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ORIGINAL ARTICLE

Factors associated with children and teenagers' trauma of victims treated at a referral center in southern Brazil

Fatores associados a crianças e adolescentes vítimas de trauma atendidas em um centro de referência no sul do Brasil

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Abstract

Introduction: Physical trauma is one of the most common causes of death and disability in children's development and adolescents. By consequence, pediatric trauma is a topic that needs further studies. OBJECTIVE: The identification of factors associated with child and adolescent victims of trauma treated at a referral center in Southern Brazil relating to trauma in children and adolescents from birth to age 14 years treated in a hospital emergency room. **Methods**: A retrospective study using secondary data from a hospital service, performed the analysis of associated factors among 375 children and adolescents (range 0-14 years) admitted to the emergency room for any kind of physical trauma and the variables described about the traumas. The period was June 14 to December 14, 2013. **Results**: Most patients were male (65.1%), white (89.1%); they were attended nightly (45.9%) and belonging to the age group 10-14 years (40.3%), head and neck prevailed in number occurrences with 33.6% of cases, followed by the upper and lower limbs 27.7% and 26.9%, respectively. Falls represented 45.6% of cases, followed by exposure to inanimate mechanical forces (12%) and exposure to animated mechanical forces (5.9%). The neurosurgery service was the most referenced for younger age groups, while for the older groups were the maxillofacial services (p = 0.001). **Conclusion**: This study showed results that draw the community's attention not only academic, but also to call the attention of caregivers to work with constant prevention alternatives to the monitoring of the course of children's development.

Keywords: Adolescent. Injuries. Trauma. Child. Children's Development. Emergency Medical Services.

Resumo

Introdução: O trauma físico é uma das causas mais comuns de morte e incapacidade no desenvolvimento infantil e dos adolescentes. Por consequência, o trauma pediátrico é um tema que carece de mais estudos. **Objetivo**: identificar fatores associados com crianças e adolescentes vítimas de traumas, que haviam sido atendidas em um centro de referência no sul de Brasil relacionando ao trauma em crianças e adolescentes desde o nascimento até os 14 anos, tratados na emergência de um hospital. **Método**: Estudo retrospectivo com dados secundários de um serviço hospitalar em que foi realizada a análise dos fatores associados entre 375 crianças e adolescentes (intervalo 0-14 anos) admitidos na sala de emergência por qualquer tipo de trauma físico e as variáveis descritas acerca dos traumas sofridos. O período foi de 14 junho a 14 dezembro de 2013. **Resultados**: A maioria dos pacientes era do sexo masculino (65,1%), da raça branca (89,1%), que haviam sido atendidos principalmente no turno da noite (45,9%) e pertencentes à faixa etária de 10 a 14 anos (40,3%). Traumas de cabeça e pescoço prevaleceram em número ocorrências com 33,6% dos casos, seguidos por traumas dos membros superiores e inferiores 27,7% e 26,9%, respectivamente. Quedas representaram 45,6% dos casos, seguidos por exposição a forças mecânicas inanimadas (12%) e exposição a forças mecânicas animadas (5,9%). O serviço de neurocirurgia foi o mais referenciado para as faixas etárias menores, enquanto para os grupos mais velhos foram os serviços maxilofaciais (p= 0,001). **Conclusão**: Este estudo apresentou resultados que chamam a atenção da comunidade, não somente acadêmica, como também de cuidadores leigos para que trabalhem com alternativas constantes de prevenção e vigilância no curso do desenvolvimento infantil.

Palavras-chave: Adolescente. Lesões. Trauma. Criança. Desenvolvimento infantil. Serviços Médicos de Emergência.

INTRODUCTION

Trauma remains one of the most common causes of death and disability in childhood and adolescence; an epidemic of the twentieth century, pediatric trauma is one of the lesser-known children's problems. The subject has been discussed in literature as the main cause of morbidity and mortality among children[1,2].

