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Original Article

Head and Face Injuries in Automobile Accidents and Associated Factors in a city in Northeastern Brazil

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Abstract

Objective: To evaluate the occurrence of head and face injuries and associated factors among victims of automobile accidents in a trauma center. **Material and Methods:** A cross-sectional study was developed through the analysis of 9,734 medical records of children and adults hospitalized due to external causes in the Regional Hospital of Emergency and Trauma at Campina Grande, Brazil. Data were analyzed with the SPSS software version 15, also using the Pearson's chi-square test. The significance level adopted was 5 %. **Results:** Cases of automobile accidents accounted for 25.9% (n = 463) of hospitalizations due to external causes, and 83.8 % of victims were male and 16.2 % were female, representing a sex ratio of 5.1:1. As for age group, most had between 20 and 29 years (38.1%) and with respect to the day of the week, 40.8 % of incidents occurred over the weekend. The occurrence of injury was greater on the face (17.4%) than on the head (7.8%) and most victims had a single injury (58.5%). The existence of bone fractures was observed in 76.9 % of victims and 14.7 % had functional impairment. There was association between variables age ($p < 0.001$), sex ($p < 0.001$), day of the week ($p < 0.001$), presence of bone fractures ($p < 0.001$) and functional impairment ($p = 0.002$) with the occurrence of automobile accidents. **Conclusion:** The most automobile accidents occur on weekends and affect young male individuals, with frequent presence of fractures among victims. The occurrence of injury was greater on the face than on the head. Factors such as age, sex, presence of bone fractures and functional impairment was associated with automobile accidents.

Keywords: Accidents, Traffic; Facial Injuries; External Causes.

Introduction

Traffic accidents are a serious public health problem [1,2]. Each year, there are more than one million deaths and approximately 50 million injured worldwide [2]. These types of accidents are considered the leading cause of death among young adults in developed countries, and their prevention is a key challenge defined by the World Health Organization (WHO) [3].

In addition to deaths, traffic accidents cause disability and loss of production equivalent to 2 % of the gross domestic product of the entire world economy [4]. In countries of low and middle income, these causes represent 90 % of the Potential Years of Life Lost (PYLL). These countries also concentrate 90 % of mortality from this type of accident [2].

In 2005 in Brazil, more than 35,000 people were victims of traffic accidents, which correspond to the average of 98 deaths per day. At the beginning of the decade, 20 to 50 million people were fully or partially disabled due to injuries caused by traffic accidents worldwide. The victims of these traumas occupied about 10% of all hospital beds in this period [5].

Some factors are considered as risk factors for morbidity and mortality from these accidents such as the non-use of safety devices, lack of proper road signs5, excess speed6, use of alcoholic beverages [6,7] and unlicensed drivers [8]. Given these characteristics, studies indicate that males and younger individuals are among those most affected [3,4,8-11].

Due to the close anatomical proximity of the maxillofacial bones and the cranium, it is common that patients with maxillofacial fractures are at increased risk of, and suffer from, traumatic head injuries simultaneously [12].

Given the above, this study assessed the morbidity and mortality and associated factors among victims of automobile accidents in a trauma center at the city of Campina Grande, Paraiba, Brazil.

Material and Methods

Study Design

An observational and cross-sectional study was carried out through indirect observation by means of analysis of medical records of children and adults hospitalized due to external causes at the Regional Hospital of Emergency and Trauma at Campina Grande, Paraiba from January 2009 to December 2009. The city is about 130 km from the capital of Paraiba State and is located in the “Agreste" region in the eastern region of the Borborema plateau. The city has an estimated population of 407,754 habitants and a municipal human development index (HDI) value of 0.72.

Data Collection

The universe comprised a total of 9,734 medical records. The sample consisted of all medical reports of children and adults affected by automotive accidents duly confirmed. The survey instrument consisted of a specific form developed from the analysis of medical records. A pilot study and calibration procedures were carried out in order to correct any failures and standardize the form

of interpretation. Reports considered illegible or incomprehensible were considered an exclusion criterion.

