

Epidemiological and clinical profile and outcome of patients with traumatic brain injury

Perfil epidemiológico, clínico e desfecho de pacientes com traumatismo cranioencefálico

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Abstract

Objective: To identify the epidemiological and clinical profile and the outcome of patients with traumatic brain injury (TBI). **Methods:** This is a retrospective research that was conducted with patients aged 18 years or over, who were admitted to the Institution during 2017, victims of TBI of any etiology. **Results:** A total of 268 medical records were analyzed, 78.7% of which corresponded to male patients, with a mean age of 51 years and the highest incidence in the age group from 31 to 50 years (38.4%). Most patients (76.1%) arrived at the Emergency Room (ER) having been brought by the Mobile Emergency Care Service (SAMU, the Portuguese acronym for Serviço de Atendimento Móvel de Urgência), with an average Glasgow Coma Scale of 12 points, 78.0% had mild TBI (between 13 and 15 points), 14.2% had severe TBI (between 3 and 8 points), and 7.8% had moderate TBI (between 9 and 12 points). Most patients (57.5%) had TBI due to fall, followed by 16.0% due to being run over, 12.0% due to aggression, 5.9% with unknown mechanisms of polytrauma, 5.6% due to motorcycle accident, 1.9% due to car accidents, and 1.1% due to gunshot wounds. Most patients (84.3%) remained in hospital for up to 10 days, with an average hospital stay of six days, 92.9% of them received (conservative) clinical treatment, and 85.8% were discharged. **Conclusions:** Males were predominant, with a mean age of 51 years, referred to the ER by the SAMU, victims of mild TBI due to fall, with an average hospital stay of six days, during which they received clinical treatment and whose outcome was hospital discharge.

Keywords: Health profile, Traumatic brain injury, Cerebrovascular trauma.

Resumo

Objetivo: Identificar o perfil epidemiológico, clínico e o desfecho dos pacientes com Traumatismo Cranioencefálico (TCE). **Métodos:** Pesquisa retrospectiva realizada com pacientes com idade maior ou igual a 18 anos, que estiveram internados na Instituição no ano de 2017, vítimas de TCE por qualquer etiologia. **Resultados:** Analisados 268 prontuários, sendo 78,7% do sexo masculino, com uma média de idade de 51 anos e maior incidência na faixa etária dos 31 a 50 anos (38,4%). A maioria (76,1%) chegou ao Pronto Socorro (PS) pelo Serviço de Atendimento Móvel de Urgência (SAMU), com uma média da Escala de Coma de Glasgow de 12 pontos, sendo que 78,0% apresentavam TCE leve (13 a 15 pontos), 14,2% apresentavam TCE grave (3 a 8 pontos) e 7,8% apresentavam TCE moderado (9 a 12 pontos). A maioria (57,5%) apresentou o TCE por queda, seguido de 16,0% por atropelamento, 12,0% por agressão, 5,9% por politrauma de mecanismos desconhecidos, 5,6% por acidente de moto, 1,9% por acidente automobilístico e 1,1% por ferimento por arma de fogo. A maioria (84,3%) ficou internada no hospital por até 10 dias, com uma média de internação hospitalar de seis dias, 92,9% receberam tratamento clínico (conservador) e 85,8% receberam alta hospitalar. **Conclusões:** Prevaleceram indivíduos do sexo masculino, com uma média de idade de 51 anos, encaminhados ao PS pelo SAMU, vítimas de TCE leve, ocasionado por queda, com uma média de internação hospitalar de seis dias, recebendo tratamento clínico e com desfecho de alta hospitalar.

Palavras chave: Perfil de saúde, Lesões encefálicas traumáticas, Traumatismo cerebrovascular.

Introduction

Traumatic brain injury (TBI) is any injury caused by an external trauma, which results in brain changes, which can be either momentary or permanent and

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Institutional Scientific Initiation Scholarship Program (PIBIC) validity: 2018/2019.

Conflict of Interest: none

cognitive or functional in nature. It is characterized as a major public health problem, as it affects a working age population in total population, thus leading to important socioeconomic damage to society⁽¹⁾.

Objective

To identify the epidemiological and clinical profile and the outcome of patients with Traumatic Brain Injury.