In 2012, in Brazil, 152,066 hospitalizations were recorded by trauma from external causes in children under 14 years of age such as: falls, exposure to animate mechanical forces, drowning, car accidents, exposure to smoke from fire and flames, burns, contact with animals and poisonous plants, assaults, among others. In Southern Brazil was recorded a total of 14.919 hospitalizations and in the city of Porto Alegre there were 3.018 hospitalizations due to external causes, in the same age group[3]. Trauma in childhood has the ability to cause children to develop, physical, emotional and social complications[4] for the rest of their lives.

Among the most common accidents in childhood and adolescence are the falls, mainly falling to the ground, followed

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by collisions, sharp instruments, biting animals, foreign bodies and burns. In Brazil the majority of these events occurs on weekends and by the afternoon[3]. Most accidents such as falls, burns and fractures, are preventable, especially when preventive measures such as physical care, social and material are made[4].

The most of the falls involve situations on the family environment where the child is in presence of a responsible, usually parents. In this context it is essential to take preventive measures in relation to the environment and supervision of children[5]. One of the most frequent accidents are falls in the childhood and from them, there may be many other injuries such as fractures, Traumatic Brain Injury (TBI), dislocations and sprains. TBI is a major complication that occurs in childhood, because children are in brain maturation. Thus, the risk of morbidity and mortality may increase by up to 40% as the result of trauma[6].

The Ministry of Health classifies accidents and violence according to the International Classification of Diseases (ICD) as external causes. These events can reach all age groups regardless of ethnicity.

Another cause of trauma in childhood and adolescence are traffic accidents, primarily collisions, which are the second leading cause of childhood trauma causing a major financial impact on society, and emotional and physical to the victims, mainly due to irreversible damages[3,7]. The most prevalent injuries are usually cuts, drilling, contusion, sprain, dislocation and fractures[8].

However, it is known that a child is more vulnerable to these events in entire context of their neurodevelopment and traumas in this age group can affect their development. Trauma in childhood has the ability to cause children to develop physical, emotional and social complications9 for the rest of their lives.

The aim of this study was to identify factors associated with children and teenagers trauma victims treated at a referral center in southern Brazil from birth to 14 years old.

METHODS

A retrospective cross-sectional study of children and adolescents treated at a trauma emergency room carried out in the referral center in physical trauma in southern Brazil. The study population was composed of children's service bulletins and adolescents from age zero to 14 years old incomplete (this is due to the characteristics of the hospital's risk rating), met in emergency, for any type of physical trauma, from 14 June to 14 December 2013. The sample size was estimated at 310 with a confidence level of 95% and a sampling error of 5%.

Inclusion criteria were age from zero to <14 years have been the victim of physical trauma. Since the criteria for the exclusion of patients with other pathologies.

Trauma in our study was defined by following the International Classification of Diseases (ICD) and external causes.

Variables (race, age, type of trauma, body part affected, accident type, Manchester Classification and Forwarding Service) were analyzed using descriptive statistics from single frequency and average tables. The comparison among nominal variables were used the Pearson's chi-square. To the factors studied categorically, ordinally or polytomous, a way of analysis of variance was used. (One-Way ANOVA). $P<0.05$ was considered statistically significant. Data processing was carried out by creating a database in Microsoft® Excel 2002 and analyzed using the Statistical Package for Social Sciences (SPSS). In order to avoid potential biases there was conducted a double checking data and increased in 20% the size of the sample.

Ethical Aspects

The present study was approved by the ethics committees of the institutions involved, protocol number 652.439 10 June 2013.

RESULTS

We analyzed 375 computerized reports of children and adolescents (range 0-14 years) treated in the emergency trauma hospital in Southern Brazil, victims of physical trauma.
The sample consisted mostly of 244 (65.1%) where the children were male with a mean age of 7.4 ±4.5 years, and the most prevalent age group 10-14 years (40.3%) and most were white (89.1%) (Table 1).

Table 1. Demographic profile of children and adolescents 0-14 years treated in the emergency in a hospital in southern Brazill.