For data collection, a specific form was created with variables related to the sociodemographic characteristics of the victims (sex and age), trauma characteristics (day of the week, location [head and face]), injury pattern (number of lesions, number of surgical procedures, presence of bone fractures and functional impairment) and the occurrence of death. Age range was categorized into seven subcategories: 0 to 9, 10 to 19, 20 to 29, 30 to 39, 40 to 49, 50 to 59 and 60 or more.

Statistical Analysis

In data analysis, descriptive and inferential statistical techniques were used. The statistical techniques involved obtained absolute distributions, percentages and statistical measures: mean, median and standard deviation. For bivariate analyses, the Chi-square test was used. The statistical significance level was set at 5%. The statistical program used was the SPSS software (Statistical Package for the Social Sciences) version 18.

Ethical Aspects

This study was conducted in compliance with the ethical guidelines issued by the Resolution 196/96 and 466/12 of the Brazilian National Health Council/Ministry of Health on research involving human subjects. The project was registered in the National Information Systems on Ethics in Research involving Humans (CAAE 2716.0.000.133-10) and approved by the Ethics Research Committee of the State University of Paraiba.

Results

Assistances due to external causes accounted for 1,789 (18.4%), of which 1,376 (76.9%) involved male patients and 413 (23.1%) were related to female patients. The age of respondents ranged from 0 to 99 years, with mean of 30.74 years, median of 27.00 years and standard deviation of 19.80 years.

Automobile accident cases represented 25.9% (n = 463) of assistances due to external causes, so that 388 victims (83.8 %) were men and 75 (16.2%) were women, representing a sex ratio of 5.1:1. As for the age group, the majority of the victims aged from 20 to 29 years (38.1%) and with respect to day of the week, 40.8% of cases were registered during the weekend (Saturday and Sunday).

Table 1 shows the association between variables age ($p < 0.001$), sex ($p < 0.001$) and day of the week ($p < 0.001$) and the occurrence of automobile accidents, revealing that the highest percentages occurred in the age group from 21 to 29 years (39.2%) and from 30 to 39 years (31.3%) and lowest in the age group from 0 to 9 years (5.0%) and 60 years or more (15.8%). Similarly, the percentage of automobile accidents was 10.0% higher among males than among females (28.2% versus 18.2%) and the percentage of accidents on Saturdays/Sundays was higher than from Mondays to Fridays (32.4% versus 22.7%).

Table 1. Association between the occurrence of automobile accident and age, sex and day of the week.

Variables	Automobile accident						P -value
	Yes		No		Total		
	n	%	n	%	n	%	
Age Group [1777]							
0 to 9	11	5.0	207	95.0	218	100.0	p<0.001
10 to 19	70	21.2	260	78.8	330	100.0	
20 to 29	175	39.2	271	60.8	446	100.0	
30 to 39	95	31.3	209	68.7	304	100.0	
40 to 49	50	27.8	130	72.2	180	100.0	
50 to 59	28	25.7	81	74.3	109	100.0	
60 or more	30	15,8	160	84,2	190	100,0	
Total	459	25,8	1318	74,2	1777	100.0	
Sex [1789]							
Male	388	28.2	988	71.8	1376	100.0	p<0.001
Female	75	18.2	338	81.8	413	100.0	
Total	463	25.9	1326	74.1	1789	100.0	
Day of the Week [1789]							
Saturday/Sunday	189	32.4	395	67.6	584	100.0	p<0.001
Monday - Friday	274	22.7	931	77.3	1205	100.0	
Total	463	25.9	1326	74.1	1789	100.0	

The occurrence of injuries was greater on the face (17.4%) than on the head (7.8%) and most victims had a single injury (58.5%). Ten percent of patients underwent two or more surgical interventions. Bivariate analysis revealed an association between the occurrence of automobile accidents and affected body site (p <0.001), number of lesions (p <0.001) and number of surgical interventions (p < 0.001). The percentage of patients with head trauma, face trauma, multiple lesions and single surgery were correspondingly higher among victims of automobile accident, and the greatest difference occurred in the number of multiple lesions (41.5% versus 27.4%), and for those who did not undergo surgery, the number of patients was higher among those who had no automobile accident (32.8% versus 21.6%) (Table 2).