Method

A retrospective, descriptive research with quantitative data analysis was carried out. Data were collected from medical records that were made available by the Medical and Statistical Archive Service (*SAME*, the Portuguese Acronym for *Serviço de Arquivo Médico e Estatístico*) at *Hospital Central da Irmandade da Santa Casa de Misericórdia de São Paulo (ISC MSP)*. All medical records of patients who had been victims of Traumatic Brain Injury of any etiology and admitted to *Hospital Central da Irmandade da Santa Casa de Misericórdia de São Paulo* between January 1, 2017, and December 31, 2017, of both sexes, aged 18 years or over were analyzed. Medical records that were not made available by *SAME* for any reason were excluded. Data collection was carried out from November 2018 to February 2019, after the Research Project was approved by the Institution Research Ethics Committee, having been assigned *CAAE* No.: 88290418.0.0000.5479.

A data collection instrument was developed by the study authors, which contained information pertaining to the patient's identification, emergency room admission data, hospital stay, and surgery.

Results

A total of 306 records of TBI victims who were admitted to *Hospital Central da Irmandade da Santa Casa de Misericórdia of São Paulo* between January and December 2017 were evaluated. Of these, 38 were excluded, as the medical records had not been made available by *SAME*, which thus resulted in a sample

of 268 medical records included in this study. For all patients, telephone contact was attempted in order to request their authorization before being included in the research, which occurred upon their signing a voluntary informed consent form (VICF). However, in most medical records, the patient's telephone number was either non-existent or outdated, and, in addition, some patients had not been asked to return for a follow-up visit. In such cases, it was impossible to ask them to sign a voluntary informed consent form. The tables and figures below show the results obtained in our study.

It is noteworthy that some variables such as level of education, profession, occupation, and comorbidi-

Table 1

TBI patients' epidemiological profile. São Paulo, between January and December, 2017.

Variables	N	%
Sex		
Male	211	78.7
Female	57	21.3
Age group (years)		
18-30	46	17.2
31-50	103	38.4
51-70	76	28.4
71-100	43	16.0
Skin color		
White	145	54.1
Brown	70	26.1
Black	45	16.8
Not included	08	3.0
Marital status		
Single	217	81.0
Married	16	6.0
Divorced	05	1.9
Separated	05	1.9
Widowed	04	1.4
Not included	21	7.8
Total	268	100.0

Table 2

TBI patients' distribution according to their described habits. São Paulo, between January and December, 2017.

Habits	Smoking		Alcoholism		Illicit drug use	
	N	%	N	%	N	%
Yes	11	4.1	61	22.8	15	5.6
No	246	91.8	196	73.1	242	90.3
Not included	11	4.1	11	4.1	11	4.1
Total	268	100.0	268	100.0	268	100.0

Table 3

TBI patients' distribution according to the length of hospital stay. São Paulo, between January and December, 2017.

Length of hospital stay (days)	N	%
Up to 3	169	63.1
4 to 6	35	13.1
7 to 9	19	7.1
10 to 12	6	2.2
13 to 15	11	4.1
> 16	28	10.4
Total	268	100.0

Table 4

TBI patients' distribution according to the length of ICU stay. São Paulo, between January and December, 2017.

Length of ICU stay (days)	N	%
Up to 3	10	38.5
4 to 6	5	19.2
7 to 9	2	7.7
> 10	9	34.6
Total	26	100.0

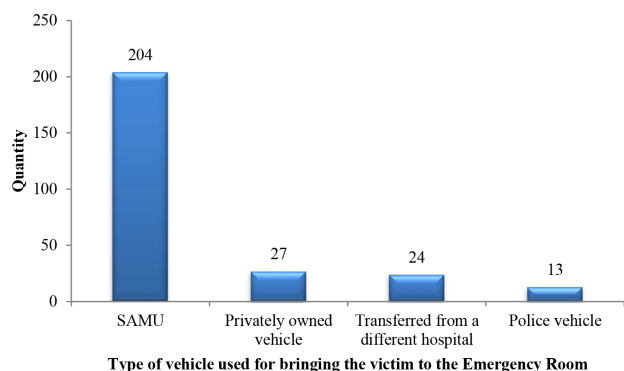


Figure 1 - TBI patients' distribution according to admission to the Emergency Room. São Paulo, between January and December, 2017.

