

## Research Article

# Facial Trauma among Children and Adolescents Victims of Traffic Accidents

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## Abstract

**Introduction:** In the literature there are several studies on facial trauma, but the epidemiology of these lesions is not well characterized regarding children and adolescents. Therefore, this study aimed to identify the prevalence of facial trauma among Brazilian children and adolescents victims of traffic accidents.

**Materials and Methods:** A cross-sectional study was performed from 196 reports of children and adolescents undergoing forensic examination for a period of four years in a Forensic Unit located in a metropolitan area of Northeast Brazil. The statistical analysis included the calculation of absolute frequencies and percentages of the variables and a chi-square test ( $p < 0.05$ ) in order to identify possible associations.

**Results:** A total of 21.1% of the victims had facial trauma. The average age of victims was 13.23 (SD = 4.77). Most of the victims were male (68.4%), belonging to the age group 12-18 years (69.9%) from rural areas (56.5%). The most common type of traffic accident was motorcycle accident (52.6%), mainly occurring during the day (55.8%) and during weekdays (72.5%). Trauma cases prevailed in lower limbs (36.1%), followed by multiple trauma cases (33.0%). Moreover, the majority of facial trauma was in soft tissue areas (63.4%) and in more than one third of the face (50.0%). The presence of facial trauma was associated with the type of accident ( $p = 0.030$ ) and the time of day ( $p = 0.012$ ).

**Conclusions:** Most victims were adolescents; most cases occurred during weekdays and motorcycle accidents constituted the main etiologic agent.

**Keywords:** Traffic Accident; Child; Adolescent

## Introduction

Despite the initiatives in different regions of the world aimed at preventing injuries and deaths from traffic accidents, many people fall victim every day, making traffic accidents a major public health issue that needs to be addressed through a multidisciplinary approach [1-3].

The epidemiology of facial fractures in pediatric and adolescent patients differs among countries, and these differences are strongly influenced by social, environmental, educational and cultural factors [4-7]. In addition, the occurrence of traffic-related trauma may vary greatly from birth to late adolescence due to the gradual increase in body resistance or even by several types of impact to which the individual is vulnerable in different age groups [8].

Facial trauma may occur in isolation or in combination with other serious injuries such as intracranial lesions, lesions of the spine and lower limbs and although its occurrence among children and adolescents is generally lower if compared to the adult age group, it may have different clinical and epidemiological characteristics [5, 6, 9].

The face involves hard and soft tissues extending superiorly from the frontal bone and inferiorly to the jaw. It is one of the most exposed regions of the body to trauma capable of causing lesions in skeleton components, teeth and the soft tissues of the face [10].

Although in the literature there are several studies on facial trauma, the epidemiology of these lesions is not well characterized regarding children and adolescents [11]. Data on the distribution of traumas resulting from traffic accidents and their consequences are vital, as they help in planning and improving health care systems and social support systems, as well as in the implementation of public health laws and initiatives in order to prevent and/or reduce the number of deaths and disabilities resulting from traffic accidents [7,8,12,13].

Moreover, in view of the possibility of verifying changes in tendencies and complexities of maxillofacial trauma among children and adolescents, this study aimed to identify the prevalence of facial trauma in Brazilian children and adolescent's victims of traffic accidents.

## Materials and Methods

The study consisted of a cross-sectional and census type study, conducted from secondary data from children and adolescents who sought a Forensic Medical Service to perform "corpus delicti" examination in order to record the extent of injuries caused by the events. The analyzed reports related to living people, from the age group 0-18 years, both sexes, living in urban or rural areas of a metropolitan region located in northeastern Brazil, which has a population close to 687, 545 inhabitants.

All reports of individuals who have had some kind of body or facial trauma recorded in the four-year period (January 2008 to December 2011) due to non-fatal land transport accidents were included. Institution’s employees who, at the time of the examination, were legal experts filled these reports.

To organize the information, a form has been structured and divided in two parts according to the information provided in reports of victims. It consisted of a first identificatory part and a second part covering information related to the accident event. Prior to the survey, a pilot study was conducted and calibration procedures, aiming to verify possible faults or errors, were made.