Table 2. Association between the affected body site, number of lesions and number of surgical procedures and the occurrence of automobile accident.

Variables	Automobile Accident						P -value
	Yes		No		Total Group		
	n	%	n	%	n	%	
Affected Body Site [1748]							
Head							
Yes	36	7.8	57	4.4	93	5.3	p=0.005
No	423	92.2	1232	95.6	1655	94.7	
Face [1748]							
Yes	80	17.4	135	10.5	215	12.3	p<0.001
No	379	82.6	1154	89.5	1533	87.7	
Number of Lesions [1778]							
Single	269	58.5	957	72.6	1226	69.0	p<0.001
Multiple	191	41.5	361	27.4	552	31.0	
Number of Surgical Procedures [1774]							
None	99	21.6	431	32.8	530	29.9	p<0.001
One	313	68.3	810	61.6	1123	63.3	
Two or more	46	10.0	75	5.7	121	6.8	

The presence of bone fractures was observed in 76.9% of victims and 14.7% had functional impairment. The number of deaths was very low (1.5%). Table 3 shows the presence of an association between the occurrence of automobile accidents and the presence of bone fractures ($p < 0.001$) and functional impairment ($p = 0.002$) and for these variables, it is noteworthy that the presence of each of the mentioned results was higher among victims of automobile accident (76.9% versus 32.8% for the presence of bone fractures and 14.7% versus 9.5% for functional impairment).

Table 3. Association between presence of bone fractures, functional impairment and death and the occurrence of automobile accident.

Variables	Automobile Accident						P -value
	Yes		No		Total Group		
	n	%	n	%	n	%	
Presence of Bone Fractures [1789]							
Yes	356	76.9	435	32.8	791	44.2	p<0.001
No	107	23.1	891	67.2	998	55.8	
Functional impairment [1789]							
Yes	68	14.7	126	9.5	194	10.8	p=0.002
No	395	85.3	1200	90.5	1595	89.2	
Death [1789]							
Yes	7	1.5	20	1.5	27	1.5	p=0.996
No	456	98.5	1306	98.5	1762	98.5	

Discussion

Accidents are a major health problem worldwide, with emphasis on those arising from traffic, with high mortality rate [9,13,14]. They are responsible for approximately 2.1% of global mortality, occurring mainly in developing countries [15]. Several factors such as injury pattern and regional location of collisions may also affect the pattern of mortality. In addition, the majority of fatally injured victims do not arrive at hospital and die due to trauma prior to arrival [17].

The choice of the Regional Hospital of Emergency and Trauma of Campina Grande was mainly due to the fact that this institution represents the only public health service with high complexity and reference to the care of patients suffering from external causes in the hinterland of the state of Paraiba.

One of the difficulties of working with secondary data lies in the fact that, in many situations, the incomplete recording of information prevents the faithful transcription of findings [9,11,17]. This condition was observed in this study, since some records were not properly filled. Nevertheless, the results presented here faithfully depict the profile of victims of car accidents among the population of Campina Grande and adjacent cities attended in that institution.

In this study, one fourth of assistances due to external causes were victims of automobile accidents, a result similar to that found in another study carried out in Brazil [9]. The high morbidity and mortality due to traffic accidents in Brazil is closely related to the model chosen for the transport system that has prioritized roads and the use of a private vehicle without providing adequate infrastructure. This system is poorly equipped to deal with violations against traffic rules

[18]. The lack of interest in wearing a motorcycle helmet or seat belt, bad road conditions, non-application of road traffic rules (negligence and recklessness while driving) or inadequate traffic law enforcement by police (especially in case of motorcyclists) may explain the reason for road traffic accident [12].