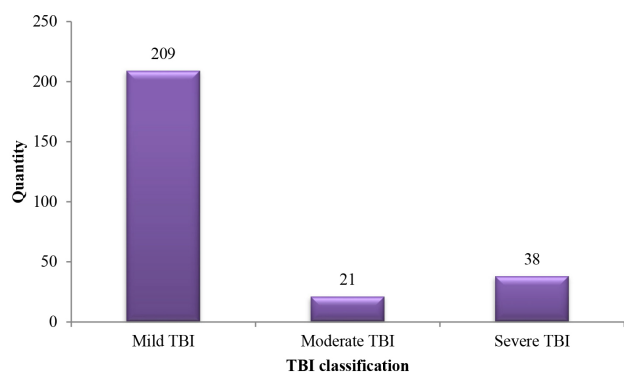


Figure 2 - Patients' distribution according to TBI classification. São Paulo, between January and December, 2017.

ties were not collected, as they were not available in the patients' medical records.

The average length of hospital stay was 6.1 days, ranging from 1 to 77 days.

The average length of ICU stay was 8.6 days, ranging from 1 to 37 days. Of the patients who stayed in the ICU (N=26), 15 (57.7%) were discharged from

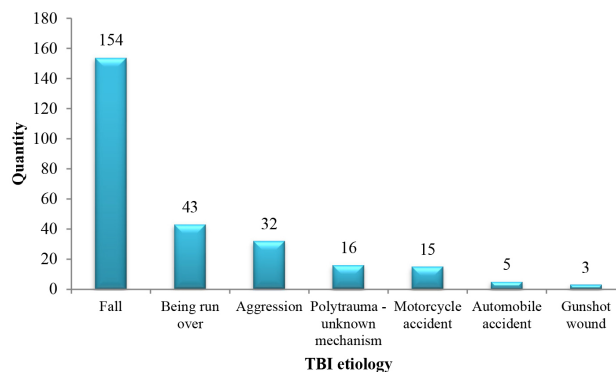


Figure 3 - Patients' distribution according to TBI etiology. São Paulo, between January and December, 2017.

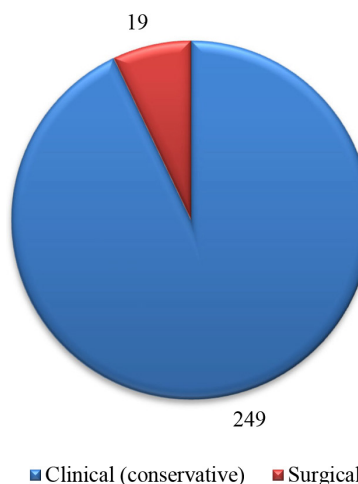


Figure 4 - TBI patients' distribution according to treatment type. São Paulo, between January and December, 2017.

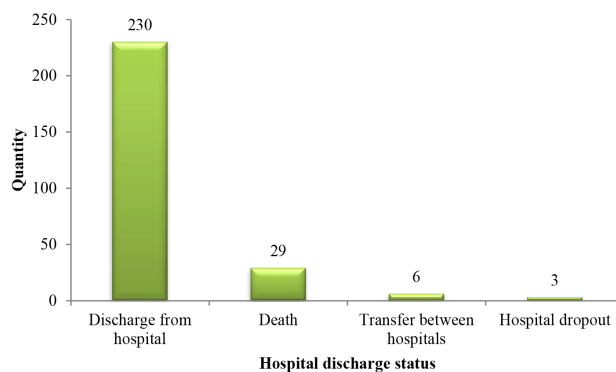


Figure 5 - TBI patients' distribution according to hospital discharge status. São Paulo, between January and December, 2017.

the hospital, nine (34.6%) died, and two (7.7%) were transferred to other hospitals.