The age of the victims was categorized according to the Brazilian Statute for Children and Adolescents, which recognizes a child as an individual who has up to twelve incomplete years, and a teenager as an individual who has between twelve and eighteen years [14]. Other variables related to victims were categorized as follows: sex (male/female) and region of residence (urban/rural). The variables related to accidents were type of accident (car/motorcycle/ trampling), day of the week in which the event occurred (weekdays /weekend) and time of occurrence (day/night). Variables related to trauma presented by victims were presence of facial trauma (yes/no), affected region of the body (head/face/neck/arm/leg/chest/abdomen/more than one), type of facial trauma (lesions in soft tissues/bone fracture/dentoalveolar fracture) and area of the face affected (upper third/middle third/lower third/more than one third).

Absolute and percentage frequencies of the studied variables were calculated and then a chi-square test ( $p < 0.05$ ) was made in order to investigate possible associations between the presence/absence of facial trauma (dependent variable) and variables related to the characteristics of victims and accidents (independent variables). The adopted confidence interval was 95%.

This study followed national and international standards on ethics in research with human beings and it was approved by the ethics committee of independent research (No. 0652.0.133.203-11). The recommendations highlighted in the “STROBE Statement” [15] were complied.

## Results

196 reports were evaluated. Of this total, 59 were children aged 0-11 years and 137 were adolescents aged 12-18 years. The average age of the victims was 13.23 (SD = 4.77) and the ratio of male and female individuals was 2.16:1.

Table 1 shows absolute and percentage distributions of data related to sociodemographic characteristics of victims. It was found that cases of males (68.4%), in the 12-18 years age group (69.9%), resident in rural areas (56.5%), prevailed.

Table 2 shows absolute and percentage distributions of data related to sociodemographic characteristics of accidents. It was observed that cases of motorcycle accidents (52.6%), followed by trampling (28.9%), mainly occurring during the day (55.8%) and during weekdays (72.5%), prevailed.

Table 3 describes absolute and percentage distributions of data related to victims’ injuries. The prevalence of facial trauma was

**Table 1:** Absolute and percentage distributions of data related to sociodemographic characteristics of victims.

Variable	n	%
Sex [196]		
Male	134	68.4
Female	62	31.6
Age group [196]		
0-11 years	59	30.1
12-18 years	137	69.9
Region of residence [193]		
Urban area	84	43.5
Rural area	109	56.5

**Table 2:** Absolute and percentage distributions of data related to the characteristics of accidents.

Variable	n	%
Type of accident [194]		
Automobile	36	18.6
Motorcycle	102	52.6
Trampling	56	28.9
Time of occurrence [163]		
Day	91	55.8
Night	72	44.2
Day of occurrence [189]		
Weekdays	137	72.5
Weekends	52	27.5

21.1%. Trauma cases prevailed in the lower limbs (36.1%), followed by multiple trauma cases (33.0%). Moreover, the majority of facial trauma was in soft tissue areas (63.4%) and in more than one third of the face (50.0%).

Table 4 shows the distribution of facial trauma presence/absence according to the characteristics of victims and accidents. After analyzing the results of the chi-square test ( $p < 0.05$ ), it was observed the following results: sex ( $p = 0.065$ ), age ( $p = 0.333$ ), place of residence ( $p = 0.438$ ), type of accident ( $p = 0.030$ ), time of occurrence ( $p = 0.012$ ), day of occurrence ( $p = 0.118$ ).

Figure 1 shows the distribution of victims according to the type of accident according to age. It was observed that, while adolescents were more involved in automobile and motorcycle accidents, children suffered most trampling.

## Discussion

The significant increase of the number of vehicles on the roads has led to an increase in the number of traffic accidents that are often associated with the occurrence of maxillofacial injuries. Children and adolescents are among the most victimized [16, 17].

The present study demonstrated that the prevalence of facial trauma among children and adolescents was 21.1%. A study by Cavalcanti et al. [18] in the same study area, but analyzing hospital-based data, found that 15.8% of the victims presented facial fractures.