Variable	N(%)
Sex	
Male	244 (65,1)
Female	131 (34,9)
Race	
White	334 (89,1)
Black	35 (9,3)
Brown	6 (1,6)
Age group	
Less than 1 year	13 (3,5)
1 to 4 years	110 (29,3)
5 to 9 years	101 (26,9)
10 to 14 years	151 (40,3)

Source: Survey data (2014).

For regions of the affected body, the head and neck were involved in 33.6%, there followed by the upper limbs with 27.7%, with 26.9% of the lower limbs and trunk with 4.3%.

Regarding the part in which the service has been done, night corresponded to 45.9% of cases, and the distribution of days of the week there came to a fair rate (13.6% to 15.2%). Their ranking in Manchester, 80.5% of children and adolescents were classified as green and 21% were referred to emergency care on the same day of the accident (Table 2).

Table 2. Epidemiological characteristics on the distribution of turn, weekdays, classification of Manchester and day care for children and adolescents 0-14 years treated in the emergency in a hospital in southern Brazil.

Variable	N(%)
Bout	
Morning	66 (17,6)
Afternoon	137 (36,5)
Night	172 (45,9)
Weekday	
Monday	54 (14,4)
Tuesday	54 (14,4)
Wendnesday	57 (15,2)
Thrusday	56 (14,9)
Friday	51 (13,6)
Saturday	52 (13,9)
Sunday	51 (13,6)
Manchester Rating	
Blue	3 (0,8)
Green	302 (80,5)
Yellow	68 (18,1)
Orange	2 (0,5)
Red	0 (0,0)
Time the patient was taken to servisse	
Same day	79 (21,1)
1 day after	39 (10,4)
After 2 days	7 (1,9)
After 3 days	3 (0,8)
More than 3 days	3 (0,8)
No data	244 (65,1)

Source: Survey data (2014).

Falls accounted for 45.6% of cases, followed by exposure to inanimate mechanical forces (12%) and exposure to animated mechanical forces (5.9%). The same level of falls accounted for 22.7%, followed by fall involving wheeled toys (skates, bicycle, etc.) 13.4%. Falls indicated in this study occurred from a small height, which characterize Unintentional injuries due to the fact that they occur when the inanimates objects are associated with the use of toys, for example. Exposure to inanimate forces as active accidental impact or liability caused by other objects and tight, cropped, compressed or crushed in or between objects represented, each, to 21.7% of trauma with inanimate forces. In exposure to animated biting forces or struck by dogs corresponded to 54.2% of cases (Table 3).

Table 3. Characteristics of the type of accident and exposures of children and adolescents 0-14 years treated in the emergency in a hospital in southern Brazil.

Variable	N(%)
Type of accident	
Falls	171 (45.6)
Exposure to forces of nature	1 (0.3)
Exposure to inanimate mechanical forces	45 (12)
Exposure to animate mechanical forces	22 (5.9)
Pedestrian injured in transport accident	5 (1.4)
Motorcyclist injured in transport accident	2 (0.5)
Occupant injured in car transport accident	2 (0.5)
Occupant injured in bus transport accident	1 (0.3)
Contact with a heat source or hot substances	2 (0.5)
Other traumas not specified	123 (32.8)
Falls	
Fall from a chair	5 (2.9)
Fall while being carried or supported by other people	1 (0.6)
Fall involving toys with wheels	23 (13.4)
Other fall on same level	39 (22.7)
Fall of a bed	12 (7)
Other fall from one level to another	11 (6.4)
Fall of other types of furniture	2 (1.2)
Fall on and from stairs and steps	13 (7.6)
Fall involving playground equipment	2 (1.2)
Fall unspecified	64 (37.2)
Exposure to inanimate forces	
Active accidental impact or liability caused by other objects	10 (21.7)
Impact caused by thrown object, designed or falling	9 (19.6)
Exposure to other inanimate mechanical forces and unspecified	10 (21.8)
Contact with sharp glass	4 (8.7)
Foreign body entering into or through eye or natural orifice	1 (2.2)
Tight, cropped, compressed or crushed within or between active objects	10 (21.7)
Accidental impact or liability caused by other objects	1 (2.2)
Projectiles of other firearms and unspecified	1 (2.2)
Exposure to animated forces	
Bitten or struck by dog	13 (54.2)
Collision between two people	1 (4.2)
Bitten or struck by other mammals	2 (8.3)
Hit, kick, bite or bruise inflicted by another person	7 (29.2)
Other	1 (4.2)

Source: Survey data (2014).