Discussion

In a study carried out in the State of Bahia, Brazil, which analyzed 1,140 medical records of TBI patients, male victims were also found to be the most prevalent patients, accounting for 81.9% of the sample⁽²⁾. A different study, carried out in Fortaleza, the capital city of the State of Ceará, Brazil, with 722 medical records of TBI patients also found a prevalence of males (82.0%)⁽³⁾. Another study analyzed 496 treatment records of TBI patients in the State of Rio Grande do Sul and also found that most victims were also males, totaling 63.3% of cases⁽⁴⁾. A further study with 155 TBI patients, also conducted in the State of Bahia, found a prevalence of males as well (84.5%)⁽⁵⁾. A further study yet, carried out in the State of Pernambuco with medical records of 121 TBI victims found that 83% of those corresponded to males⁽⁶⁾. A survey with 277 TBI victims found a male prevalence as well, which amounted to 85.9% of the sample⁽⁷⁾. Last of all, a study conducted with 139 TBI victims in Uberlândia, in the State of Minas Gerais, found that male victims corresponded to 85.6% of the sample⁽⁸⁾.

The predominance of male TBI patients can be explained by the greater exposure men have to risk factors that are associated with trauma, possibly due to their lifestyle or sociocultural context. They take greater risks when driving vehicles, such as greater speed, riskier maneuvers, alcohol use, interpersonal violence, among others⁽⁶⁻¹⁵⁾. Men are more exposed from childhood to external causes, as they are more independent, enter the labor market earlier and adopt riskier behaviors, such as driving after having consumed alcoholic beverages⁽¹⁶⁾. Males have greater access to automobiles and more frequently perform work activities away from their homes. Consequently, they are more exposed to risky conditions⁽⁴⁾. Gender-related historical and cultural patterns, such as the expected male aggressiveness and a behavior that is often more reckless than those related to the opposite sex could partly explain men's greater exposure to sustaining external injuries⁽¹⁷⁻¹⁸⁾.

In this study, we found that the highest incidence was in the age group from 31 to 50 years, totaling 103 cases (38.4%), followed by 76 cases (28.4%) in victims aged between 51 and 70 years. The mean age was 51 years, ranging from 19 to 96 years. The analysis of a study carried out with 1,140 medical records showed that the most prevalent age group was that of victims aged between 20 and 29 years, which accounted for 26.4% of the sample⁽²⁾. Another study, which analyzed the medical records of 676 patients victims of traumatic

brain injury who had been admitted to a hospital in Recife, in the State of Pernambuco, found a prevalence of 46.0% of victims over 35 years of age⁽¹⁰⁾. Another further study carried out with 298 medical records of patients admitted to a hospital in the State of Minas Gerais found that 42.6% of victims belonged to the age group between 19 and 50 years old⁽¹³⁾. Another research, which analyzed 496 care service records in the State of Rio Grande do Sul, found the highest prevalence (44.3%) in the age group from 0 to 15 years old⁽⁴⁾. An additional study conducted in the State of Pernambuco with 121 medical records found that 34.7% were aged between 21 and 30 years⁽⁶⁾. According to a study carried out with 139 victims in Uberlândia, in the State of Minas Gerais, their age ranged from 18 to 89 years, with an average of 40.7 years⁽⁸⁾.

In these studies, TBI was observed to be predominant in individuals belonging to the working age population in total population, a fact that has an impact on the economy. This generates a high cost to society related to hospital expenses in both the acute and chronic phases and the loss of a number of years' worth of work, which represents the greatest socioeconomic impact from this type of trauma^(6,8,10,13,18). The fact that adolescents and young adults are more usually affected by accidents and violence can be explained by their lack of experience, recklessness, tendency to seek emotions and challenges, get involved in fights, derive pleasure from experiencing risky situations, impulsiveness, and alcohol or drug abuse^(3,6,9,14,19). The relationship between age, lacking experience, risky behavior, and unsafe attitudes are contributing factors in the occurrence of accidents⁽⁶⁾.

In our survey, most patients (76.1%) arrived at the Emergency Room having been brought by the Mobile Emergency Care Service (*SAMU*, the Portuguese acronym for *Serviço de Atendimento Móvel de Urgência*). Most patients with mild TBI are transported to hospital by privately owned car, whereas patients with moderate or severe TBI are often transported by *SAMU* ambulances⁽²⁰⁾.