**Table 3:** Absolute and percentage distributions of data related to victims' lesions.

Variable	n	%
Presence of facial trauma [194]		
Yes	41	21.1
No	153	78.9
Body region [194]		
Head	7	3.6
Face	20	10.3
Neck	1	0.5
Upper limbs	27	13.9
Lower limbs	70	36.1
Chest	1	0.5
Abdomen	4	2.1
More than one	64	33.0
Type of facial trauma [41]		
Soft tissue	26	63.4
Bone fracture	11	26.8
Dentoalveolar fracture	4	9.8
Third of face hit [40]		
Upper third	13	32.5
Middle third	4	10.0
Lower third	3	7.5
More than one	20	50.0

Another study developed in Chile identified a prevalence of 6% of facial fractures in children [7]. Trauma to the facial region may result in physical, emotional, social and economic consequences, negatively impacting the quality of life of victims and overloading the health system [9, 10, 19-22].

The prevalence of trauma resulting from traffic accidents illustrates the need to strengthen and expand the legislation destined to prevent traffic accidents, and thus to reduce the resulting consequences of injuries among children and adolescents.

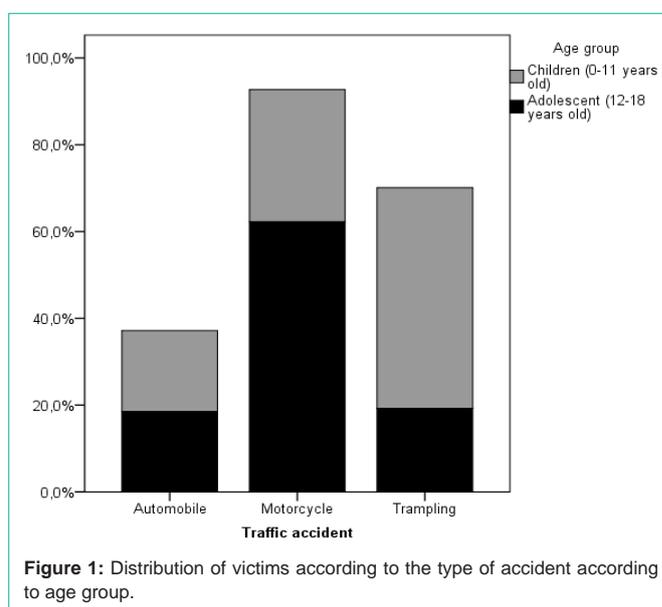
The most victimized sex, both pediatric and adolescent, was male. The ratio identified between men and women was 2.16:1. A study conducted by Collao-González et al. [7] showed that, among Chilean children, the proportion of boys and girls was 3.5:1, supporting the hypothesis that boys are more victimized than girls. A study conducted in Norway also obtained results that suggest a higher male victimization [23].

Adolescents aged from 12 to 18 suffered more facial trauma than children with 0-11 years. Similar results were observed in the literature [6]. Cavalcanti et al. [18] reported that the most affected age group was 1-4 years. This difference may be explained by the fact that they included in their sample cases of trauma resulting from etiologic agents other than traffic accidents, such as aggression and falls.

The prevalence of maxillofacial fractures is generally higher in large cities, among other reasons due to heavy traffic and violence. The causes, types and location of these fractures seem to change according to the geographical location [12]. However, there was no

**Table 4:** Distribution of presence/absence of facial trauma according to the characteristics of victims and accidents.