When age was associated with types of trauma, there was, here, a statistically significant difference (p=0.013 ANOVA), especially in wheeled toys involving falls (Table 3).

The referral to trauma emergency room appeared in 48.8% of cases. After the first visit, 2.1% of children and adolescents remained hospitalized. The average hospital stay was from 4.25 to 3.61 days (IC 24 hours to 12 days). Treatment of fractures in operating rooms corresponded to 75% of reasons for hospitalizations. Children and adolescents met, 79.5% underwent additional examinations, and X-Rays were the most requested (90.9%). In all cases, only eight patients (2.1%) required hospitalization, mainly due to surgery for fracture (n=6, 75%).

When comparing age groups with areas of the body, it has been observed that trauma involving head and neck were more prevalent among children aged 0-4 years. Trauma involving upper limbs, trunk and lower limbs occurred more often between 5 and 14 years. These accidents occurred equally throughout the week, differing only by age groups (p=0.001 and p=0.044) (Table 4).

Male children and adolescents showed more lesions in the thoracic region when compared to female who presented more often traumas on the back of the trunk region (p=0.036). (Table 4)

Table 4. Comparison of age with body parts and days of the week of the accident among children and adolescents 0-14 years of age treated in the emergence in a hospital in southern Brazil.

Variable	Age group				
	<1 year	1 a 4	5 a 9	10 a 14	P
Part of the bory					
Head and neck	10	62	31	23	
upper limbs	1	26	27	50	
lower limbs	1	16	28	56	0,001*
Trunk	0	0	7	9	
multiple regions	1	6	8	12	
Unspecified region	0	0	0	1	
Weekday					
Monday	2	10	18	24	
Tuesday	1	19	13	21	
Wednesday	2	11	18	26	
Thursday	0	18	14	24	0,044*
Friday	1	8	16	26	
Saturday	4	22	12	14	
Sunday	3	22	10	16	

* Chi-square test (Pearson).

Source: research data (2014).

It has been observed that neurosurgery service was the most referenced amidst the lower age groups, while for the older groups they varied from the trauma to maxillofacial services. There was a significant difference between groups, it was noted (p=0.001) (Table 5). Most children and adolescents were brought to the emergency room on the same day of the accident (p=0.007).

Table 5. age comparison with type of routing among children and adolescents 0-14 years of age treated in the emergence in a hospital in southern Brazil.

Variable	Age Group				
	<1 Year	1 a 4	5 a 9	10 a 14	P
Routing servisse					
Plastic surgery	0	15	19	16	
Traumatology	1	39	46	97	
Rescue Worker	4	31	25	30	0,001*
Neurosurgery	7	19	3	2	
Bucomaxillofacial	1	5	6	2	
Other	0	1	2	5	

* Chi-square test (Pearson).

Source: research data (2014).

DISCUSSION

Children and adolescents, trauma victims treated at emergency units, are mostly male, which is also a pointed prevalence in our study (65.1%)[1,10-11]. This suggests an association with different activities performed by boys. Since boys are often exposed to big risks and, culturally have more freedom, without being supervised by an adult, got greater freedom to perform activities and games without supervision. In addition, males have greater exposure to events of violent nature such as practice of harsh sports and involvement in physical fights[12].

In this study, it has been observed that Caucasian children and adolescents were mostly injured by physical trauma corresponding to 89.1%. This fact has been supported by a study performed at a different hospital in Brazil[3]. The most affected age range was 10 to 14 years, corresponding to 40.3%. Bem and col. (2008)[2] and Silva and col. (2010)[1] found 23% and 32.3% of children and teenagers on the same age group.

