5. Moraes Neto OL, Malta DC, Mascarenhas MD, Duarte EC, Silva MM, Oliveira KB, et al. Fatores de risco para acidentes de transporte terrestre entre adolescentes no Brasil: Pesquisa Nacional de Saúde do Escolar (Pense). *Ciênc Saúde Colet.* 2010;15 Suppl 2:3043–52.
6. Gaspar VLV, Lamounier JA, Cunha FM, Gaspar JC. Fatores relacionados a hospitalizações por injúrias em crianças e adolescentes. *J Pediatría.* 2004;80(6):447–52.
7. Moraes Neto OL, Montenegro MM, Monteiro RA, Siqueira Júnior JB, Silva MM, Lima CM. Mortalidade por acidentes de transporte terrestre no Brasil na última década: tendência e aglomerados de risco. *Ciênc Saúde Colet.* 2012;17(9):2223–36.
8. Prefeitura Municipal de São Paulo. Secretaria Municipal de Saúde. Tabnet. Violências e acidentes: acidentes de transporte. Disponível em: <http://www.prefeitura.sp.gov.br>
9. Caixeta CR, Minamisava R, Oliveira LM, Brasil VV. Morbidade por acidentes de transporte entre jovens de Goiânia. *Goiás Ciênc Saúde Colet.* 2010;15(4):2075–84.
10. Almeida LVC, Pignatti MG, Espinosa MM. Principais fatores associados à ocorrência de acidentes de trânsito na BR-163, Mato Grosso. Brasil, 2004. *Cad Saúde Pública.* 2009;25(2):303–12.
11. Marín-Leon L, Belon AP, Barros MB, Almeida SD, Restitutti MC. Tendência dos acidentes de trânsito em Campinas, São Paulo. Brasil: importância crescente dos motociclistas. *Cad Saúde Pública.* 2012;28(1):39–51.
12. Faria EO, Braga MG. Propostas para minimizar os riscos de acidentes de trânsito envolvendo crianças e adolescentes. *Ciênc Saúde Colet.* 1999;4(1):95–107.
13. Martins CB, Andrade SF, Soares DA. Morbidade e mortalidade por acidentes transportes terrestres entre menores de 15 anos no município de Londrina. *Paraná Ciênc Cuid Saúde.* 2007;6(4):494–501.
14. Sallum AM, Koizume MS. Natureza e gravidade das lesões em vítimas de acidente de trânsito de veículo a motor. *Rev Esc Enferm USP.* 1999;33(2):157–64.
15. Anjos KC, Evangelista MR, Silva JS, Zumioti AV. Paciente vítima de violência no trânsito: análise do perfil socioeconômico, características do acidente e intervenção do Serviço Social na emergência. *Acta Ortop Bras.* 2007;15(5):262–6.
16. Posner JC, Liao E, Winston FK, Cnaan A, Shaw KN, Durbin DR. Exposure to traffic among urban children injured as pedestrians. *Inj Prev.* 2002;8(3):231–5.
17. Boström L, Nilsson B. A review of serious injuries and deaths from bicycle accidents in Sweden from 1987 to 1994. *J Trauma.* 2001;50(5):900–7.