In this study, 66.4% of patients were classified as having mild TBI. In analyzing a study with 1,140 medical records, we found a prevalence of 36.0% of mild TBI cases⁽²⁾. Another study analyzed the medical records of 676 patients admitted to a hospital in Recife, in the State of Pernambuco, and found a prevalence of 81.8% of mild TBI cases⁽¹⁰⁾. Another study with 277 victims found a prevalence of 43.0% of patients with mild TBI⁽⁷⁾. A descriptive, cross-sectional study carried out at the neurological clinic in a referral emergency hospital in the city of Teresina, in the State of Piauí, evaluated 132 occurrences of TBI patients from January to March, 2015, and found a sample containing 54.5% of mild TBI cases⁽⁸⁾. The main advantage of the

Glasgow Coma Scale (GCS) is its objective assessment of the patient's neurological status and TBI lethality. It is a method used worldwide to categorize TBI patients, as it measures the severity of head trauma and provides a good correlation with severity results of the population with TBI^(11,21).

As for the etiology of trauma, in our study, the main cause of TBI patients' admission to hospital was falls, accounting for 57.5% of the sample. An analysis of 676 medical records of patients admitted to a hospital in Recife, in the State of Pernambuco, revealed a prevalence of falls corresponding to 42.0% of the sample⁽¹⁰⁾. Another study carried out with 298 medical records of patients admitted to a hospital in the State of Minas Gerais found a prevalence of falls⁽¹³⁾. In a survey that analyzed 496 care service records in the State of Rio Grande do Sul, the prevalence of falls represented 47.0% of the sample⁽⁴⁾. A study carried out in the State of Pernambuco with 121 medical records found motorcycle accidents as the most prevalent type of accident in 35.0% of the sample⁽⁶⁾. A study with 277 cases found a prevalence of victims of traffic accidents (60.3%) among TBI cases⁽⁷⁾. In a prospective study with 139 patients diagnosed with severe and moderate TBI receiving treatment at the Emergency Unit at *Hospital de Clínicas da Universidade Federal de Uberlândia* between January and December, 2002, traffic accidents were found to be the most prevalent type of accident, accounting for 64.7% of the sample⁽⁸⁾.

The high rates of falls are related to the age groups corresponding to the elderly or children. Elderly people are more susceptible to falls, which occur as a result of the total loss of postural balance - this, in turn, may be due to intrinsic factors resulting from aging-related physiological changes, decreased muscle strength, presence of comorbidities, effects caused by the use of drugs, and extrinsic factors, which depend on social and environmental circumstances that create challenges for the elderly^(2,6,12,13). Falls from standing height are the most important cause of TBI in elderly and middle-aged individuals than they are among young adults. In general, young individuals sustain injuries from other traumatic mechanisms, such as car accidents. From the age of 40 onwards, accidents resulting in TBI due to falls from standing height affect men and women in the same proportion. The mean age of patients sustaining TBI due to falls from standing height is higher than the mean age of patients with TBI involving other traumatic mechanisms, such as car accidents⁽²⁰⁾.

The growth in the use of motorcycles as a means of transportation can be linked to their reduced cost, low maintenance expenses, speed, convenience, and economy it provides in an increasingly congested traffic, the lack of official inspection thereof, and

poor reinforcement measures. The poor quality of municipal public transportation means has led the population to seek motorcycles as a more convenient and cheaper vehicle. This situation, associated with the increase in the unemployment rate, causes many individuals to use the motorcycle as a "work tool," mostly on an informal basis for delivering goods and providing transportation services^(2,6,14,15,17,22). Drivers, popularly known as "motorcycle couriers" or "motorcycle taxi drivers" are constantly exposed to the risk of accidents, either due to their greater exposure while driving on public roads, carrying out risky maneuvers or adopting high speeds in order to quickly perform tasks and consequently increase their own productivity. Motorcycle accidents often result in serious injuries to drivers and passengers; therefore motorcyclists should be considered more vulnerable in comparison to drivers using other types of motor vehicles. Motorcyclists are the victims sustaining the most severe injuries in traffic accidents. When worn, crash helmets can reduce the severity of injuries and TBI-related mortality rates⁽⁵⁾. There are some characteristics related to this population, such as immaturity and feelings of omnipotence, which can be exacerbated by the use of alcohol and drugs when driving, as well as by speeding, disrespect for traffic laws, recklessness and not using safety equipment (i.e., not wearing crash helmet). All these deserve attention, especially with regard to the planning of preventive actions, as well as reinforcement measures^(6,12,15).