Occurrences of attendance predominantly happen overnight, probably due to physical trauma that had happened during the evening period[1,2,13]. As for to the day, when patient received an assistance at the emergency unit, it was not noticed any variation between weekdays and weekends, however number of patients assisted on Friday, Saturday and Sunday were lower than compared to other days of the week. Usually this finding has not been found by other studies, in which attendances increasing on weekends due to children and teenagers have more free time to play and go out at night with friends without adult supervision, especially for adolescents[1]. Therefore, this event can be seasonal.

The current study patients were selected to receive assistance

following Manchester Triage System, this protocol evaluates patients according to the level of urgency emerging: red-immediate care; orange - very urgent (call in 10 minutes); yellow – not urgent (call in 60 minutes); green - not urgent (call in 120 minutes) and blue – not urgent (call in 240 minutes). Patients have been classified according to their great majority as green, 80.5% of cases, followed by yellow 18.1% of patients. This classification or triage is a system that does the management of risk and aim to manage the flow of patients who seek emergency care[14]. In this study were evaluated at what time following trauma patient were referred to receive assistance in the emergency department, in this evaluated sample data are retrospectively nature and draws attention to the fact that in 65.1% of cases this information concerning service were not present and only 21.1% of patients received treatment on the same day. Not found in literature, findings have evaluated his time between occurrence of children physical trauma, and search for qualified care in an emergency room.

Literature shows that the head and neck, upper limbs and lower limbs are the body parts most frequently affected by physical traumas among children and adolescents[1,15]. Head and neck were prevalent throughout the number of occurrences with 33.6% of cases, followed by the upper limbs and lower limbs 27.7% and 26.9% respectively. These data confirmed other studies where falls were among the main occurrences of childhood trauma[11,16]. Mechanisms that result in falls in children are several, nevertheless important considerations connected with neuronal network that involves the development of balance and locomotion of children and which were procedural throughout childhood. In addition, the frontal lobe responsible for critical and reason will be improved in their functions during the whole adolescence providing individual awareness of what is dangerous or not for their physical integrity[12,17]. The most prevalent falls were those that occurred on the same level of height of children or adolescents (22.7%) and involved toys with wheels in 13.4% of cases. In literature, the fall from height has been identified as one the most common types of falls18. Fall in circumstances involving objects such as bed, chair, ladder and cycling have also been reported19. Inanimate mechanical forces were the second leading cause of visits to emergency unit in our study. Among them there stands out active accidental impact or liability caused by other objects (21.7%), tight, cropped, compressed or crushed in or between objects (21.7%) and impact of thrown object, designed or falling with 19.6%. The results from the present study are similar to a study evaluated 8,854 patients under 15 years of age treated at an emergency room, present study impact from object launched or falling were the most frequently, followed by impact of sports equipment and impact against objects[19].

The present study observed about exposure to animate mechanical forces where the main reason were the bites caused by dogs (54.2%), followed by stroke, kick, bitten or scratched by another person (29.2%). Gaspar et al. (2012)[11] shows the dog bite on top of the causes of trauma involving animated mechanical forces. Bites were considered causes of morbidity and mortality, and a public health problem in our country[20].

Mankind over the centuries comes taming and utilizing animals for various tasks. The dog has many races, each one with its specificities, and the dog is just part of many families[21]. The attacks caused by dogs might lead to severe bodily injury, mutilation and even lead to death[22]. The victims profile of dog bites are usually school children and the dog is known to the children in 72% of cases[23].

When comparing the injured body part with age, we find as significant (P=0.000), children between 0 and 4 years have mainly the head and neck as body structure achieved during physical traumas, and children and adolescents between 10 and 14 presented more involvement of the upper and lower limbs. Head trauma, especially in the age group of one to three years, may be related to the child's stage of development, where on this age there is a lake of protective reflexes. Injuries members usually occur in school children and adolescents of age, because of that with the development[19]. In addition, adolescents usually begin with the sports practice, and they are more exposed to trauma in football games, volleyball, cycling, among others our daily sports[24].

By comparing the week day with age, we found significant values (P=0.044) mainly on Saturday and Sunday where children from 1 to 4 years old suffer more accidents, as well as children and adolescents between 10 to 14 are less likely to develop injuries related to physical trauma. Throughout the week the children and adolescents between 10 and 14 suffer more traumas if compared with the weekend.