Variables	Presence of facial trauma				Total	p
	Yes	%	No	%		
Sex						0.065
Male	23	17.4%	109	82.6%	132	
Female	18	29.0%	44	71.0%	62	
Age group						0.333
0-11 years	15	25.4%	44	74.6%	59	
12-18 years	26	19.3%	109	80.7%	135	
Region of residence						0.438
Urban zone	20	24.1%	63	75.9%	83	
Rural zone	21	19.4%	87	80.6%	108	
Type of accident						0.030
Automobile	13	37.1%	22	62.9%	35	
Motorcycle	20	19.8%	81	80.2%	101	
Trampling	8	14.3%	48	85.7%	56	
Time of occurrence						0.012
Day	14	15.6%	76	84.4%	90	
Night	23	32.4%	48	67.6%	71	
Day of occurrence						0.118
Weekdays	33	24.3%	103	75.7%	136	
Weekends	7	13.7%	44	86.3%	51	



statistically significant difference when analyzing the occurrence of facial trauma and the place of residence of the victim.

Regarding the type of accident, cases of motorcycle accidents followed by trampling prevailed. By analyzing the distribution of types of accidents according to the age of the victims, it was observed that, among trampling victims, children prevailed. The occurrence of pedestrian trampled by motorcycles and cars, especially in younger

age groups, reflects the need to encourage the drivers of these vehicles to beware the transit and the movement of children nearby, for they often fail to realize the time a vehicle takes to reach a certain distance [8].

Regarding the time of day, it was observed that most of the events occurred during the day and during weekdays. This finding can probably be explained by the fact that, during the week, children and adolescents have to go to school and, therefore, they become more vulnerable.

The most affected body region was lower limbs. In relation to the face, it was observed that situations in which more than one third of the face was hit prevailed. The literature shows that children, when compared with younger teenagers, have a more prominent front projection of the skull. Consequently, central cranial and facial lesions are more common in children and babies, whereas lesions in the lower third of the face are more common in adolescents, suggesting differences in the occurrence of age-related maxillofacial fractures [11].

The most common type of facial trauma was soft tissue injuries. A study conducted in Norway found that lesions in soft tissues, including lacerations, bruises, contusions and abrasions, were the most common lesions resulting from traffic accidents [23]. Soft tissue injuries, although not life threatening in most cases, may require a complex treatment and they generate a significant impact on the function and the patient's facial aesthetics [24]. Therefore, the diagnosis, the correct handling and interdisciplinary cooperation among general surgeons, plastic surgeons, bucomaxillofacial and ophthalmologists is essential [12].

A limitation of this study is due to the fact that it is cross-sectional, and therefore cannot establish causal relationships. Another limitation was due to the use of secondary data, which do not always present complete information.

It was not possible to evaluate the use of helmets and safety belts and the location of the victim (front or back seat) in motor vehicles. It is interesting that future researches address other age groups and compare the differences in victimization according to life-cycle stages.

This study provided a specific vision of the distribution of facial trauma in children and adolescents. It is expected that the results may contribute to epidemiological surveillance of health outcomes in the studied population and support decision-making.

## Conclusions

It was concluded that the most victimized individuals were male adolescents, resident in rural areas and involved in motorcycle accidents. Most accidents happened during the day and during weekdays. Furthermore, the most affected area of the body were the lower limbs. The most common situations of facial traumas were in more than one third of the face, and the most common type of facial trauma injury was soft tissue injury.