The occurrence of TBI related to traffic accidents can be explained by the increase in the number of circulating vehicles, a lack of adequate infrastructure, lacking reinforcement measures, poor state of conservation of vehicles, recklessness of drivers, and impunity of traffic offenders. It is commonly related to the presence of behavioral risk factors, such as the use of alcohol and drugs when driving, speeding, reckless maneuvers, lack of attention to traffic conditions, and not using safety and protection equipment^(10,12,13,15,17,19). The severity of trauma related to car accidents, which lead to high disability and mortality rates among patients, may be linked to the lack of safety of personal protective equipment, such as seat belts and airbags, or to the fact that most people do not use such safety items^(17,19).

Violence and physical aggression are growing causes of mechanical trauma in large cities and related to the urbanization process, which ends up accentuating economic inequalities, predisposing the victims to this type of trauma^(10,19). Gunshot wounds are generally the most frequent cause of TBI in the lower-income population⁽¹¹⁾.

The average length of hospital stay found in our study was six days and six days in the ICU. A study

carried out in the State of Bahia analyzed 1,140 medical records and found an average length of hospital stay of 11 days⁽²⁾. Another study carried out with 298 medical records of patients admitted to a hospital in the State of Minas Gerais found an average length of hospital stay of 7.2 days⁽¹³⁾. The patient with TBI must remain for at least 24 hours under observation in the urgency/emergency service, in order to ensure that health care professionals can perceive any signs indicating worsening of the patient's clinical status, such as convulsive episodes, disorientation, headache, among other symptoms characterizing TBI⁽⁴⁾.

Of the patients in our sample, 92.9% received clinical treatment (conservative), whereas 7.1% received surgical treatment. A study carried out in the State of Bahia with 1,140 medical records found similar data and showed a prevalence of clinical treatment corresponding to 86.4% of the sample⁽²⁾. A conservative treatment consists of observation and correction of associated disorders aiming to avoid secondary injuries by strictly controlling hypotension and cerebral hypoxia through monitoring of intracranial pressure and cerebral blood flow⁽²³⁾. The conservative treatment is accompanied by a higher occurrence rate of mild traumas⁽²⁾. The surgical approach related to the severity of TBI increases hospital costs and compromises the public health budget, since neurosurgery expenses are quite high and the recovery of such patients takes longer, requiring intensive care and specialized monitoring⁽¹⁵⁾.

Regarding the progression of trauma, 85.8% of the patients in our sample were discharged from hospital. A study that analyzed 496 medical records in the State of Rio Grande do Sul found that 70.8% of patients also progressed to discharge⁽⁴⁾. A survey conducted with 155 patients in the State of Bahia identified that 67.7% of victims were discharged⁽⁵⁾. Another study analyzed the medical records of 676 patients with traumatic brain injury who had been admitted to a hospital in Recife, in the State of Pernambuco, and 77.0% of the sample progressed to discharge⁽¹⁰⁾. Last of all, still another study carried out in Fortaleza, in the State of Ceará, with 722 medical records of TBI patients found that 84.0% of patients progressed to discharge⁽³⁾. The lethality rate of victims of TBI is considered high when compared to other pathologies - and even with other types of trauma - and correlates with the initial GCS score: the lower the score, the greater probability of death. Higher death rates are associated with patients diagnosed with severe TBI⁽¹⁵⁾. It is noteworthy that the mortality rate is limited to hospitalized patients, that is, it does not consider those who died at the site of the event, which means that it might be higher in TBI patients, mainly due to homicide⁽¹⁸⁾.

Conclusions

After having analyzed 268 medical records of TBI patients, we can conclude that male, white, single, individuals with high blood pressure, alcoholism and a mean age of 51 years prevailed. They arrived at the Emergency Room having been brought by the Mobile Emergency Care Service (*SAMU*, the Portuguese acronym for *Serviço de Atendimento Móvel de Urgência*), had been victims of falls, presenting with a mild TBI and characterized by scoring 13 to 15 points in the Glasgow Coma Scale upon arrival at the Emergency Room. Conservative treatment was the most indicated type of treatment, the patients remained on average six days in the hospital and on average nine days in the ICU, after which they were discharged.

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Article received: December 13, 2020

Article approved: June 1, 2021

Article published: June 4, 2021