Most significant assumption for this finding is that children who attend school were more protected during the week mainly with direct supervision by an official during activities, and when they had the weekends most leisure time to play around without supervision and ended up hurting2. This hypothesis was not seen in this study, given that the children and older adolescents between 10 and 14 who are in school term get hurt more during the week than on weekends. Another hypothesis for children between 1 and 4 years were most exposed at weekends to trauma than compared to weekdays is that often the weekend the responsibility to care for the child is torn between many familiars and not concentrated in only one person, therefore, there may occur carelessness and the child become more vulnerable to physical trauma.

Comparing parts of the trunk hit with sex of children and adolescents, we observed that male patients have chest region most affected by trauma, however the female patients presented more frequently trauma to posterior region of log (P=0.036). It was found in similar literature. An assumption for this finding would be that in terms of defense mechanisms among boys and girls, girls, especially in the age group 10-14 years more protect the breasts and face during the trauma, being exposed to the posterior trunk region (Tabela 4).

Children between 0-4 years are directed mainly to neurosurgery services. This finding is related to cranial trauma[18].
As for children and adolescents aged 10-14 years are forwarded

mainly for trauma services. Such situation is also linked to the age of children and adolescents, which in this age group have the upper and lower limbs are more exposed to sports practice-related accidents as cycling and playing football[24].

The referral to the buco maxilla facial emergency service was more frequent in the age group 1-9 years. In the literature was observed that facial trauma is related mainly falls[1]. The present study corresponded to 45.6% of visits, which represents a large number of cases that can be worked with the focus of prevention and environmental safety. In addition, children aged less than 10 years old may not have discernment of what is dangerous and the immediate consequences of their actions2. Furthermore, we must consider the motor period of development, intellectual and psychological that will be improved over the years. Added to this is the fact that living and discovering the world provides adolescents the desire to experience new forms of learning such as how to ride a skateboard, skates, jump and risk in lively activities involving own struggles and challenges with colleagues.

Furthermore, the organization of emergency services, it is essential to understand the complexity of the physical trauma of children and adolescents that needs to be constantly worked in the training of health professionals.

When compared the turn of arrival to attend the emergency department with time after injury, there was statistical significance in this data (P = 0.007). This is probably because the traumas occur in the afternoon and evening. With this, at the same day that the trauma occurs many of them are taken at night to meet, however due to various other circumstances many are directed to call the morning of the next day.

Although statistically significant data on this study, during the data collection process was observed limitations such as lack of records and data standardization. Another limiting factor observed was the sample size and the brief period in which the collection took place. Nevertheless, the profile of this population survey brought subsidies for a reflection on the organization of emergency services[26].

Emergency services need to improve work processes, starting with more accurate records, which should include the outcome and complications of trauma, to improve the communication process and humane care and knowledge[26].

CONCLUSION

Different types of trauma related to the child's age range and adolescent may be associated mainly to the period of development where children have not yet developed the balance and the coordination so have the head and neck as parts of the body most frequently affected during the trauma. On the other side, older children are playing more sports, so they are exposed to limb traumas more often.

The role of schools and the development of the functional actions that the universities have carried out in terms of activities in the community with programs and projects are examples of activities that may involve technical knowledge combined with the prevention of occurrence of certain events such as physical trauma. In addition, the hospital has the attribute of performing not only a role of treating the injury of children and adolescent victims of physical trauma, but also welcome and listen to the victims and their families. The hospital aim is that families may demonstrate a deeper look and guard the health of children and adolescents thus avoiding the recurrence of physical trauma in this age group.

The profile of this population survey has brought subsidies for a reflection on the organization of emergency services, because "knowledge of the context is fundamental to understanding the urgency of the users"26:3665. The implication is that it is essential that children's physical trauma be constantly worked on the training of health professionals. Teaching units need to consider the morbidity and the mortality profile of the age range and the personal, social and cultural impacts that can cause injuries and health problems.

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