## References

1. Fraga AM, Fraga GP, Stanley C, Costantini TW, Coimbra R. Children at danger: injury fatalities among children in San Diego County. *Eur J Epidemiol*. 2010; 25: 211-217.
2. Gopalakrishnan S. A public health perspective of road traffic accidents. *J Family Med Prim Care*. 2012; 1: 144-150.
3. Olayemi AB, Adeniyi AO, Samuel U, Emeka OA. Pattern, severity, and management of cranio-maxillofacial soft-tissue injuries in Port Harcourt, Nigeria. *J Emerg Trauma Shock*. 2013; 6: 235-240.
4. Kumaraswamy SV, Madan N, Keerthi R, Singh DS. Pediatric injuries in maxillofacial trauma: a 5 year study. *J Maxillofac Oral Surg*. 2009; 8: 150-153.
5. Kraft A, Abermann E, Stigler R, Zsifkovits C, Pedross F, Kloss F, Gassner R. Craniomaxillofacial trauma: synopsis of 14,654 cases with 35,129 injuries in 15 years. *Craniomaxillofac Trauma Reconstr*. 2012; 5: 41-50.
6. Kim SH, Lee SH, Cho PD. Analysis of 809 facial bone fractures in a pediatric and adolescent population. *Arch Plast Surg*. 2012; 39: 606-611.
7. Collao-González C, Carrasco-Labra A, Sung-Hsieh HH, Cortés-Araya J. Epidemiology of pediatric facial trauma in Chile: a retrospective study of 7,617 cases in 3 years. *Med Oral Patol Oral Cir Bucal*. 2014; 19: 99-105.
8. Gorios C, Souza RM, Gerolla V, Maso B, Rodrigues CL, Armond JE. Transport accidents among children and adolescents at the emergency service of a teaching hospital in the southern zone of the city of São Paulo. *Rev bras ortop*. 2014; 49: 391-395.
9. Chao MT, Losee JE. Complications in pediatric facial fractures. *Craniomaxillofac Trauma Reconstr*. 2009; 2: 103-112.
10. Bali R, Sharma P, Garg A, Dhillon G. A comprehensive study on maxillofacial trauma conducted in Yamunanagar, India. *J Inj Violence Res*. 2013; 5: 108-116.
11. Imahara SD, Hopper RA, Wang J, Rivara FP, Klein MB. Patterns and outcomes of pediatric facial fractures in the United States: a survey of the National Trauma Data Bank. *J Am Coll Surg*. 2008; 207: 710-716.
12. Kamulegeya A, Lakor F, Kabenge K. Oral maxillofacial fractures seen at a Ugandan tertiary hospital: a six-month prospective study. *Clinics*. 2009; 64: 843-848.
13. Grivna M, Barss P, Stanculescu C, Eid HO, Abu-Zidan FM. Child and youth traffic-related injuries: use of a trauma registry to identify priorities for prevention in the United Arab Emirates. *Traffic Inj Prev*. 2013; 14: 274-282.
14. Brazil. Law no. 8.069. Treats of the Statute of the Child and Adolescent, and take other measures. July 13, 1990 [Access on: Feb 15, 2014].
15. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, STROBE Initiative. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *BMJ*. 2007; 335: 806-808.
16. Singh G, Mohammad S, Pal US, Hariram, Malkunje LR, Singh N. Pediatric facial injuries: It's management. *Natl J Maxillofac Surg*. 2011; 2: 156-162.
17. Bodalal Z, Bendardaf R, Ambarek M. A study of a decade of road traffic accidents in Benghazi-Libya: 2001 to 2010. *PLoS One*. 2012; 7: 1-7.
18. Cavalcanti AL, Assis KM, Cavalcante JR, Xavier AFC, Aguiar YPC. Maxillofacial traumatism in children and adolescents in Campina Grande, Brazil. *Pesq Bras Odontoped Clin Integr*. 2012; 2: 439-445.
19. Alexandrescu R, O'Brien SJ, Lecky FE. A review of injury epidemiology in the UK and Europe: some methodological considerations in constructing rates. *BMC Public Health*. 2009; 9: 226.
20. Kramer DN, Landolt MA. Early psychological intervention in accidentally injured children ages 2-16: a randomized controlled trial. *Eur J Psychotraumatol*. 2014; 5.
21. Arnberg FK, Rydelius PA, Lundin T. A longitudinal follow-up of posttraumatic stress: from 9 months to 20 years after a major road traffic accident. *Child Adolesc Psychiatry Ment Health*. 2011; 5: 8.
22. Wittmann L, Zehnder D, Jenni OG, Landolt MA. Predictors of children's sleep onset and maintenance problems after road traffic accidents. *Eur J Psychotraumatol*. 2012; 3.

23. Søreide K, Krüger AJ, Ellingsen CL, Tjosevik KE. Pediatric trauma deaths are predominated by severe head injuries during spring and summer. Scand J Trauma ResuscEmerg Med. 2009; 17: 3.
24. Kretlow JD, McKnight AJ, Izaddoost SA. Facial soft tissue trauma. SeminPlast Surg. 2010; 24: 348-356.