There is a significant relation between seasons and traffic accidents as the main cause of trauma, such that this rate was higher in summer that can be related to widespread use of motorbike in the hot season and increased traffic agriculture and rural areas [19].

Men were the victims most affected by automotive accidents, confirming previous findings [5,9,12,16,20-22]. Although high, the sex ratio in this study was lower than that observed in India (5.1:1 versus 7.2:1) [23] and Brazil (5.1:1 versus 6.3:1) [9]. This phenomenon can be attributed to the increased exposure of men through their social and cultural behavior, predisposing them to greater risk of injury and deaths [22,24]. The lifestyle and cultural differences in this region of the country mean that most females work indoors (office work) or at home plus they drive more carefully and less frequently than males [12].

Regarding age, the population predominantly affected was composed of young adults, especially those in the third decade of life. Similar results were observed in different countries [5,9,20,23] and among the possible explanations for this are the lack of experience in driving [25] and adoption of unsafe driving practices, including speed above limits established by law and disrespect to traffic rules [8]. Other factors such as emotion seeking, pleasure in experiencing risky feelings, impulsivity and abuse of alcohol or drugs may contribute to the higher incidence of traffic accidents in this age range [26].

With respect to the day of the week, automobile accidents occurred more frequently on weekends, corroborating previous findings [10,22,27]. Some studies have reported a higher incidence of accidents on weekends with possible ingestion of alcoholic beverages by drivers [24,28] and driving over the speed limit and disrespect of traffic rules [22].

Some researchers showed that head and thoracic injuries were found to be the leading injuries, which were most likely to be the cause of death [16]. The occurrence of injuries was higher on the face than on the head, confirming previous results carried out in India [20]. Head and neck injuries after automobile accidents are the most common causes of mortality [16,22,27] and morbidity [21,29,30] in most developed and developing countries and may result in temporary or permanent disability [27]. Craniofacial trauma and injuries associated with the maxillofacial region are highlighted in the context of multiple fracture patients, especially for being an area related to the occurrence of many types of injuries whether isolated or associated with other organs [30].

The presence of fractures and functional impairment was identified in most records of victims of automobile accidents, confirming previous study [20]. Such injuries can be associated with non-use of some safety devices such as seatbelts and the lack of airbags in the vehicle, which makes occupants quite vulnerable to injuries3 producing sequels, disability and impairments [5]. Disability due to injuries of serious or very serious nature leads to implications for the individual (financial,

family, mobility, professional, etc.) and for society (hospital costs, decreased production, pension costs, etc.) [31]. In this study, the number of deaths was very low. A previous study showed that the majority of patients died on scene, followed by a consistent decrease during the post-traumatic period [16].

Automobile accidents are responsible for a high number of victims due to the high number of passengers in a vehicle, as well as the large fleet of these vehicles circulating in countries like the United States, Brazil and Canada [5]. Accordingly, efforts are needed to reduce morbidity and mortality from these accidents, with the implementation of a surveillance system to control the risk factors, plan of assistance, and the establishment and evaluation of prevention interventions [3]. Prevention should be understood as the most effective strategy for its control [1] and changes in car safety may influence the pattern of injury and therefore the pattern of mortality [16].

It is also essential to redesign the municipal public health and safety policies in order to offer a better emergency assistance to victims, and to implement preventive and educational actions involving pedestrians and drivers [9]. The Human Development Index (HDI) could be an explanatory variable to understand the factors that influence the increased morbidity, since HDI is based on three pillars: education, income and longevity [30]. Successful experiences of other regions in reducing road accidents must be considered in the designing of interventions from government and different sectors of society, as well as the definition of public investments [10].

Conclusion

The most automobile accidents occur on weekends and affect young male individuals, with frequent presence of fractures among victims. The occurrence of injury was greater on the face than on the head. Factors such as age, sex, presence of bone fractures and functional impairment was associated with automobile accidents.

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